Cross-linguistic evidence for a non-distributive lexical meaning of conjunction *

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Abstract

This paper investigates the lexical meaning of elements like English *and* ('COORD') in conjunctions with individual-denoting conjuncts by considering cross-linguistic form-function correlations. We present two generalizations concerning the correspondence between distributive/ non-distributive readings and formal markedness both inside and outside the coordinate structure. We argue that they suggest that the cross-linguistic lexical meaning of COORD is non-distributive and that distributivity is introduced by additional morphology. We then discuss how existing semantic treatments of coordinate structures could be adapted to yield a compositional analysis of the cross-linguistic facts.

1 Introduction

This paper focusses on the lexical meaning of English *and* and its correlates in other languages ('COORD') in '*e*-conjunctions' – conjunctions with individual-denoting conjuncts as in (1-a).

(1) a. *Mary and Sue earned exactly 100 euros.*
b. Mary earned exactly 100 euros and Sue earned exactly 100 euros. D-reading
c. Mary and Sue earned exactly 100 euros between them. ND-reading

What we will call **D-theories** assume that this lexical meaning is **distributive**, ('D'), which roughly means that it is reducible to the operation '$\wedge$' from classical propositional logic. **ND-theories**, on the other hand, take it to be **non-distributive** ('ND') which essentially means that COORD expresses an operation analogous to that which forms pluralities from individuals. Each type of analysis has to assume additional operations to derive certain readings of sentences with *e*-conjunctions: For (1-a), D-theories require additional operations to derive the ND-reading in (1-c), whereas ND-theories need additional operations for the D-reading in (1-b).

The question here is whether cross-linguistic evidence supports either of these two theories. Based on data from both the literature and our own ongoing study, we address this question by

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looking at form-function correlations: Broadly speaking, we try to relate the different additional operations posited by the two theories to overt morphological markers that appear in sentences with *e*-conjunctions. Two paradigms will each be correlated with the availability of D- and ND-readings: First, we will look at **conjunction patterns** – paradigms, where the formal realization of COORD is held constant, but where the formal realization of the entire coordinate structure varies w.r.t. additional conjunction particles (μ), as schematized in (2-a). Second, we will examine **conjunction strategies**, paradigms, where the coordinate structure itself is held constant and variation concerns additional markers (ν) occurring *outside* of the coordinate structure, (2-b).[1] Our survey is restricted in three respects: First, we only consider instances of *iterative coordination*, i.e. coordinate structures that allow for more than two conjuncts (cf. [2] for a more precise definition). Second, we only look at *e*-conjunctions occurring in *subject position*. Third, we only investigate sentences where such conjunctions occur with what we call **C-predicates**, namely, predicates containing a degree expression, as in (1-a) above, or an indefinite plural, e.g. *read exactly five books*.[2]

(2) a. [A COORD B] [P] vs. [A COORD B μ] [P]
b. [A COORD B] [P] vs. [A COORD B] [ν P]

Based on our (limited) data set, we present two generalizations which, if they should turn out to be universal (among languages that have iterative *e*-conjunction in the first place), would have the following theoretical consequences: First, the lexical meaning of COORD is ND. Second, at least one of the additional operations required by ND-theories – so-called VP-level distributivity operators – must be available cross-linguistically. We then investigate how our findings can be implemented. In most existing theories of COORD, its lexical meaning is defined as a *binary* operation on the conjuncts' denotations. However, many languages display conjunction patterns where *each* conjunct is morphologically marked by μ, [6, 10]. This suggests that, in addition to COORD, some conjunction patterns involve a *unary* operator modifying each conjunct. We show how the semantic analyses of this pattern in [6, 10] could be adapted to a ND lexical meaning for COORD and point to the remaining problems.

2 Background: Theories of conjunction

D-analyses of conjunction (cf. e.g. [8]) take the meaning of COORD to be defined in a unified way as in (3-b) for all types that "end in t", (3-a), thus accounting for the cross-categorial applicability of COORD in languages like English. For *e*-conjunctions we thus need the operation in (3-c) that shifts the denotations of the conjuncts to a t-conjoinable type. As a result, we derive the D-reading of *e*-conjunctions like (1-a) as in (3-e), using the derived meaning for quantifier conjunction in (3-d).

(3) a. The set TC of t-conjoinable types is the smallest set of semantic types such that $t \in TC$ and if $b \in TC$, then for all a, $\langle a, b\rangle \in TC$. (cf. [8])
b. $[\![\text{COORD}_t]\!] = \lambda p_t.\lambda q_t.p \wedge q$, and for every type $b \in TC$ and every type a:
$[\![\text{COORD}_{\langle a,b\rangle}]\!] = \lambda P_{\langle a,b\rangle}.\lambda Q_{\langle a,b\rangle}.\lambda x_a.[\![\text{COORD}_a]\!](P(x))(Q(x))$ (cf. [8])

[1] Neither of the schemata in (2) is supposed to represent linear order facts or the number of occurrences of μ/ν. Nor do we assume that COORD must be phonologically realized.

[2] We explicitly instructed our consultants to use C-predicates, and to avoid sentences with inherently distributive predicates – such as *John, Mary and Sue left* – since such predicates won't let us distinguish the D-reading and the ND-reading truth-conditionally. Therefore, our claims about the presence and the obligatoriness of certain distributivity markers might not generalize to inherently distributive predicates.

c. $[\![\uparrow]\!] = \lambda x_e.\lambda P_{\langle e,t\rangle}.P(x)$ (cf. [7])
d. $[\![\text{COORD}_{\langle\langle e,t\rangle,t\rangle}]\!] = \lambda \mathbf{P}_{\langle\langle e,t\rangle,t\rangle}.\lambda \mathbf{Q}_{\langle\langle e,t\rangle,t\rangle}.\lambda R_{\langle e,t\rangle}.\mathbf{P}(R) \wedge \mathbf{Q}(R)$
e. $[\![[[\uparrow \text{M}_e]\ \text{COORD}_{\langle\langle e,t\rangle,t\rangle}\ [\uparrow \text{S}_e]]\ \text{P}]\!] = [\![\text{P}]\!]([\![\text{M}]\!]) \wedge [\![\text{P}]\!]([\![\text{S}]\!])$

Without further assumptions, the D-analysis derives the D-reading for sentences with C-predicates like (1-a), but does not straightforwardly account for the ND-reading in (1-c). Yet, D-analyses *can* retrieve ND-readings by assuming additional operations. [11] posits two operators, MIN, (4-a), and $\exists$, (4-b), which attach to the conjunction (we slightly adapt his proposal for our purposes). In combination, they yield existential quantification over those pluralities[3] consisting exclusively of individuals the conjuncts' denotations identify, (4-d) – which will give us the ND-reading for sentences like (1-a).

(4) a. $[\![\text{MIN}]\!] = \lambda \mathcal{P}_{\langle\langle e,t\rangle,t\rangle}.\lambda x_e.\exists Q_{\langle e,t\rangle}.[\mathcal{P}(Q) \wedge \forall Q'_{\langle e,t\rangle}[Q' \subseteq Q \wedge \mathcal{P}(Q') \rightarrow Q' = Q] \wedge x = \bigoplus Q]$
b. $[\![\exists]\!] = \lambda P_{\langle e,t\rangle}.\lambda Q_{\langle e,t\rangle}.\exists x_e[P(x) \wedge Q(x)]$
c. [[$\exists$ [MIN [[$\uparrow$ Mary] COORD$_{\langle\langle e,t\rangle,t\rangle}$ [$\uparrow$ Sue]]]] [earned 100 euros]]
d. $[\![\exists[\text{MIN}[[\uparrow \text{M}]\ \text{COORD}_{\langle\langle e,t\rangle,t\rangle}[\uparrow \text{S}]]]]\!] = \lambda Q_{\langle e,t\rangle}.\exists x_e[x = m \oplus s \wedge Q(x)] = \lambda Q_{\langle e,t\rangle}.Q(m \oplus s)$

ND-analyses of conjunction (cf. e.g. [4]) on the other hand assume that COORD denotes a sum operation ('$\oplus$') in the individual domain, (5-a). *e*-conjunctions denote pluralities of individuals and we straightforwardly derive the ND-reading. With this type of analysis, additional operations – e.g. a **distributivity operator** – are required to derive the D-reading. There are two potential implementations: D_1 in (5-b) shifts a type *e* plurality to a distributive quantifier. Applying D_1 after COORD yields the same result as the D-analysis in (3-e). D_2 in (5-c) modifies the predicate rather than the subject (cf. a.o. [5]).[4] (6) shows that both approaches yield the same result for (1-a), but as shown below, they make distinct cross-linguistic predictions.

(5) a. $[\![\text{COORD}_e]\!] = \lambda x_e.\lambda y_e.x \oplus y$
b. $[\![\text{D}_1]\!] = \lambda x_e.\lambda P_{\langle e,t\rangle}.\forall y \leq_a x.P(y) = 1$
c. $[\![\text{D}_2]\!] = \lambda P_{\langle e,t\rangle}.\lambda x_e.\forall y \leq_a x.P(y) = 1$

(6) a. $[\![[\text{D}_1$ [Mary COORD$_e$ Sue]] earned 100 euros$]\!] = [\lambda P_{\langle e,t\rangle}.\forall y \leq_a m \oplus s.P(y) = 1]$ ($[\![$earned 100 euros$]\!]) = 1$ iff $\forall y \leq_a m \oplus s.[\![$earned 100 euros$]\!](y) = 1$
b. $[\![[[$Mary COORD Sue] [D_2 [earned 100 euros]]$]\!] = [\lambda x_e.\forall y \leq_a x.[\![$earned 100 euros$]\!](y) = 1](m \oplus s) = 1$ iff $\forall y \leq_a m \oplus s.[\![$earned 100 euros$]\!](y) = 1$

Our question in the following will be whether one of the analyses could hold **universally** (among languages with iterative *e*-conjunctions).[5]

[3] We assume a set $A \subseteq D_e$ of atomic individuals, a binary operation $\oplus$ on D_e and a function $f : (\mathcal{P}(A) \setminus \{\emptyset\}) \rightarrow D_e$ s.th.: 1) $f(\{a\}) = a$ for any $a \in A$ and 2) f is an isomorphism between the structures $(\mathcal{P}(A) \setminus \{\emptyset\}, \cup)$ and $(D_e, \oplus)$. Hence there is a one-to-one correspondence between plural individuals and nonempty sets of atomic individuals. We will use the notions in (i), following much of the literature.

(i) For any $a, b \in D_e$, $S \subseteq D_e$:
a. $a \leq b \Leftrightarrow a \oplus b = b$ ("a is a part of b")
b. $a \leq_a b \Leftrightarrow a \leq b \wedge a \in A$ ("a is an atomic part of b")
c. $\bigoplus S = f(\bigcup\{f^{-1}(x) \mid x \in S\})$ (the sum of all individuals in S)

[4] We assume that the extension of predicates modified by D_2 can also include atomic individuals.

[5] We rule out the possibility that COORD is ambiguous between a lexical D-meaning and a lexical ND meaning: This is unlikely to be universally correct, given examples like (i) (adapted from [1]) which show that at least in some cases, the ambiguity is due to the predicate rather than COORD: (i) is ambiguous between a D- and a

3 Correlating form and function cross-linguistically

As the two analyses differ in which reading of sentences like (1) they take to be 'basic', they make different predictions about cross-linguistic form-function correlations. These relate to how formal *markedness* relations between coordination patterns or strategies correlate with distributivity. We present two cross-linguistic generalizations, one about coordination *patterns*, one about coordination *strategies*. We then specify the predictions of the analyses and show that the generalizations support the ND-analysis for a cross-linguistic lexical meaning of COORD.

Our data set comprises examples from the literature and from our on-going Terraling study 'Conjunction and disjunction' (cf. http://test.terraling.com/groups/8) which currently contains data from X languages from Y language families. Terraling is an open-ended, open-source database where language experts (mostly native speaker linguists) answer metalinguistic questions in a 'yes/no/does-not-apply' format, and also have the option of providing glossed examples (cf. [3]). Our study is the first to use this database to determine semantic properties of languages; for this purpose, consultants were asked to answer a number of questions concerning the availability of particular forms in their language (with a focus on the presence / absence of additional markers that enforce a certain reading) and the range of meanings these forms can express [2]. In particular, we asked our consultants to test for the presence of distributive and non-distributive interpretations for a given form by constructing a sentence with a C-predicate, analogous to (1), and testing whether it can be used to adequately describe a scenario of a particular type. We asked consultants to use modified numerals inside the C-predicate where possible, in order to make it easier to distinguish the two readings truth-conditionally.

3.1 Generalization A: Conjunction patterns

Generalization A concerns markedness relations within the coordinate structure itself.

(7) **Generalization A (GA)**: For any pair of iterative coordination patterns within a language that have a conjunctive meaning and apply to proper names, where one pattern can be obtained from the other by adding "additional markers":
(a) If the **marked** pattern permits a **ND** interpretation, so does the **unmarked** pattern.
(b) If the **unmarked** pattern allows for a **D** interpretation, so does the marked pattern.

For two *coordination patterns* P1 and P2, where P1 has both a D-reading and an ND-reading and P2 is morpho-syntactically marked relative to P1 – i.e. where P2 contains all the markers present in P1 plus some additional marker(s) – there are three logical possibilities.[6] The first possibility is that P2 could also have both readings, in which case the additional material in P2 would not affect (non-)distributivity. This case, discussed by [10] for Japanese *A-to B* and *A-to B-to*, is uninformative for the question at hand.

(8) A-to B(-to) de 100 kg ni naru.
'A and B weigh 100 kg' (Japanese ([10, 182, (48)]), both D-and ND-reading available)

ND-reading of VP2 and can thus be true in a scenario where Mary and Sue drank exactly one glass each. For this reading, a distributive lexical meaning of COORD would be needed – but this conflicts with the requirement that COORD must be non-distributive to license the collective predicate in VP1.

(i) *Mary and Sue [$_{VP1}$ met in the bar] and [$_{VP2}$ had exactly one glass of wine].*

[6] A language may also have two coordination patterns that are not related in an obvious way, i.e. neither of the patterns formally 'contains' the other, e.g. German *A und B* vs. *sowohl A als auch B* 'A as well as B'. Taken at face value, such cases are uninformative w.r.t. our initial question, but cf. [2] for discussion.

The second option is that P2 has only a D-reading, i.e. the additional marking 'removes' the ND-interpretation. This is exemplified by (9) from Serbo-Croatian (cf. also [10] for Hungarian). The marked pattern P2 in (9-b) 'contains' the unmarked pattern P1 in (9-b): Whereas in (9-b) the marker *i* modifies each conjunct, this is not the case in (9-a). P1 is ambiguous between a D-reading and a ND-reading because (9-a) true in both scenarios in (10). P2, on the other hand, has only a D-interpretation, because (9-b) is not true in the scenario in (10-b).

(9) a. [A (i) B i C] su zaradili tačno sto evra.
A (and) B and C AUX.3PL earn.PART.PL.M exactly hundred euros.GEN
'A, B and C earned exactly 100 euros.'
b. [I A i B i C] su zaradili tačno sto evra.
and A and B and C AUX.3PL earn.PART.PL.M exactly hundred euros.GEN
'A, B and C earned exactly 100 euros each.' (Serbo-Croatian, adapted from examples by Jovana Gajić[7])

(10) a. A earned 100 euros, B earned 100 euros, C earned 100 euros.
b. A earned 30 euros, B earned 30 euros, C earned 40 euros.

The third possibility is that P2 has only an ND-reading. This possibility – excluded by **GA** – is not attested in our data set, although our survey explicitly asks for examples of this kind. We conjecture that additional marking inside the coordinate structure never 'removes' a D-reading.

GA captures another interesting gap in our data set: A coordination pattern P2 that has both a D-reading and an ND-reading is never marked relative to a pattern P1 that only has a D-reading. It seems that marking inside the coordinate structure never 'adds' an ND-reading. While we did not explicitly ask our consultants whether this pattern exists, we did ask them to provide examples of *e*-conjunctions that only have a D-reading, and of *e*-conjunctions that are ambiguous. These examples never show the markedness relation just described.

3.2 Generalization B: Conjunction strategies

Generalization B relates to additional marking *outside* of the coordinate structure, i.e. on the predicate.

(11) **Generalization B (GB)**: Predicate-level **distributivity** markers **can be "obligatory"** in the sense that for some iterative coordination pattern with a conjunctive meaning, the ND reading of sentences with a C-predicate is available with the marker, but unavailable if the marker is omitted.
Predicate-level **non-distributivity** markers are **not "obligatory"** in this sense.

We are now comparing *coordination strategies* S1 and S2, where the coordinate structure itself is the same in S1 and S2, but S1 is morpho-syntactically less marked in the sense that S2 contains additional material *outside* the coordinate structure. The picture here is analogous to that of coordination patterns: While many languages have overt predicate-level markers that force an ND-interpretation (e.g. English *together*), our data set involves no cases where a predicate-level marker is *required* for an ND-interpretation of a C-predicate. Yet, we do find languages where additional marking on the predicate is required for a D-interpretation, i.e. where S1 has only an ND-interpretation and S2 adds a D-interpretation. This is exemplified by Basa'a in (12).

[7] *http://test.terraling.com/groups/8/examples/16182, http://test.terraling.com/groups/8/examples/16177*

(12) a. [A, B ni C] ɓá-bí-kosná dikóó dísámal
A B COORD C 2.SM-PST2-receive 13.thousands 13.six
'A, B and C received six thousand francs.' (ND only)
b. [A, B ni C] ɓá-bí-kosná dikóó dísámal, híkií mut
A B COORD C 2.SM-PST2-receive 13.thousand 13.six each 1.person
'John, Mary and Peter received six thousand francs each.' (D only)
Basa'a (Equatorial Bantu; adapted from examples by Paul Roger Bassong[8])

The coordinate structure in (12-a) and (12-b) is the same, but they exemplify different coordination strategies, as *híkií mut* 'each person' is present only in (12-b). The less marked strategy S1 in (12-a) has an ND-only interpretation and the more marked one S2 has a D-interpretation.

3.3 Theoretical consequences

While **GA** and **GB** are analogous in that some kind of formal 'markedness' is associated with D-interpretations, but not with ND-interpretations, they differ in their theoretical consequences.

As opposed to **GA**, **GB** relates to formal correlates of the two readings of C-predicates, rather than formal correlates of the two readings of conjunction, since predicate-level D-markers are not part of the coordinate structure itself. Its impact on our initial question concerning the cross-linguistic semantics of COORD is thus indirect – it will help us determine the theoretical consequences of **GA**. Namely, **GB** suggests that cross-linguistically, the D-interpretation of C-predicates always involves an additional operator in the syntactic structure, which is absent in the case of an ND-interpretation. More precisely, we submit that predicate-level operators like D_2 in (5-c) are available in all languages that allow for D-interpretations of C-predicates.[9] Languages differ in whether they have to spell out D_2 overtly: In a language like English in which sentences like (1-a) without overt D-marking are ambiguous, (13-a) must have a structure like (13-b), with an overt realization of D_2, while (1-a) can correspond to either of the two structures in (13-b) and (13-c). Languages like Basa'a, on the other hand must realize D_2 overtly whenever it is present. In such languages, a sentence with a C-predicate lacking an overt D_2 will thus be unambiguously ND (assuming an ND-interpretation of the coordinate structure itself).

(13) a. Mary and Sue each earned 100 euros.
b. [[Mary COORD Sue] [D_2 [earned 100 euros]]]
c. [[Mary COORD Sue] [earned 100 euros]]

With the assumption that predicate level D_2 is indeed available cross-linguistically, we can specify the theoretical predictions of **GA**.[10] Both analyses allow us to derive a non-distributive meaning for coordinate structures which, when combined with D_2, yields the D/ND ambiguity found in conjunction strategies such as English *A, B and C* or Serbo-Croatian *A, B i C*. To derive a D-only strategy under the ND-analysis, we have to add an operator like D_1 (14-a). In a language like English, there is no morphosyntactic evidence for this operator. But in languages where this operator always has an overt morphological reflex, but does not affect the morphological spell-out of COORD, we would get an additional marker that removes the

[8] *http://test.terraling.com/groups/8/examples/16284*; *http://test.terraling.com/groups/8/examples/16285*

[9] This assumption is motivated independently by the fact (reported in [2]) that our data sample contains no iterative coordination patterns that are limited to an ND-interpretation. If this generalization turns out to be robust, it suggests that D_2 is universally available and that ND-only patterns do not exist because C-predicates can receive a distributive interpretation via a mechanism that is unrelated to the coordinate structure.

[10] [2] spell out the parameter-settings that have an effect on these predictions and lay out the morpho-syntactic assumptions required to derive them without predicting a transparent markedness relation in every language.

ND-reading – a situation that seems to be attested in Serbo-Croatian, Hungarian and Turkish, among others (cf. [10] and data on *test.terraling.com/groups/8*), (14).

(14) a. [A COORD B] D or ND (depending on D_2)
b. [D_1 [A COORD B]] D only **ND-analysis**

The D-analysis, on the other hand, predicts that the ND-reading requires the presence of the additional operators MIN and ∃. In this case, if a language required an overt realization of either of these operators, we would get an additional marker that adds the ND-reading to a structure lacking it – a situation unattested in our sample and ruled out by **GA**.

(15) a. [A COORD B] D only
b. [∃ [MIN [A COORD B]]] D or ND (depending on D_2) **D-analysis**

Of course, the predictions of the D-analysis would change if our claim that D_2 is present cross-linguistically turned out to be false. But then we would still predict that additional marking can *remove* the D-interpretation – another unattested situation ruled out by **GA**. In summary, if the unattested markedness relations in our sample reflect real typological gaps, these gaps can be derived from the ND-analysis under certain morphosyntactic assumptions. Further, under the D-analysis the existence of D-only conjunction patterns that are marked relative to an ambiguous conjunction pattern – a situation found in several languages – would be unexpected.

4 Issues for the analysis of conjunction particles

The generalizations above suggest that the lexical meaning of COORD is ND and that a D-reading of the coordination is derived by means of additional morphology μ. So far, we assumed that it is the operator D_1 that yields us the D-interpretation, but this assumption is at odds with the actual form of the marked patterns that display a D-reading: Very often, μ is affixed to each conjunct – witnessed by e.g. (9) above and schematized in (16) – which means that μ itself cannot spell out D_1. The question we raise here is thus how we can compositionally derive a D-reading for (16) while simultaneously maintaining an ND-analysis of COORD.

(16) A-μ COORD B-μ

While [6] and [10] each provide compositional analyses of the formal pattern in (16), neither takes the lexical meaning of COORD to be ND or tries to derive the D-reading from the ND-reading. Hence, neither proposal is compatible with our empirical results and their consequences. In the following, we discuss if these accounts can be adapted to fit our claims above.

4.1 Conjunction particles introduce postsuppositons

[10] assumes the underlying structure in (17-a) for (16) (adapted here to our examples). The conjuncts must be shifted to t-conjoinable type (by ↑) and are each affixed by μ, which introduces a postsupposition requiring that the conjunct's denotation is asymmetrically entailed by the denotation of the entire conjunction. The resulting expressions are then conjoined by COORD, which forms a pair of their denotations, (17-b). Finally, the silent operator $OP_\cap$ applies at the top-level of the conjunction and returns the intersection of the elements of the pair, (17-c).

(17) a. [$_X$ $OP_\cap$ [$_Y$ [[↑ Mary] μ] [COORD [[↑ Sue] μ]]]]
b. $[\![Y]\!] = \langle [\![\uparrow \mathrm{M}]\!], [\![\uparrow \mathrm{S}]\!] \rangle$ (ignoring postsuppositions)

c. $[\![X]\!] = [\![\uparrow \text{M}]\!] \cap [\![\uparrow \text{S}]\!]$ (ignoring postsuppositions)

How would we have to modify such a proposal to make it fit our generalizations and their consequences? Recall that we are trying to derive the D-reading of the more complex structure from the ND-reading of the more simple structure in (18). (18) cannot contain $OP_\cap$ (because it has an ND-reading),[11] which in turn means that we cannot assume that COORD denotes pair-formation – otherwise (18) wouldn't be interpretable.

(18) [A [COORD B]]

As the meaning of COORD should remain constant across the less marked and the more marked pattern, and the lexical meaning of COORD in (18) must be ND, we have to generalize the ND-analysis to types ending in t if we want to maintain (17-a) above – otherwise, $OP_\cap$ cannot apply. Furthermore, this generalized ND-analysis must be such that the denotations of the individual conjuncts remain transparent for $OP_\cap$. For this purpose we employ a proposal discussed by [9] for generalized sum-formation: For any semantic domain D_a there is a set $AT_a \subseteq D_a$ of atomic elements of that domain, a binary operation $\oplus$ on D_a and a function $f_a : (\mathcal{P}(AT_a) \setminus \{\emptyset\}) \to D_a$ such that: 1) $f(\{X\}) = X$ for any $X \in AT_a$ and 2) f_a is an isomorphism between the structures $(\mathcal{P}(A) \setminus \{\emptyset\}, \cup)$ and $(D_a, \oplus)$. Assuming that COORD occurring with conjuncts of type a always expresses the operation $\oplus$ on D_a, the constituent Y from (17-a) above thus has the denotation in (19-a) – which is isomorphic to $\{[\![\uparrow\text{M}]\!], [\![\uparrow\text{S}]\!]\}$. The denotation of $OP_\cap$ must accordingly be altered so as to apply to all atomic parts of the conjunction's denotation, (19-b). Hence, we also derive the meaning in (17-c) for (17-a) above, but our assumptions about the semantic roles played by the individual parts of the structure differ from those made by [10].

(19) a. $[\![Y]\!] = [\![\uparrow \text{M}]\!] \oplus [\![\uparrow \text{S}]\!]$
b. $[\![OP_\cap]\!] = \lambda\mathcal{P}_{\langle\langle et\rangle t\rangle}.\bigcap\{\mathcal{Q} : \mathcal{Q} \leq_{AT} \mathcal{P}\}$

In addition, we must posit a syntactic agreement mechanism that ties the occurrence of $OP_\cap$ to that of μ, because we must exclude silent $OP_\cap$ from occurring in structures lacking μ, like (18). If it could apply in these cases, we would falsely predict that languages like Basa'a in (12), where C-predicates are unambiguous, should always allow for D-readings of conjunctions, irrespective of whether the predicate contains a D-marker or not.

Clearly, this adaptation of the proposal is not yet satisfactory. Without additional assumptions concerning the composition of quantifier pluralities with the predicate, $OP_\cap$ seems obligatory whenever COORD conjoins expressions of quantifier type and therefore, such conjunctions should be limited to D-readings - but it is well-known that they are not: One of the readings of (20-a) is the ND-reading in (20-b).

(20) a. *Two girls and five boys earned exactly 100 euros.*
b. A plurality consisting of two girls and five boys earned exactly 100 euros in total.

Furthermore, the proposal relies on the availability of $OP_\cap$, which we would expect at least some languages to spell out overtly but which we have not encountered, yet, in our data set.

4.2 Conjunction particles introduce type-shifts

[6] do not posit a silent operator at the top node of the conjunction but rather put the semantic workload on the particles μ and silent morphemes $\Uparrow_{\langle e\langle et\rangle\rangle}$ which each conjunct combines with

[11] Adding an additional operator on top of (17-a) which yields the ND-reading is incompatible with **GA**.

first, (21-a). $\Uparrow_{\langle e\langle et\rangle\rangle}$ maps individuals to the singleton containing them (i.e. shifts expressions from e to $\langle et\rangle$), wheras μ shifts expressions from $\langle et\rangle$ to $\langle\langle et\rangle t\rangle$, (21-b). For the meaning of COORD, [6] assume the D-analysis, so that X in (21-a) has the same denotation as (17-c) above.

(21) a. $[_X$ [[Mary $\Uparrow_{\langle e\langle et\rangle}$ $]\mu]$ [COORD [[Sue $\Uparrow_{\langle e\langle et\rangle\rangle}]$ $\mu]$]]
b. $[\![\mu]\!] = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.P \subseteq Q$

If we want to preserve the structure in (21-a) and the meaning for μ assumed by [6], we have to depart significantly from their analysis of COORD: We require a generalized meaning for COORD that gives us the ND-reading for (18) and also combines with quantifiers. For this purpose, we use a simplified version of the proposal by [9]: Working with the ontology and the denotation for COORD introduced in section 4.1, we add a compositional rule '•' of pointwise application, which applies in two kinds of situations: (i) If an argument plurality $a \oplus b$ combines with a (non-plural) function f that itself does not take pluralities as its argument, the result will be the plurality of values $f(a) \oplus f(b)$. (ii) If a function plurality $f \oplus g$ combines with a (non-plural) argument, the result is again a plurality of values $f(a) \oplus g(a)$. Assuming that sentential pluralities are true iff all of their atomic parts are true, this analysis, partially spelled out in (22-b), correctly derives the D-reading for sentences with the pattern in (21-a). The unmarked pattern in (18), on the other hand, will denote a plurality of individuals ($m \oplus s$). In order to prevent • from applying in (22-c), where the unmarked pattern occurs with a C-predicates that does not contain D_2, we must assume that such predicates primitively take pluralities as their argument and thus combine with the subject plurality by means of functional application. Accordingly, the difference between the marked and the unmarked pattern lies in the type of the coordinates and the assumption that some predicates primitively hold of individuals.[12]

(22) a. $[\![$ [[[[Mary $\Uparrow_{\langle e\langle et\rangle}$ $]\mu]$ [COORD [[Sue $\Uparrow_{\langle e\langle et\rangle\rangle}]$ $\mu]$]] [earned 100 euros]]$]\!] =$
b. $\lambda P.\{m\} \subseteq P \oplus \lambda P.\{s\} \subseteq P \bullet [\![$earned 1000 euros$]\!] =$
$= \{m\} \subseteq [\![$earned 1000 euros$]\!] \oplus \{s\} \subseteq [\![$earned 1000 euros$]\!]$
c. $[\![$[[Mary COORD Sue] [earned 100 euros]]$]\!] = [\![$eraned 100 euros$]\!]$ $(m \oplus s)$

This adaptation also runs into a number of problems. One obvious obstacle is that as in section 4.1, we falsely predict only D-readings for conjunctions in which the conjuncts are of type $\langle\langle et\rangle t\rangle$. Furthermore, our current proposal breaks down in configurations where – according to the assumptions made here – both of the expressions that need to combine with one another denote pluralities, as e.g. in (23) (but cf. [9]). Since (23) has an ND-reading (where it is true if Mary sang and Sue danced), we cannot expand pointwise application to (23). On the other hand, forcing an ND-reading by what is in effect collective predictation as in (22-c), is also not straightforwardly compatible with our meaning of COORD above.

(23) *Mary and Sue sang and danced.*

5 Conclusion and Outlook

We considered two theories concerning the lexical meaning of COORD in e-conjunctions – the D-analysis and the ND-analysis. Crucially, each of these analyses has to assume additional operations in order to derive some of the readings of sentences containing such conjunctions. We

[12] Note that as in section 4.1 – and for the very same reasons – we have to make sure that the mechanism associated with the presence of μ is limited to those contexts where it actually occurs. This raises interesting questions wrt the formal marking of type-shifts in other contexts, which we omit here for reasons of space.

raised the question whether either analysis is supported by cross-linguistic evidence concerning form-function correlations of sentences: More specifically, we considered whether cross-linguistic formal markedness patterns match the predictions in terms of additional operations that each analysis has to posit. We presented two generalizations in our (limited data set), which, in combination, strongly support the ND-analysis, i.e. that the lexical meaning of COORD is ND and that distributivity is the result of additional operations. We then raised the question of how we can implement this claim compositionally, given the actual formal patterns found in languages. The most interesting questions (apart form those concerning the compositional implementation) concern various aspects of the scope of our generalizations: Do **GA** and **GB** remain valid once.... (i) we considering a larger data set? (ii) we losen our restrictions on our data set, e.g. once we include *e*-conjunctions in object position? (iii) we consider conjunctions with conjuncts other than individual denoting ones, e.g. predicate conjunctions?

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