

# Plural anaphora with split antecedents in discontinuous reciprocal predicates

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# Introduction

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- ❑ In case of split antecedents, plural anaphora is not only a question of searching the more coherent antecedent with the discourse topic fulfilling the grammar gender and number cues
- ❑ Further computations are needed in addition to those needed by singular anaphors

# Introduction

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- Review of some factors influencing the formation of a plural anaphora
  - Importance of the type of syntactic (*and* versus *with*) conjunction (Sanford & Lockhart, 1990)
  - Affinities between noun descriptions with respect to the verb scenario (Moxey et al., 2004; Moxey et al., 2011)
  - Verb properties such as symmetric versus non symmetric meaning (Koh & Clifton, 2002; Bianco & Schnedecker, 2000)
  - Influence of pragmatic information such as the localisation of each of the referents (Carreiras, 1997)

# Introduction

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- ❑ The influence of fulfilling a thematic role as being the object-of-PP referent in symmetric predicate in discontinuous constructions have not been studied yet
- ❑ The goal of this study is to contrast symmetric verbs (a subset of the reciprocal verbs) and non symmetric ones in their respective ability to favour subsequent plural formation in discontinuous constructions or to favour the extraction of the object-of-PP referent

## → Examples

- ❑ Tina discussed with Harry after the party. They/he...
- ❑ Tina left with Harry after the party. They/he...
- ❑ Harry discussed with Tina after the party. They/he...
- ❑ Harry left with Tina after the party. They/he...

# Outline

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Properties of symmetric verbs

Why discontinuous constructions are particularly adapted to test the properties of these verbs

Anterior results on non symmetric verbs in discontinuous constructions using a comitative PP

Anterior results on symmetric verbs in discontinuous constructions

This study in detail

Results and discussion

# Symmetric Verbs

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- Some verbs require several participants to be saturated that's why they are called plural verbs such as « quarel, gather, assemble, collide, embrace »
- They express reciprocity without morphological making such as « each other » or « on another »
- They accept the permutation of their thematic arguments without a meaning change :
  - Tina is quarelling with Harry = Harry is quarelling with Tina
- Their meaning does not change either if their arguments are conjoined by *and*
  - Tina and Harry are quarelling.

# Symmetric Verbs

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- These verbs establish an equivalence between their arguments and were used in different experimental designs to study the effect of this equivalence on 1) the discrimination of 2 types of grouping (Koh & Clifton, 2002), 2) the role of description nouns (Moxey et al. 2004, 2011) or 3) their ability to form as many plural with the syntactic conjunctions *with* and *and* (Bianco & Schnedecker, 2000)
- Most of the time they are called **symmetric verbs**, but they are also qualified as **naturally reciprocal verbs** (Kemmer, 1993) or as **irreducibly symmetric verbs** (Dimitriadis, 2004) or as **covert reciprocals**

# Symmetric Verbs

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- These verbs express a binary relationship where the two participants have necessarily identical participation (Dimitriadis, 2004) in discontinuous constructions
- Put another way (Evans, 2008)

Their meaning-to-form projection involves a complex mapping between two overlaid thematic roles, all in a single clause

The thematic roles of the participants are permuted so that each referent is linked to both thematic roles

- John and Mary love each other.

John is both the lover and the beloved, the same for Mary



# Symmetric Verbs

- For Dimitriadis (2004) the discontinuous symmetric construction always saturates the thematic roles of verbs, which is not the case of the corresponding “simple” symmetric (that is with plural subject in intransitive constructions)
- This means that a symmetric verb is lexically a two-places verb, rather than a derived one-place predicate
- Dimitriadis (2004)’s theoretical inference seems to have found a demonstration in Patson and al.’s (2009) experiments on garden-path
  - While the trainer and the vet wrestled/walked the alligator watch them closely.
  - While the trainers wrestled/walked the alligator watch them closely.
  - While the two trainers wrestled/walked the alligator watch them closely.

# Symmetric Verbs

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- Patson and al. (2009) found:
  - 1) that sentences with reciprocal verbs preceded by **conjoined NP** are easier to process than ones with non reciprocal verbs,
  - 2) that **Plural definite descriptions do not block garden-path effects, even with reciprocal verbs**
- These experiments suggest that morphological and semantic plurality are not enough to immediately induce a reciprocal reading. This result questions the representations of plural entities, the semantic structure of symmetric verbs and the parser's use of information about the number of entities denoted by the plurality

# Anterior results on non-symmetric verbs

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- In a sentence continuation task, Sanford & Lockhart (1990) found that conjoining characters with *and* promotes a plural reference in the next utterance (#40%) more than conjoining characters with *with* (#20%)
  - Mary and John went to the shops. /vs/ Mary went to the shops with John.
- In a speeded continuation task, Carreiras (1997) found that readers are faster at continuing aloud a sentence beginning by *They* if the characters of the given narration are in the same general location (or the same scenario) and are conjoined with *and* rather than *with*
  - Thomas accepted the move to a branch office in Madrid and Sophie got a job in Madrid (or in Barcelona) with a software company. They...

# Anterior results on non-symmetric verbs

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- In production and comprehension tasks, Moxey et al. (2004) studied the role of syntax introducing two characters on the subsequent construction of a plural referent
  - 1) Jack and Jill painted the lounge. (*and* condition)
  - 2) Jack painted the lounge with Jill. (*with* condition)
  - 3) Jack painted the lounge for Jill. (*for* condition)

In (1) the conjunction forces the individuals into a common role

In (2) the comitative PP leads to attribute to Jill a status of co-agent who shares a role with Jack

In (3) Jill plays clearly a different role from Jack

# Anterior results on non-symmetric verbs

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- 1) Jack and Jill painted the lounge. (*and* condition)
- 2) Jack painted the lounge with Jill. (*with* condition)
- 3) Jack painted the lounge for Jill. (*for* condition)

Preferences are

- Plural pronominal continuations for the *and* condition over the other two (56%)
- Singular pronominal continuations for the *for* condition (72%)
- Mixture of singular and plural pronouns for the *with* condition

# Anterior results on symmetric verbs

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- In a sentence continuation task in French, Bianco & Schnedecker (2000) found that the production of plural anaphors depends not only on the conjoining structure (*avec* versus *et*), but also on the type of predicates
- 1- Distributive action with indecisive spatio-temporal frame  
Après les élections, le sénateur et le député ont déjeuné dans un restaurant 3 étoiles.  
**(After the elections, the senator and the MP had lunch in a good restaurant.)**
- 2- Common action with shared spatio-temporal frame  
Cet été Michel et Philippe ont rejoint la Côte d'Azur à vélo.  
**(This summer, Michel and Philippe went to the côte d'Azur by bike.)**
- 3- Symmetric action with shared spatio-temporal frame  
Depuis l'an dernier, Jacques et François collaborent à la mise au point d'un réseau d'enseignement interactif.  
**(Since last year, Jacques and François have collaborated in the development of an interaction education network.)**

# Anterior results on symmetric verbs

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Bianco & Schnedecker (2000): *With* versions

1- Distributive action with indecisive spatio-temporal frame

**After the elections, the senator had lunch in a good restaurant with the MP.**

2- Common action with shared spatio-temporal frame

**This summer, Michel went to la côte d'Azur by bike with Philippe.**

3- Reciprocal action with shared spatio-temporal frame

**Since last year, Jacques has collaborated in the development of an interaction education network with François.**

In case 1, the percentage of plural for the *and* condition ->82% was almost twice as high as the one for the *with* condition ->47%

In case 2, 64% with *and*, 43% with *with*

Significant difference in cases 1 and 2 between *the-* and *and with*-conditions

No significant difference in case 3, 73% with *and*, 65% with *with*)

# Anterior results on symmetric verbs

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- Koh & Clifton (2002) proposed the equivalent hypothesis as a rule to construct a non atomic entity from split antecedents :
  - **two discourse entities may be grouped as a non atomic discourse entity, if there are equivalent to each other with respect to some property**

They further showed the relevance of this hypothesis in a self-paced reading task using predicates such as *sing with* involving arguments that are in an equivalence relation



# Anterior results on symmetric verbs

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- Tom sang with Jim and Tony at the school. They were happy because they both did their best.
  - Tom sang with Jim and Tony at the school. They were happy because they all did their best.
  - Tom recognized Jim and Tony at the school. They were happy because they both did their best.
  - Tom recognized Jim and Tony at the school. They were happy because they all did their best.
- Koh & Clifton (2002) found that

The reading times for the *they all* group-of-three antecedents condition were faster than those for the *they both* group-of-two condition only when a symmetric predicate was used

# Anterior results, to conclude

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- Some factors invite subjects to group split referents in a non-atomic discourse entity
  - The sameness of ontological status
  - Syntactic structure of utterances : *with* phrases elicit a good proportion of plural formation but less than *and* phrases, while *for* phrases do not frequently support plural formation (Moxey et al., 2004)
  - Common role for referents with respect to the action or the event described, that is sameness of action and location, favours plural formation (Sanford & Lockhart, 1990; Moxey et al., 2004; Moxey et al., 2011)
  - Thematic roles such as those of symmetrical predicates which favour the formation of plural in some contexts (Bianco & Schnedecker, 2000; Koh & Clifton, 2002)

# This study

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This study investigates the likelihood that symmetric predicates in discontinuous constructions affect the choice of who to refer to next, when the characters are designed by proper names, not by predicative names as in the experiments of Moxey et al. (2011)

Maggy often converses with Eddy during the long winter evenings. They/he...

→ Critical condition, with symmetric verbs

Maggy often has a monologue with Eddy during the long winter evenings.  
They/he...

→ Critical condition, with non-symmetric verbs

Eddy often converses with Maggy during the long winter evenings. They/he...

Eddy often has a monologue with Maggy during the long winter evenings.  
They/he...

# This study

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- Being denoted by proper names, the characters are both good candidates to be used in continuations of the narration (Sanford et al., 1988)
- As the test items are constructed as a sentence alone, the participants dispose of the gender cue, of the circonstants and of the semantics of the verb, to choose the subsequent referent
- In this study, characters and circonstants are fixed : the verb alone changes between conditions in addition of the discourse parameter of gender of the subject referent and the object-of-PP referent

# This study

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→ Participants are asked to begin the continuation sentence by a pronoun given orally “il(s)” (they/he), indiscriminate for number in French

When the male character is the subject, the participants should have no difficulty processing a singular pronoun as many studies have shown

But when the female character is the subject, the participants have to choose between extracting the antecedent from the PP or forming a plural

→ the subsequent anaphora will reveal the role of the verb semantics on the choice made by the participants who face in the critical conditions the possibility of forming a plural or of extracting an object-of-PP referent

# This study and related tests

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- Koh & Clifton (2002) found that the referents fulfilling the thematic roles of symmetric predicates in discontinuous constructions favour the grouping of the subject referent and the object-of-PP referent
  - Tom sang with/recognized Jim and Tony at the school.
  - They were happy because they both/all did their best.

**But the task consisted in contrasting two possible groupings of entities with symmetric and non-symmetric predicates more than studying thematic roles**

**In addition, the tested predicates often support collective events or actions rather than symmetrical ones**

- *sing with* is a collective activity, for example
- *in contrast, discuss with* supposes a speaker and a listener who exchange ideas and is symmetric

# This study and related tests

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- Bianco & Schnedecker (2000) compared 3 types of predicates on their ability to differentiate 2 types of syntactic conjunctions

After the elections, the senator and the MP had lunch in a good restaurant.  
After the elections, the senator had lunch in a good restaurant with the MP.

This summer, Michel and Philippe went to la côte d'Azur by bike.  
This summer, Michel went to la côte d'Azur by bike with Michel.

Since last year, Jacques et François have collaborated in the development of an interaction education network.

Since last year, Jacques has collaborated in the development of an interaction education network with François.

# This study

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- In our design, **the characters are all conjoined by *with***, but
  - When the predicates are symmetrical the object-of-PP referent is in relation of reciprocity with the subject referent
  - When the predicates are non symmetrical the object-of-PP is a “companion”, a co-actant of the subject referent
- Previous experiments have contrasted the type of conjoined phrases with *and* versus *with*, but **no experiments have contrasted different status of *with* phrases**
- The problem is now to choose the characteristic of the non-symmetric predicates we are going to contrast with symmetric ones



# This study

- We select French covert symmetric verbs among those studied by Borillo (1971) : *cohabiter, rivaliser* ...
- For the control verbs, we select distributive verbs to contrast with the symmetric verbs since symmetric verbs were found to tend to group their arguments in discontinuous constructions both in English and French
- As summarized by Arnold (2001) : Since the tendency for **subject referents** to be continued is reliably high, the thematic role biases do not greatly influence their accessibility,  
while the accessibility **of object-of-PP referents** fulfilling a thematic role can be extended
- We therefore expected differences in the choice of who would be denoted next as a function of the type of verbs

# This study

- The responses given by the first 25 participants confirm this general hypothesis
- The results of the data analyses by glmer (logiciel R) was
  - Interaction Gender and Verb (Chisquare=3.9, df=1, p=0.05)
  - Main effect of gender (Chisquare=12.3, df=2, p=0.002)

Gender : Verbe	Symmetric	Non symmetric
Female	14%	12%
Male	8%	10%

- With symmetric verbs, there were more subsequent plural formation when the subject referent was female than when it was male
- No difference with non-symmetric verbs

# This study : hypothesis

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- Thus when the subject referent is female, we assume there will be more plurals with symmetrical predicates than with control predicates (cf. koh & Clifton, 2002)
- In contrast, this should not be the case when the referent is male
- In addition, we expect a main effect of the grammatical gender of the subject noun resulting in fewer plural pronouns with a male proper name

# This study : design

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- 2x2 within participants design with the factors
  - Verb = symmetric vs. distributive
  - Gender = female vs male
- 28 single-sentence material, each with a male proper name and a female proper name
  - 14 with symmetric predicates, half mentionned the male first, half the female first
  - 14 with distributive predicates, half mentionned the male first, half the female first
- 30 fillers
- Four versions of each material : four files constructed such that in any given file each item appeared in only one condition and each condition appeared an equal number of times

# Material

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- Since the French symmetric verbs selected were unmarked for the property of symmetry, it was possible to have a unique syntactic structure for the test items and the control items

Sofia plots silently with Sylvain in a strained atmosphere.

Sofia cries silently with Sylvain in a strained atmosphere.

Sylvain plots silently with Sofia in a strained atmosphere.

Sylvain cries silently with Sofia in a strained atmosphere.

- The *with* PP was always detached from the verb with an adverb or a complement to allow the processing of the verbal semantic per se and avoid collective interpretations because of proximity with the verb
- The object-of-PP referent was always followed by a another adverb or complement to avoid the last given referent to be chosen as antecedent of the pronoun because of recency.

# Task and passation

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- ❑ Sentence were presented individually in booklets, in a fixed random order
- ❑ There was one sentence per page.
- ❑ Participants read each sentence in turn and simultanously listened to it, enunciated orally and followed by the pronoun « il(s) » with which participants had to write a new sentence that was a sensible continuation: so they had to choose between singular and plural
- ❑ Participants had 20 s to write it down : they were told that they could miss a sentence if they lacked inspiration
- ❑ Participants were 85 students at Paris3-Sorbonne University native french-speaking who received an entry ticket to the Forum des Halles

# Results

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Continuations were coded as follow

- Continuation with *il* → S
- Continuation with *ils* → P
- Other type of Continuation → A

**We found 50% of plural continuations and 43% of singular continuations overall**

The analyses with the general linear mixed-effects model of R show only a main effect of the factor Gender (Chisquare=96.29, df=2,  $p < 0.001$ )

With the **female proper names** as grammatical subjects there was **29% of plural, 17% of singular**

With the **male proper names** as grammatical subjects **21% of plural, 26.5% of singular**

# Confusing factor

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- Despite the distributive verbs, some control predicates tend to have a collective reading, because of the spatiotemporal cues or shared situation described

- In example 1

Sofia plots silently with Sylvain in a strained atmosphere.

Sofia cries silently with Sylvain in a strained atmosphere.

Sylvain plots silently with Sofia in a strained atmosphere.

Sylvain cries silently with Sofia in a strained atmosphere.

(Sofia/Sylvain complotte/pleure sans bruit avec Thomas dans une atmosphère tendue.)

**the interpretation consisting of understanding that the object-of-PP referent is also crying is unlikely**



# Confusing factor

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- In example 2

Elsa discusses the food parcels with Thomas all day long.

Elsa controls the food parcels with Thomas all day long.

Thomas discusses the food parcels with Elsa all day long.

Thomas controls the food parcels with Elsa all day long.

(Elsa discute/contrôle quotidiennement avec Thomas des colis alimentaires.)

- **in contrast the action of controlling the food parcels is common to both the characters**

- In our experimental material the collective interpretation and the distributive ones were equally frequent (fifty-fifty)

# Re-Analysis

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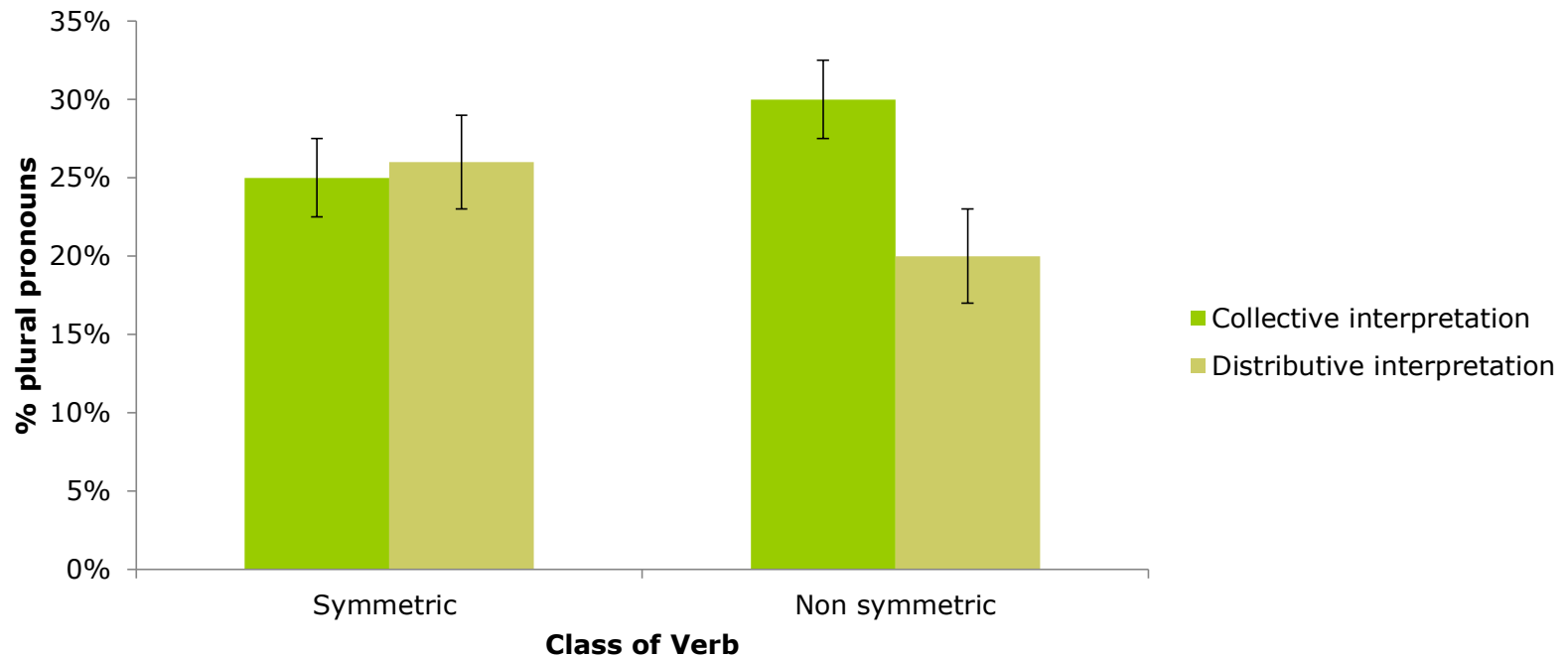
- Taking into account the fact that the collective interpretation of half of our control items (Factor Control) could be a possible intervening factor, a new general linear mixed-effects analysis was conducted
- We found
  - a significative interaction between the factors Verb and Control (Chisquare=47.47, df=2,  $p<0.001$ )

When the interpretation of the **control predicate is distributive**,  
**26% of plural with Symmetric Verbs and 20% with control Verbs:** the difference is significant (Chisquare=36.23, df=2,  $p<0.001$ )

When the interpretation of the **control predicate is collective**  
**25% of plural with Symmetric Verbs and 30% with control Verbs:** the difference is significant (Chisquare=22, df=2,  $p<0.001$ )

# Re-Analysis

## Interaction Verb/Control predicate Interpretation



# Discussion

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These results show the role of the compositionality of predicates in the formation of the discourse representation of verb, objects and circumstants

They also shed light on the different results obtained in experiments with the conjoining factor *with* :

From **20%** in the experiment of Sanford & Lockhart (1990) to **65%** in the experiment of Bianco & Schnedecker (2000)

**40%-60%** for non-symmetric predicates in our study, function of the interpretation they evoke : 40% of plural for the distributive interpretation and 60% for the collective interpretation

**The symmetric predicates were in between, with 50% to 53% of plural pronouns**

# Discussion

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Although this result must be confirmed, it could contribute to our understanding of the nature of the linking between arguments of reciprocal predicates

Our finding that there are more plural pronouns when the female character is the grammatical subject shows that it is easier to form a plural entity from a subject referent and an object-of-PP referent than to extract the male object-of-PP referent, whatever the type of predicate

Koh & Clifton (2002) found a similar main effect but in addition found an interaction with the type of predicate: however the processing required by their material concern a pairing of number of referents (*both* versus *all*). The processing of gender could be different

# Discussion

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The main effect of gender for symmetric predicates shows that the equivalence that these predicates establish between their arguments does not get over discourse structure

Indeed, even when the verb is symmetric, the predicate can be asymmetric

As shown by this famous example:

The drunk embraced the lampost.

- \* The lampost embraced the drunk.
- \* The drunk and the lampost embraced.

# Discussion

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Gleitman (1994) shows how discourse and local parameters of symmetric sentence interfere as in

The humblest citizen is equal to the President.

vs

The President is equal to the humblest citizen.

The unit of measure in the first sentence is *The President* is, while it is *the humblest citizen* in the second sentence; *the humblest citizen* gets the status of a President in the first sentence and *the President* is reduced to the status of *the humblest citizen* in the second.

However, if we change the verb, the effect of asymmetry is reduced

The humblest citizen converses with the President.

vs

The President converses with the humblest citizen.

# Discussion

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The characters of the symmetric verbs which are not stative are bound as crossed co-referents, which is a different kind of linking that the link of equality



# To resume

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The nature of the predicate is crucial when testing the plural

Symmetric verbs differ from collective predicates...  
(but formalists as Landman (1996) and Schwarzschild (1996), never considered symmetric predicates as collective)

And differ from distributive predicates

Some more experiments are needed to understand the specificity of symmetric predicates!

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# THANK YOU

Linguistic and Cognitive Effects in  
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