Pronouns over gaps in parsing?
Relative clause processing in Santiago Laxopa Zapotec

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The subject gap advantage

**SUBJECT-GAP ADVANTAGE** (SGA): the language processor prefers subject gaps to non-subject gaps.

E.g.:

**SUBJECT RELATIVE CLAUSES** (SRCs) are easiest to process in unambiguous relative clauses.

1. The reporter \([RC \text{ who } \_\_ \text{ attacked the senator}]\) disliked the editor.  
   \[\text{SRC}\]

2. The reporter \([RC \text{ who the senator attacked } \_\_]\) disliked the editor.  
   \[\text{ORC}\]

The subject gap advantage

...And ambiguous RCs give rise most readily to **SRC** interpretations.

(3) de Amerikaanse die de Nederlander wil uitnodigen

*the American who the Dutch person wants to invite*

‘the American who wants to invite the Dutch person’ **SRC 74%**

OR ‘the American who the Dutch person wants to invite’ **ORC 26%**
Verb-initiality and SGA

The SGA has been observed in a few studies of verb-initial languages (V1):

- Ch’ol, Q’anjob’al (Mayan)
- Chamorro, Tagalog, Niuean* (Austronesian)

In many instances, there are morphological means to create unambiguous RCs, such as case marking on the noun and verbal morphology.

Today

We investigated Santiago Laxopa Zapotec (SLZ), a V1 language without visible case or agreement.

SLZ thus presents:

- a strong test case for SGA, in the absence of morphological information
- a window into what else speakers might recruit as a cue in the absence of case and agreement
Results (Preview)

We found that SLZ comprehenders:

- show the SGA for ambiguous RCs
  = a consistent preference to interpret as SRCs

- prefer to interpret a subject pronoun as a resumptive pronoun (RP)
  instead of positing a gap in object position

- show great variation with (optional) object RPs
Essential features of Santiago Laxopa Zapotec
Features in preview

1. **Rigidly VSO:**
   
   V - N - N is unambiguous

2. **Movement creates ambiguity:**
   
   N - V - N: gap in SUBJ or OBJ position

3. There are **resumptive pronouns** (RPs)
   
   - which look like regular pronouns:
   
   - … SUBJ pronouns obligatorily cliticize on verb
   
   - … OBJ pronouns cannot cliticize across NP subject
   
   - therefore, **can potentially disambiguate**
Rigid VSO word order

SLZ is rigidly **VSO** (like other Zapotec languages).

```
Verb
Tsyill pinch.CONT

Subject
bene' nu'ulhe=nh
CL woman=DEF

Object
bene' xyage'=nh.
CL man=DEF
```

‘The woman is pinching the man.’
NOT ‘The man is pinching the woman.’

Adler, Foley, Pizarro-Guevara, Sasaki, & Toosarvandani (2018)
Movement creates ambiguity

Movement to the left ~ AMBIGUITY

E.g., in focus position

\[
\begin{array}{ccc}
\text{Subject or Object} & \text{Verb} & \text{Subject or Object} \\
\text{Bene' nu'ulhe=nh} & \text{tsyill} & \text{bene' xyage'=nh.} \\
\text{CL woman=DEF} & \text{pinch.CONT} & \text{CL man=DEF} \\
\end{array}
\]

\text{THE WOMAN is pinching the man.}'

OR

\text{The man is pinching THE WOMAN.}'
Movement creates ambiguity

Or, in relative clauses (RCs)

I see the woman that ___ is pinching the man.’

OR  ‘I see the woman that the man is pinching ___.’

Schematized

Shlhe’eyd=a’ bene’ nu’ulhe=nh

see.CONT=1SG CL woman=DEF

tsyill bene’ xyage’=nh.

pinch.CONT CL man=DEF
3 Pronouns

Resumptive pronouns (RPs) can eliminate ambiguity.

(7) Shlhe’eyd=a’ bene’ nu’ulhe=nh

see.CONT=1SG CL woman=DEF

tsyl=k=e’ bene’ xyage=nh.
pinch.CONT=3EL CL man=DEF

‘I see the woman that she is pinching the man.’
‘I see the woman that the man is pinching her.’

Schematized

N V=pro NP ✓SRC XORC
3 Pronouns

RPs can eliminate ambiguity.

(8) Shlhe’eyd=a’ bene’ nu’ulhe=nh

see.CONT=1SG CL woman=DEF

tsyill bene’ xyage’=nh le’.

pinch.CONT CL man=DEF 3EL

‘I see the woman that she is pinching the man.’

‘I see the woman that the man is pinching her.’
③ Pronouns

Pronouns (/RPs) encode animacy and person but are invariant for grammatical relation.

Table 1: 3rd PERSON pronoun inventory

<table>
<thead>
<tr>
<th></th>
<th>Clitic</th>
<th>Strong</th>
</tr>
</thead>
<tbody>
<tr>
<td>3EL(DER)</td>
<td>((n)\text{e}')</td>
<td>\text{le}'</td>
</tr>
<tr>
<td>3HU(MAN)</td>
<td>\text{ba}'</td>
<td>\text{leba}'</td>
</tr>
<tr>
<td>3AN(IMAL)</td>
<td>((e)b)</td>
<td>\text{leb}</td>
</tr>
<tr>
<td>3IN(ANIMATE)</td>
<td>((e)\text{nh})</td>
<td>\text{lenh}</td>
</tr>
</tbody>
</table>

Source of disambiguation

Subject pronouns must cliticize.

Object pronouns cannot cliticize across R-expressions; they are realized as strong.

Toosarvandani (2017), Sichel & Toosarvandani (2018)
3 Pronouns

RPs can’t eliminate ambiguity in the absence of an R-expression co-argument.

(10) Shlhe’eyd=a’ bene’ nu’ulhe=nh tsyill=e’.
    see. CONT = 1SG CL woman = DEF pinch. CONT = 3EL

‘I see the woman that sheRP is pinching (someone/something).’

OR ‘I see the woman that s/he is pinching ___.’

Schematized

N V = pro [RP] SRC
N V = pro ORC
Features, recapped

1. **Rigidly VSO**: $V-N-N$ is unambiguous

2. **Movement creates ambiguity**:
   - $N-V-N$: gap in *SUBJ* or *OBJ* position

3. **Resumptive pronouns** (RPs) can disambiguate.

\[
\begin{align*}
N \ [V=\text{pro} \ NP] \\
N \ [V \ NP] \\
N \ [V \ NP \ pro]
\end{align*}
\]
Subject gap advantage in SLZ?

N \[V=\text{pro} \ NP]\n
N \[V \ NP]\n
N \[V \ NP \ pro]\n
Clearest prediction. NP-only RCs $\sim$ SRC bias.

Less-clear prediction. Will speakers prefer a subject RP $>$ object gap?

**SRC:** ✔ local $\times$ pronoun $\times$ null indefinite object

**ORC:** $\times$ non-local ✔ gap $\times$ req. discourse antecedent
Experiment design
Design

1. **Picture matching + auditory presentation**
on tablet computers

2. **Trial structure**
scene setting + carrier phrase + critical RC
Here is one N and one N.

(11) Ni  ze  tu  bez=e'nh  na  tu  beku’=nh.

here is one fox=DEF and one dog=DEF

‘Here is a fox and a dog.’

Schematized

“Here is one N and one N.”
Trial structure

(12) Bta belhje’=nh ga shlhe’eyd=u’...

move.comp star=DEF where see.CONT=2SG

‘Move the star to the place where you see…’

Schematized

Move the [STAR/LEAF/...] to the place where you see…
Trial structure

Scene setting

Carrier phrase

+ N–RC

(13) bez=e’nh tsyi’in beku’=nh xhan yage’=nh.

fox=DEF bite.CONT dog=def under tree=DEF

‘the fox that __ is biting the dog under the tree.’
‘the fox that the dog is biting __ under the tree.’

Schematized

N V NP PP ✓SRC ✓ORC

24
Design

1. **Picture matching + auditory presentation** on tablet computers

2. **Trial structure**
   scene setting + carrier phrase + critical RC

3. **Conditions**: 4 argument realizations
# Conditions

Table 2: Summary of experimental conditions and their possible interpretations

<table>
<thead>
<tr>
<th>Condition</th>
<th>Schema</th>
<th>Possible interpretations</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP only</td>
<td>N [ V NP PP ]</td>
<td>SRC and ORC</td>
</tr>
<tr>
<td>Pro-only</td>
<td>N [ V=pro PP ]</td>
<td>SRC and ORC</td>
</tr>
<tr>
<td>NP + subj. pro</td>
<td>N [ V=pro NP PP ]</td>
<td>SRC only</td>
</tr>
<tr>
<td>NP + obj. pro</td>
<td>N [ V NP pro PP ]</td>
<td>ORC only</td>
</tr>
</tbody>
</table>

※ Full design: Argument realization (4) × Classifier (2)

Optional classifier (≈relative pronoun?) at left edge of RC.
There was no effect of classifier, so we (mostly) omit from discussion.
Design

1. **Picture matching + auditory presentation**
on tablet computers

2. **Trial structure**
scene setting + carrier phrase + critical RC

3. **Conditions**: 4 argument realizations

4. **Participants**:  
105 speakers living in Santiago Laxopa, ages 18-78
Results
Results

SRC Proportion

NP-only

This ambiguous RC showed a SRC bias (62% ± 3%) – weak but significant
Results

SRC Proportion

Proportion of SRC response

Classifier
- Classifier
- No Classifier

<table>
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<td>N [ VP=pro PP ]</td>
<td>SRC and ORC</td>
</tr>
<tr>
<td>NP + subj.</td>
<td>N [ VP=pro NP PP ]</td>
<td>SRC only</td>
</tr>
<tr>
<td>NP + obj. pro</td>
<td>N [ VP NP pro PP ]</td>
<td>ORC only</td>
</tr>
</tbody>
</table>

Pronoun-only
This ambiguous RC, had a high SRC bias (82% ± 2%)
Results

SRC Proportion

NP + Subj pronoun
This unambiguous RC had the highest SRC rate (87% ± 2%)
Results

SRC Proportion

NP + Obj pronoun
This unambiguous ORC gave rise to SRC interpretations in nearly half the trials (48% ± 3%)
Subject gap advantage in SLZ

N \([V=\text{pro} \ \text{NP}]\)

62%

SRC

N \([V=\text{pro}]\)

38%

ORC

N \([V \ \text{NP}]\)

N \([V \ \text{NP} \ \text{pro}]\)

Clearest prediction. NP-only RCs \(\sim\) SRC bias.
Subject gap advantage in SLZ

N [V=pro NP]

62% SRC 82% ORC

N [V NP]

38% ORC 18%

N [V NP pro]

Less-clear prediction.

Speakers do prefer a subject RP to object gap.

SRC: ✓ local  ✗ pronoun  ✗ null indefinite object

ORC: ✗ non-local  ✓ gap  ✗ req. discourse antecedent
RP v. gaps in SLZ

The presence of a subject clitic reliably boosted SRC interpretation rate

Table 3: Summary of findings

<table>
<thead>
<tr>
<th>Condition</th>
<th>Schema</th>
<th>Possible interpretations</th>
<th>Proportion(SRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP-only</td>
<td>N [ VP NP PP ]</td>
<td>SRC and ORC</td>
<td>62% (± 3%)</td>
</tr>
<tr>
<td>Subj pro-only</td>
<td>N [ VP=pro PP ]</td>
<td>SRC and ORC</td>
<td>82% (± 2%)</td>
</tr>
<tr>
<td>NP + subj. pro</td>
<td>N [ VP=pro NP PP ]</td>
<td>SRC</td>
<td>87% (± 2%)</td>
</tr>
</tbody>
</table>
RP v. gaps in SLZ

Pronoun-only condition

Interpretation of the **Pro-only condition**:
- SRC response: subject clitic must be an RP, and no overt obj.
- ORC response: subject clitic is a discourse-bound pronoun with an object gap downstream.

(14) bez=e’nh tsyi’in=eb xhan yage’=nh
    fox=DEF bite.CONT=3.AN under tree=DEF

‘the fox that it\textsubscript{RP} is biting (something) under the tree’
‘the fox that it (the dog) is biting __ under the tree’

Schematized

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>V=pro\textsuperscript{[RP]}</th>
<th>SRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td></td>
<td></td>
<td>V=pro</td>
<td>ORC</td>
</tr>
</tbody>
</table>
RP v. gaps in SLZ

- SLZ is evidently not constrained by the **Highest Subject Restriction** (~ “a resumptive pronoun cannot occupy a subject-position immediately subjacent to its binder”; McCloskey, 1990, 2006)
- Yet, what is the status of **Highest Object Resumption** in the language?

Hypothetical

\[
N \ [V \ NP \ pro]
\]

\[
\begin{array}{c}
10\% \\
90\%
\end{array}
\]

\[
10\%
\]

 SRC

 Observed

48%

52%

 SRC

 ORC

 SRC

 ORC

 SRC
Is a response bias obscuring grammatical performance in Object Pro conditions?

Probably not.

- We split speakers in the NP-only condition according to their interpretation preference.
- Even speakers least apt to give SRC responses in ambiguous RCs made many errors with object pronoun RCs.
Are Object RPs actually grammatical in SLZ?

- Foreman & Munro (2007):
  Object RPs – and only object RPs – are unacceptable in Macuiltianguis Zapotec (MacZ)

- A parsing constraint is proposed to account for this:
  **immediately post-verbal NPs are parsed as subjects,**
  if they satisfy the verb’s selectional requirements.

**Thus, in MacZ:**

- … NP-only RCs receive a default ORC interpretation
- … and subject RPs are frequently used to achieve SRCs
Are Object RPs actually grammatical in SLZ?

- **SLZ** impressionistically seem a lot like MacZ:
  - subject RPs are optional but freely used, and
  - object RPs are, in some sense, fragile
- However, Foreman & Munro’s account for MacZ cannot immediately be ported to SLZ, because **SLZ NP-only RCs** show an **SRC preference**.
Animacy and Object RP

- ...And fieldwork reveals that any difficulty with object RPs 
  **disappears when RC arguments are of unequal animacy**
- E.g., an **object RP** in (15) is as good or **better** than a **gap**.

(15) Ble’eyd=a’ xhile’ tsjanaw bi byu (leb)
    see.comp=1sg sheep chase.cont boy 3sg.an

‘I saw the sheep that the boy is chasing.’

- Animacy effects on resumption have been observed in Irish 
  (McCloskey 2017).
- Could object RP difficulty in equal-animacy cases be related to 
  retrieval or encoding interference (Oberauer & Kliegl 2006)?
Conclusions

- SLZ exhibits the subject-gap advantage, even in the absence of case and agreement cues
- Subject pronouns are preferentially interpreted as RPs
  - an unusual instance of an optional RP actually being preferred (cf. Hebrew, Meltzer-Asscher et al. 2015)
- Comprehenders struggle with object RPs in SLZ
  - similar to observations in MacZ, but the existing account of MacZ cannot be ported
  - need a finer-grained picture of parsing AND the influence of animacy
Duxklhenu’ ~ Thank you!

- Raul Díaz Robles, and two other speakers
- Residents of Santiago Laxopa
- Director Evaristo López Velazquez
- Santiago Laxopa President Celestino Robles Ramirez
- Roque Reyes Mendoza, Illustrator


References


