A unified analysis of anaphoric expressions in spoken and signed languages

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Anaphoric expressions

Referential expressions that refer to familiar entities. Dependent, but not syntactically bound (Safir 2004)

Familiar:

- Previous mention
- Familiar by common knowledge

How do we know which expression to use? A lot of options.
Anaphoric expressions

There are many anaphoric expressions.

(1) I met a girl. [DP] looked happy.

- she
- the girl
- that girl
- Ø
- girl
Anaphoric expressions are often **interchangeable**:

(2) I met a girl. \{She, The girl\} looked happy.

But we see an interaction:

(3) Every girl\(_i\) thinks that Jin likes \{ her\(_i/j\), the girl\(_x/j\) \}.

(4) A girl entered the room. \{She, The girl\} looked happy.
Interaction

Processing studies:

Repeated Name Penalty

Jin entered the stage.
#Jin/He...

Repeated Noun Penalty

The singer entered.
#The singer/He...

Overt Pronoun Penalty

Jin entered the stage.
#He/∅...

name > pronoun
noun > pronoun
overt > null

Referent tracking studies from corpus

[5] **Accessibility Hierarchy**

full name > long definite description > short definite description > last name >
first name > distal demonstrative + modifier > proximate demonstrative +
modifier > distal demonstrative + NP > proximate demonstrative + NP > distal
demonstrative > proximate demonstrative > stressed pronoun > unstressed
pronoun > cliticized pronoun > verbal person inflections > zero


in focus > activated > familiar >
it > that, this, this N > that N

uniquely identifiable > referential > type identifiable
the N > indefinite this N > a N
## No unified semantic analysis

<table>
<thead>
<tr>
<th>she</th>
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<tr>
<td><strong>pronoun</strong></td>
<td><strong>definite description</strong></td>
<td><strong>demonstrative</strong></td>
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What we have so far

**Semantics**
Disjoint discussions on what each expression denotes

**Language Use**
Relative frequency and distribution; interaction in processing

How are these two related?
What are the underlying denotations that result in the distributional patterns we see?
The interpretive and distributional properties of an anaphoric expression is a result of semantic/pragmatic competition.

**Unified analysis of anaphoric expressions**

- Share the underlying structure
- Differ only in restrictions

→ naturally derives a competition through independently motivated semantic economy principles
Enables a unified semantic account of independently observed phenomena across languages

Allows for systematic predictions for gradient properties such as cross-linguistic and individual variation

Has implications on current debates involving sign languages
Overview

Motivation: Bare Noun Blocking

A unified analysis

Spoken languages: Capturing gradience
   Cross-linguistic variation
   Variation across speakers

Sign languages: pointing
Motivation: Bare Noun Blocking
Bare argument languages

Languages that **freely allow bare nouns** as arguments to predicates.

- Excludes languages like English ‘Dinosaurs are everywhere.’

Languages investigated:

- Japanese, Mandarin, Korean, Thai, Turkish
- Russian, Belarusian, Polish
- Hindi
- American Sign Language (ASL)
Bare argument languages

Bare arguments in these languages can be definite.
[Dayal 2004; Jenks 2015; Jiang 2012; Schwarz 2009]

(7)  mkamlæj hàw.
dog PROG bark
‘The dog is barking.’

[Thai;Jenks 2015]

But which definite?
Licensing definites

What does a definite denote?

- uniqueness (Frege 1892; Russell 1905)  ‘The moon is bright.’
- familiarity (Heim 1982; Roberts 2002)  ‘I saw a mouse. The mouse.’

Schwarz 2009, 2013: Both must be semantically distinguished.

<table>
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<th>German</th>
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</tr>
</thead>
<tbody>
<tr>
<td>UNIQUE</td>
<td>the</td>
<td>a</td>
<td>im</td>
<td>N</td>
</tr>
<tr>
<td>FAMILIAR</td>
<td>the</td>
<td>di</td>
<td>in dem</td>
<td>N CL DEM</td>
</tr>
</tbody>
</table>
Uniqueness

Bare arguments can be **uniqueness** denoting.

(8) Tsuki-ga  ōkī.
    moon-NOM big
    ‘The moon is big.’
    [Japanese]

(9) ay  parlak
    moon shiny.3sg
    ‘The moon is shining.’
    [Turkish]

(10) duæ-can sàwààŋ mâak.
    moon bright very
    ‘The moon is very bright.’
    [Thai; Jenks 2015]

(11) chand chamak raha  hai.
    moon shine   AUX.PROG AUX.PRS
    ‘The moon is shining.’
    [Hindi]
New Observation:

Bare argument languages differ in the anaphoric ability of the bare noun in **intersentential anaphora**:

‘I bought book. [Book] was expensive.’

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ABN: Anaphoric Bare Noun
Languages that allow bare nouns in intersentential anaphora:

(12) watashi-wa hon-o kat-ta. hon-wa takaka-ta.
I-TOP book-ACC buy-PAST book-TOP expensive-PAST
‘I bought a book. The book was expensive.’

[Japanese] [Ryoichiro Kobayashi, p.c.]

(13) ecey chayk-ul sa-ss-ta. chayk-un pissa-ss-ta.
yesterday book-ACC buy-PAST-DECL book-TOP expensive-PAST-DECL
‘I bought a book yesterday. The book was expensive.’

[Korean]

(14) bir kitap al-dı-m. kitap pahalı-ydı.
INDEF book buy-PAST-1SG Book expensive-PAST
‘I bought a book. The book was expensive.’

[Turkish] [Deniz Satik, Hande Sevgi, p.c.]
Languages that disallow bare nouns in intersentential anaphora:

(15) Maine ek kitab kharid-i. *(Vo) kitab mehngi thi.  
1SG.ERG one book.SGF buy-PAST.SGF (that) book.SGF expensive be.PAST.SGF  
‘I bought a book. The book was expensive.’

[Hindi]  
[Vyom Sharma p.c.]  
[variation; discussed later]

(16) miawaan phom cee kap nakri ph student khon nin. nakri chalaat maak.  
yesterday I meet with student CLF INDEF student clever very  
‘Yesterday I met a student. Students are very clever.’

[Thai; Jenks 2015]
**Generalization**

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[Q] Do bare nouns in *ABN languages block anaphoric uses?

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**Q** Do bare nouns in *ABN languages block anaphoric uses?

→ No. This is a derived property.

*ABN: bare nouns blocked by morphologically simplex pronoun.
Generalization:
If a bare argument language has morphologically simplex pronouns (‘simplex pronouns’) for third person reference, bare nouns are blocked from intersentential anaphora when simplex pronouns can resolve the referent.
Bare Noun Blocking

**Thai**: *ABN language that has simplex pronouns.

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</tr>
<tr>
<td>3</td>
<td>kăo, man</td>
<td>pûak kăo</td>
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**Demonstratives**

- dtó nán ('table that')
- pronominal uses possible
  [https://www.thailanguagehut.com]
Bare Noun Blocking

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**Demonstratives**

- dtó nán (‘table that’)
- pronominal uses possible

[https://www.thailanguagehut.com]

**Hindi:** No morphological distinction, but fully productive use of pronominal demonstrative vo

- vo kitab (‘that book’)
- vo (‘he’, ‘she’, ‘it’)

[21]
**Bare Noun Blocking**

**Korean**: ABN language that does not have simplex pronouns

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<td>na</td>
<td>wuli</td>
</tr>
<tr>
<td>2</td>
<td>ne</td>
<td>nehuy</td>
</tr>
<tr>
<td>3</td>
<td>ku NP</td>
<td>ku NP-tul</td>
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**Demonstratives**

- **ku chayksang** (‘that desk’)
- pronominal use restricted

(17)  a. *kyay: ku ay* (‘that kid’)  
       reduced  
       dem N  

b. *ku salam* (‘that person’)  

reduced  

dem N  

c. *ku kes* (‘that thing’)  

reduced  

dem N  

Bare Noun Blocking

Other ABN languages

Japanese: All pronouns are (reduced forms of) adnominal demonstratives
[ ctx, Michael Erlewine, pc ]

(18)  a. ano hito (‘that person’)  dem N
     b. ko/so/a-itsu (‘this/that guy’)  dem CL

Turkish: Distal demonstrative description with o used; pronominal use restricted to animate entities

(19)  Bir kitap al-di-m.  {Kitap / *o / o kitap} pahali-ydi.
     indef book buy-PAST-1SG Book  3SG that book expensive-PAST
     ‘I bought a book. The/that book was expensive.’  [Turkish]

[Deniz Satik, Hande Sevgi, p.c.]
Bare Noun Blocking

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Only in the languages that lack simplex pronouns, bare nouns are used anaphorically.
How does this generalization work?

Recall:

\textit{she}

\textbf{pronoun} variables? hidden definite descriptions?

[Evans 1980; Kamp 1981]

\textbf{the girl}

\textbf{definite description} uniqueness? familiarity? both?

[Heim 1982; Schwarz 2009]

\textbf{that girl}

\textbf{demonstrative} pointing! Extended definites

[Kaplan 1969; King 2008]

\textbf{∅}

\textbf{null argument} constraints on pro-drop, different interpretations

[Duguine 2014; Kurafuji 2019]

\textbf{girl}

\textbf{bare noun} interpretations, constraints, unique vs. anaphoric [Chierchia 1998b; Dayal 2009; Jenks 2015]
How does this generalization work?

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How does this generalization work?

\[ \textit{she} \quad \text{pronoun} \quad \begin{array}{l}
\text{variables? hidden definite descriptions?} \\
[\text{Kamp 1981; Evans 1980}] 
\end{array} \]

\[ \textit{the girl} \quad \text{definite description} \quad \begin{array}{l}
\text{uniqueness? familiarity? both?} \\
[\text{Heim 1982; Schwarz 2009}] 
\end{array} \]

\[ \textit{that girl} \quad \text{demonstrative} \quad \begin{array}{l}
\text{pointing! extended definites} \\
[\text{Kaplan 1969; King 2008}] 
\end{array} \]

\[ \emptyset \quad \text{null argument} \quad \begin{array}{l}
\text{constraints on pro-drop, different interpretations} \\
[\text{Duguine 2014; Kurafuji 2019}] 
\end{array} \]

\[ \textit{girl} \quad \text{bare noun} \quad \begin{array}{l}
\text{interpretations, constraints, unique vs. anaphoric} \\
[\text{Chierchia 1998b; Dayal 2009; Jenks 2015}] 
\end{array} \]

Combine into a unified theory!
A unified analysis
Unified theory

Idea: All anaphoric expressions share the same semantic structure

\[
\sup [\lambda x. \text{entity}(x) \land \ldots ]
\]

\text{supremum operator} \quad \text{restrictions}

‘the maximal \( x \) such that \( x \) is an entity and \( \ldots \)’
Unified theory

Idea: All anaphoric expressions share the same semantic structure

\[
\sup \quad \left[ \lambda x. \text{entity}(x) \land \ldots \right]
\]

supremum operator restrictions

‘the maximal x such that x is an entity and ...’

↑

kind and number of restrictions
Anaphoric DP structure

\[ [\text{DP}_n] = \]

\[
\begin{array}{c}
\text{DP} \\
\text{IdxP} & \text{D'} \\
\text{Idx} & \text{[n]} & \text{sup} & \text{NP} \\
\end{array}
\]

\[ \lambda x. \ldots \]

\[
\begin{array}{c}
[\text{DP} & [\text{n}] & [\text{sup} & \text{maximality} & \text{operator} & [\text{NP} & \lambda x: \text{entity}(x) \land \text{female}(x) \ldots ] & \text{restrictions} ] ]
\end{array}
\]
[she₇] =

\[ \lambda x. \text{entity}(x) \land \text{female}(x) \]

\[ \text{‘smallest individual } x \text{ such that all individuals } y \text{ that is } P \text{ form part of } x’ \]
Anaphoric DP structure

\[ \llbracket \text{she}_7 \rrbracket = \]

\[
\begin{array}{c}
\text{DP} \\
\text{IdxP} \\
\text{Idx} [n] \\
\text{sup} \\
\lambda x. \text{entity}(x) \land \text{female}(x) \\
\text{NP} \\
\end{array}
\]

\[
\llbracket \text{Idx} \rrbracket = \lambda n. \lambda x_\epsilon : x = g(n). x
\]
Anaphoric DP structure

$[[\text{she}_7]] =$

```
- DP
  - IdxP
    - Idx $[n]$
    - sup $\lambda x. \text{entity}(x) \land \text{female}(x)$
  - D'
```

$[[\text{Idx}]$ = $\lambda n. \lambda x : x = g(n). x$

the (plural) individual that consists of all females defined iff $x = g(7)$
Semantic restrictions

entity(x)  true if x is an entity
\( \phi(x) \)  true if x meets the \( \phi \) feature requirements (gender, number, etc.)
\([\text{NP}] (x)\)  true of x if \([\text{NP}] (x)=1\)
R(x)  true of x if R(x)=1

**Denotations:** Universal

a.  \( \lambda x. \text{entity}(x) \)
b.  \( \lambda x. \text{entity}(x) \land \phi(x) \)
c.  \( \lambda x. \text{entity}(x) \land [\text{NP}] (x) \)
d.  \( \lambda x. \text{entity}(x) \land R(x) \)
e.  \( \lambda x. \text{entity}(x) \land [\text{NP}] (x) \land R(x) \)
f.  ...
Language-specific lexicalizations

**English**

\[ [\text{she}] = \sup [\lambda x. \text{entity}(x) \land \phi(x)] \]

\[ [\text{the girl}] = \sup [\lambda x. \text{entity}(x) \land \phi(x) \land [\text{girl}](x)] \]

\[ [\text{that}_R \text{ girl}] = \sup [\lambda x. \text{entity}(x) \land \phi(x) \land [\text{girl}](x) \land R(x)] \]

\{ she, the girl, that girl \}
Language-specific lexicalizations

**English**

\[
\begin{align*}
[she] &= \text{sup } [\lambda x. \text{entity}(x) \land \phi(x)] \\
[\text{the girl}] &= \text{sup } [\lambda x. \text{entity}(x) \land \phi(x) \land [\text{girl}](x)] \\
[\text{that}_R \text{ girl}] &= \text{sup } [\lambda x. \text{entity}(x) \land \phi(x) \land [\text{girl}](x) \land R(x)] \\
\{ &\text{ she, the girl, that girl } \} \\
\end{align*}
\]

**Korean**

\[
\begin{align*}
[\text{sonye}] &= \text{sup } [\lambda x. \text{entity}(x) \land \phi(x) \land [\text{girl}](x)] \\
[\text{ku}_R \text{ sonye}] &= \text{sup } [\lambda x. \text{entity}(x) \land \phi(x) \land [\text{girl}](x) \land R(x)] \\
\{ &\text{ N}_{\text{DEF}}, \text{DEM} \text{ N} \} \\
\end{align*}
\]
Implications

A pronoun differs from a definite only in its restrictions.

\[
\begin{align*}
\llbracket \text{she} \rrbracket &= \sup [\lambda x. \text{entity}(x) \land \phi(x)] \\
\llbracket \text{the girl} \rrbracket &= \sup [\lambda x. \text{entity}(x) \land \phi(x) \land \text{girl}(x)]
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\end{align*}
\]

Different from:

- general assumptions [Heim & Kratzer 1998]
  \[
  \begin{align*}
  \llbracket \text{she} \rrbracket &= x_n \\
  \llbracket \text{the girl} \rrbracket &= \iota x. \text{girl}(x)
  \end{align*}
  \]

- e-type analyses [Elbourne 2005; Evans 1980]
  \[
  \begin{align*}
  \llbracket \text{she} \rrbracket = \llbracket \text{the girl} \rrbracket &= \iota x. \text{girl}(x) \\
  \llbracket \text{the girl} \rrbracket &= \iota x. \text{girl}(x)
  \end{align*}
  \]
Implications

1. Independently motivated economy principles like *Minimize Restrictors!* [Schlenker 2005] can be applied directly.

**Recall redundancy:** \{She > #The girl\} looked happy.

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**Minimize Restrictors!**

[Schlenker 2005]  
no redundant restrictions

*my father > #my tall father*
Implications

2. The competition can also be subsumed under Maximize Presupposition! [Heim 1991].

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Maximize Presupposition!

[Heim 1991] N/A N/A

sup[female(x)] = g(n) ⇒ sup[girl(x)] = g(n)
Going back to Bare Noun Blocking

*ABN Languages:
Simplex pronouns are **simpler** than bare nouns.

- Less semantic content
  
  no NP property

[kão] = sup [λx. entity(x) ∧ animate(x)]

[nakrian] = sup [λx. entity(x) ∧ animate(x) ∧ student(x)]
Going back to Bare Noun Blocking

*ABN Languages:
Simplex pronouns are **simpler** than bare nouns.

- Less semantic content
  no NP property

[kāo] = sup [λx. entity(x) ∧ animate(x)]  [Thai]
[nakrian] = sup [λx. entity(x) ∧ animate(x) ∧ student(x)]

When both are possible, **the more complex form is blocked**
due to semantic economy (Minimize Restrictors!, Efficiency [Meyer 2014]).

{ kāo, nakrian, … }
Going back to Bare Noun Blocking

**ABN Languages:**
No simplex pronouns that can block bare nouns.

*I met student. Student was clever.*

\[
\text{[haksayng]} = \sup [\lambda x. \text{entity}(x) \land \phi(x) \land \text{student}(x)]
\]

\[
\text{[ku haksayng]} = \sup [\lambda x. \text{entity}(x) \land \phi(x) \land \text{student}(x) \land R(x)]
\]

\{ haksayng, ku haksayng \}
Bare Noun Blocking

- Not that bare nouns disallow anaphoric uses in *ABN languages.
- Simplex pronouns in *ABN languages block bare nouns.
Advantage

Context-sensitivity can be captured.

- As soon as we add another possible referent in the context, bare noun can be used in *ABN languages.
  [see Jenks 2015 for discussions in Thai]

**Hindi** (Vyom Sharma, pc):

I bought book$_{i}$. Book was expensive.  

I bought book$_{i}$ and cup$_{j}$. Book was expensive.

1SG.ERG one book.SGF and one cup buy-PAST.SGF book.SGF expensive be.PAST.SGF  
‘I bought a book and a cup. The book was expensive.’
Summary

1. A unified semantic account of anaphoric expressions
   - extensionally equivalent
   - differs in restrictions

2. Semantic economy principles can derive competitions
   - Bare Noun Blocking
   - (null vs. overt pronouns in Romance)
   - (personal vs. demonstrative pronouns in German)
Summary

1. A unified semantic account of anaphoric expressions
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   - (personal vs. demonstrative pronouns in German)

→ Spoken languages: capturing gradience
→ Sign languages: implications on semantic analyses of pointing
Spoken languages: Capturing gradience
Deriving more fine-grained differences

1. Cross-linguistic variation
   - When does the competition lead to a penalty vs. a blocking?

   Penalty vs. Blocking

2. Variation across speakers
   - Anaphoric ability of bare noun depends on pronoun status

   Variation at individual level
1. Going back to processing penalties

Repeated Noun/Name Penalty

- Adult English speakers take longer to process repeated nouns/names than pronouns. [Almor 1999; Gordon et al. 1993; Song & Fisher 2005]

A doctor walked with Jin. The doctor told Jin a story. longer!

A doctor walked with Jin. She told Jin a story.
1. Going back to processing penalties

Repeated Noun/Name Penalty

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A doctor walked with Jin. The doctor told Jin a story.
A doctor walked with Jin. She told Jin a story.

[Ahn 2019]: Use of higher elements in the scale has semantic consequences. (domain accommodation)
Accommodation

I met a doctor. \{She, The doctor\} looked happy.

- Presupposition of \textit{the doctor} is weaker than that of \textit{she}.
- Use of the weaker expression results in an anti-presupposition
  \cite{Heim1991, Sauerland2008}
  
- Use of \textit{the doctor} implies that there was no unique female entity
Accommodation

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**Domain widening** as accommodation.

\[
\{ j_3 \} \rightarrow \{ j_3, k_7 \}
\]

- constrained by/indicated by **focus** that triggers alternatives.


*the DOCTOR*   THAT doctor
Processing costs of accommodation

- Processing costs of presupposition accommodation
  [cf. Domaneschi & Di Paola 2018; Schwarz 2014; Singh et al. 2016; Tiemann et al. 2015, a.o.]

**Semantics**
- Shared structure
- Competition

**Language Use**
- Processing penalties

Domain widening

\[
\{ j_3 \} \rightarrow \{ j_3, k_7 \}
\]
Penalty vs. Blocking

A girl walked in. {She / The girl / That girl} looked happy.

processing penalty
Penalty vs. Blocking

A girl walked in. {She / The girl / That girl} looked happy.  
processing penalty

I met student. {kăo, nakri\text{\text{-}an}} was clever.  
blocked
Penalty vs. Blocking

A girl walked in. \{She / The girl / That girl\} looked happy.

processing penalty

I met student. \{kǎo, nakrian\} was clever.

blocked

[Q] What determines whether competition leads to a penalty vs. a complete blocking?

The status of bare nouns in bare argument languages.
Bare nouns

Something we know about bare nouns in these languages:
[Chierchia 1998b; Dayal 2004; Déprez 2005; Jenks 2015; Jiang 2017]

(21) *nakrian*: the student / a student / $\cap$STUDENT / students
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(21)  *nakrian*: the student / a student / Student / students

- The use of a bare noun might signal the alternative readings
  → generic reading in Thai; indefinite in Hindi
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- The use of a bare noun might signal the alternative readings
  \( \rightarrow \) generic reading in Thai; indefinite in Hindi

English: \textit{the doctor} does not have non-definite readings.
\( \rightarrow \) processing difficulty

Thai: \textit{nan nakrian} (only anaphoric) is not blocked.

I met student. \{k\( \ddot{a} \), nakrian, nan nakrian\} was clever.
\( \text{blocked} \quad \text{possible} \)
1. Processing vs. Blocking - Summary

Semantics

\(\forall x. \ldots\)

Competition

Domain widening

{ \( j_3 \) } \rightarrow \{ \( j_3, k_7 \) \}

Penalty
1. Processing vs. Blocking - Summary

**Semantics**
\[ \text{\textit{x}. [...]} \]

**Competition**

- Domain widening
  \[ \{ j_3 \} \rightarrow \{ j_3, k_7 \} \]

- Alternative meanings
  \[ \exists, K, \tau \]

**Penalty**

**Blocking**
2. Variation across speakers

Variation in Mandarin and Hindi:

**Mandarin**
- Subject bare noun anaphoric, but not objects [Jenks 2018]
- Non-subject bare nouns can be anaphoric [Dayal & Jiang in prep]

**Hindi**
- 3 speakers rejected anaphoric bare nouns
- 1 speaker allowed anaphoric bare nouns
- 1 speaker showed variation
Variation in Bare Noun Blocking

Present theory can predict variation in Hindi and Mandarin. (And specifically in Hindi and Mandarin, not others)
Variation in Bare Noun Blocking

Present theory can predict variation in Hindi and Mandarin. (And specifically in Hindi and Mandarin, not others)

<table>
<thead>
<tr>
<th>‘Productive pronoun scale’</th>
<th>↑</th>
<th>↑</th>
<th>↑</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korean</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandarin</td>
<td></td>
<td>↑</td>
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<tr>
<td>Hindi</td>
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<tr>
<td>Thai</td>
<td></td>
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<td>↑</td>
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<tr>
<td>non-existent</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fully productive</td>
<td></td>
<td>↑</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Mandarin has simplex pronouns (ta) but mixed status
- Hindi lacks distinct simplex pronouns but productively used

Interaction at the individual level
Interaction at the individual level

Hindi speaker:


(23) Maine ek paudha kharid-a. maiN *paudhe-ko roz 1SGM.ERG one plant.SGM buy-PAST.SGM 1SGM plant-DAT daily pani de-ta huN. water give-IMPRF.SGM be.PRS.1SG ‘I bought a plant. I water the plant everyday.’
Grammaticality depends on availability of pronouns

(22) ‘I bought a book. \{ book, *vo \} was expensive.’
(23) ‘I bought a plant. I water \{ *plant, use \} everyday.’
Grammaticality depends on availability of pronouns

(22) ‘I bought a book. \{ book, *vo \} was expensive.’

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Variation on pronoun status → variation on anaphoric bare nouns.

- The competition still applies categorically.
- But the alternatives may vary in a gradient way.
  - Animacy, information structure, pragmatic constraints, etc.
2. Variation - Summary

- Hard-wired categorical restrictions
  - Mandarin non-subject nouns do not allow anaphoric reading.
    [Jenks 2018]
- Wide range of gradient data:
  - Context sensitivity (number of referents)
  - Individual-level variability

The competition mechanism allows for a more systematic account for variation than hard-wired restrictions.

- depends on the availability of alternatives, which is determined in a gradient nature.
Spoken languages: summary

There are many patterns we see in language use. These result from combinations of categorical rules and gradient factors.

The unified theory allows us to make systematic predictions on such gradient patterns: processing penalties, competition, and variation.

→ Empirical advantage over hard-wired principles.
Sign languages: pointing
Implications

1. Anaphoric expressions have the same semantic function. Implemented by sharing the same underlying structure.

2. The interpretation of an anaphoric expression depends on the presence of other expressions. Implemented by semantic economy

→ Cross-linguistic semantic typology
   Analysis of pointing in sign languages
Anaphoric expressions in ASL

- Bare noun
- IX\textsubscript{NEU}    [Koulidobrova & Lillo-Martin 2016; Neidle et al. 2000; Steinbach & Onea 2015]
- IX\textsubscript{LOC}     [Barberà & Zwets 2013; Lillo-Martin & Klima 1990; Schlenker 2011]
Anaphoric expressions in ASL

- Bare noun
- IX \text{NEU} [Kouli dibrova & Lillo-Martin 2016; Neidle et al. 2000; Steinbach & Onea 2015]
- IX \text{LOC} [Barberà & Zwets 2013; Lillo-Martin & Klima 1990; Schlenker 2011]

→ Considering the relative distributional pattern allows for a simpler analysis of IX_{\text{LOC}}.
IX

- IX: indexical pointing handshape used to refer to entities
IX can refer to entities not present in the context ($IX_{\text{LOC}}$)

[Friedman 1975]

(24) YESTERDAY JOHN $IX_A$ MEET $IX_B$ DOCTOR. $IX_B$ BUSY. [ASL]

‘Yesterday John met a doctor. The doctor was busy.’
Setting up referents in space

[Lillo-Martin & Klima 1990]:
loci: overt instantiations of indices that occur with pronouns

(25)  \( J_{in1} \) met \( J_{imin2} \). She\(_{1}\) helped her\(_{2}\).

- \( g = \{ <1, jin>, <2, jimin> \} \)
- \( [she_{1}]^g = [x_1]^g = g(1) = jin \)

\( IX_A \) is like \( she_{1} \)

A puzzle

[Ahn, Kocab, & Davidson 2019] **An odd case of anaphoric indices**
(At least not the one we assume for spoken languages)

- **indices** assigned to *every* discourse referent
  - present in *every* anaphoric relation
- **loci**: marked in distribution and interpretation
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  - infrequent in natural production data
  - 6/340 tokens [Czubek 2017; Frederiksen & Mayberry 2016]
Production data

Natural production studies [Czubek 2017; Frederiksen & Mayberry 2016]
12 native ASL signers; 6-panel picture
Production data

How frequent is IX_{LOC}?

- Production studies: not very frequent.

[Czubek 2017; Frederiksen & Mayberry 2016]

<table>
<thead>
<tr>
<th></th>
<th>Null Arg</th>
<th>CL</th>
<th>N</th>
<th>IX</th>
<th>F-S</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintained</td>
<td>.73 (219)</td>
<td>.20 (63)</td>
<td>.07 (21)</td>
<td><strong>.02 (6)</strong></td>
<td>.04 (1)</td>
<td>310</td>
</tr>
<tr>
<td>Reintroduced</td>
<td>.67 (20)</td>
<td>0 (0)</td>
<td>1 (10)</td>
<td><strong>0 (0)</strong></td>
<td>0 (0)</td>
<td>30</td>
</tr>
</tbody>
</table>

IX is more frequent in more complex discourse. [Czubek 2017]
A puzzle

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    - felicitous with >2 referents [Ahn, Kocab, & Davidson 2019]
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Felicity judgments

Felicity judgments [3 native ASL signers] [Ahn, Kocab, & Davidson 2019]

**IX\textsubscript{LOC} is not obligatory or preferred:**

- when it is obvious who the referent is (null or IX\textsubscript{NEUT} preferred)

\texttt{#BOY IX\textsubscript{A} ENTER CLUB. IX\textsubscript{A} DANCE.}

\texttt{BOY IX\textsubscript{A} ENTER CLUB. SEE GIRL IX\textsubscript{B} READ. IX\textsubscript{A} DANCE.}

‘A boy entered a club. (He saw a girl read). He danced.’
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\text{‘A boy entered a club. (He saw a girl read). He danced.’}
\]

$\text{IX}_{\text{LOC}}$ is not licensed:
- with inanimate referents.

\[
\text{MARY IX}_A \text{ BUY BOOK } \text{?IX}_B. \text{ ?IX}_B \text{ EXPENSIVE.} \\
\text{(intended) ‘Mary bought a book. The book was expensive.’}
\]
IX\textsubscript{LOC} is not an index

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IX_{LOC}: a restriction!
IX_{LOC} as a restriction

\[ \text{[that linguist}_R\text{]} = \sup \left[ \lambda x. \text{entity}(x) \land \text{linguist}(x) \land R(x) \right] \]

- Exophoric demonstratives in spoken languages:
  \( R \) is filled with a locational restriction provided by \( \rightarrow \)

\[(26) \quad \text{[That bottle]} \rightarrow \text{is blue.} \]

- \( \text{[that bottle}_A\text{]} = \sup \left[ \lambda x. \text{entity}(x) \land \text{bottle}(x) \land \text{[\( \rightarrow_A \)]}(x) \right] \)

- \( \text{[\( \rightarrow \)]} = \lambda a. \lambda x_e. x \text{ is at } a \)
  (note that \( a \) is always saturated as soon as you point)
**IX_{LOC} as a restriction**

\[ [\text{that linguist}_R] = \sup [\lambda x. \text{entity}(x) \land \text{linguist}(x) \land R(x)] \]

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- \( [\rightarrow] = \lambda a. \lambda x. x \text{ is at } a \)
  (note that \( a \) is always saturated as soon as you point)

Idea: \( [IX_A] = [\rightarrow_A] = \lambda x. x \text{ is at } a \)
IX\textsubscript{LOC} as an anaphoric expression

(27) \[ IX_A \text{ DANCE.} \]

- \[ [IX_A] = [\emptyset IX_A] = \operatorname{sup} \{\text{entity}(x) \land \text{at-A}(x)\} \]
  ‘the one at A’
**IX\textsubscript{LOC} as an anaphoric expression**

(27) \( \text{IX}_A \) \text{DANCE.} \\

\[ [\text{IX}_A] = [\emptyset \text{IX}_A] = \sup \ [\text{entity}(x) \land \text{at-A}(x)] \]

\text{‘the one at A’}

**IX\textsubscript{LOC} must be introduced first.**

\textbf{JIN IX}_A \textbf{SIT-IN \text{CLASS.} \emptyset IX}_A \textbf{DANCE.}

\text{supplementary} \hspace{1cm} \text{restrictive}

\text{‘Jin (who is at A) .. The entity that is at A ..’}
A modifier with a null head noun?

- English: *the rich* 
  [Beatrice Santorini, pc]
- Relative clauses with null heads possible

(28) *Wo mai-de hen gui.*
    I buy-DE very expensive
  ‘The one I bought was expensive.’
  [Mandarin; Yuyin He, pc.]
$[\mathbf{I X}_A] = [\emptyset \mathbf{I X}_A]$

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- Deverbal anaphors in Nicaraguan Sign Language
  [Senghas 1995]
Deverbal anaphors

[Senghas 1995] Nicaraguan Sign Language (NSL)
‘a reduced, truncated form of a recently-signed verb... to refer back to the referent in the narrative that last served as the most salient argument of that verb’ (p.139).

(29) MAN FALL-DOWN-[iterative].
‘The man falls down head-over-heels.’
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BIRD LAUGH.
‘The bird laughs.’
Deverbal anaphors

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‘Feathers float down and the man collects them.’
BIRD LAUGH.
‘The bird laughs.’
[COLLECT]_n LOOK UP.
‘The collector looks up.’
IX_{LOC} as a modifier

\[[IX_{LOC}] = \lambda a. \lambda x. x \text{ is at a mark}\]

✓ modifier added when referent not salient

Minimize Restrictors! [Schlenker 2005]
$[\text{IX}_{\text{LOC}}] = \lambda a. \lambda x. x \text{ is at a}$

- **marked ✓** modifier added when referent not salient
- **Minimize Restrictors!** [Schlenker 2005]
- **intro. ✓** modifier can attach to familiar and new nouns
- modifier can be restrictive or supplementary
Jin, who is at A

\[
[JIN \, I_X_A] = [jin \, [who \, is \, at \, A]]
\]

What does it mean for Jin to be ‘at A’ though?
Jin, who is at A

\[ \text{[JIN IX}_A\text{]} = [\text{jin [who is at A]}] \]

‘Jin’

What does it mean for Jin to be ‘at A’ though?

Pragmatic extension of exophoric reference [Ahn 2020]

- Evident that Jin is not there
- Addressee accommodates; takes it as a label
Pragmatic extension

Using an abstract label in speech:

- My friend, \textit{A}, decided to call my other friend, \textit{B}, but \textit{B} didn’t pick up because \textit{B} didn’t want to talk to \textit{A}.

- There is this woman, \{\textit{let’s call her A / who I’ll call A}\}

- Jin\_{A} was talking to Jimin\_{B} and she\_{B} kicked her\_{A}.
Sign languages: summary

IX and loci

- Analysis of loci as overt indices
- Led to discussions on whether sign language makes meaning more visible than spoken languages [Schlenker 2018]

Proposal

- Evaluating $IX_{LOC}$ in relation to other anaphoric expressions in ASL suggests that $IX_{LOC}$ isn’t an anaphoric index.
- $IX_{LOC}$ is a modifier (just like $\text{A}$ in spoken languages)
- an additional restriction added to help resolve referent
- No sign language-specific mechanism necessary!
General Discussion

1. A unified semantic structure for all anaphoric expressions
   - Only differ in the kind and number of restrictions

2. Competition is naturally derived from the meaning
   - Bare Noun Blocking

3. In spoken languages: we can capture the gradient nature of the competition more systematically
   - Processing vs. Blocking
   - Cross-linguistic/individual variation

4. In sign languages, the analysis of $I_{LOC}$ can be simplified to a locational restriction
Thank you!
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Slavic languages

Russian, Belarusian, Polish

- Rich set of grammatically gendered pronouns
- Allow bare nouns
  (at varying degrees – less good for Polish)

(30) Ja kupil-a knig-u včera. Knig-a byl-a dorog-aja.
1SG buy-PST.F book-ACC yesterday Book-NOM be-PST.F expensive-F
‘I bought a book yesterday. The book was expensive.’
[Russian]
[Lena Borise, Katia Gushchanskaya, Yury Kukushkin, pc]

yesterday bought-1SG-PST map.ACC be.3SG.F.PST expensive.F
‘Yesterday I bought a map. The map was expensive.’
[Polish]
[Zuzanna Fuchs, Marek Majer, pc]

Counterexample?
Grammatical gender

- Slavic pronouns: **grammatically gendered**
- takes the arbitrary gender of the NP

Suggests that the **NP is present in the underlying structure.**
[Sauerland 2007]

\[
\text{[Janá] = [Janá kníga] = } \nu x. \text{entity}(x) \land \phi(x) \land \text{book}(x) \quad \text{[Russian]}
\]
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- Slavic pronouns: **grammatically gendered**
- takes the arbitrary gender of the NP

Suggests that the NP is present in the underlying structure.
[Sauerland 2007]

\[
\text{[aná]} = \text{[aná kniga]} = \exists x. \text{entity}(x) \land \phi(x) \land \text{book}(x)
\]  
[Russian]

**Hindi and Thai**: naturally gendered pronouns (animacy)

- Even though Hindi nouns have grammatical gender
Another competition

[Jenks 2018]: strong vs. weak distinction in Mandarin

- Unique definite: N
- Familiarity definite: \textit{dem} \textit{cl} N

\textbf{Index!}: Index as much as possible.

Idea: Maximally specify which interpretation out of

\{ unique, anaphoric, indef, kind \}

\textbf{Two competitions:}

1. Don’t Overdetermine! \hspace{1cm} \textbf{[anaphoric expressions]}
2. Index! \hspace{1cm} \textbf{[noun interpretation]}