Bound and referential pronouns

*with thanks to
Birgit Bärnreuther,
Christina Bergmann,
Dominique Goltz,
Stefan Hinterwimmer,
Maike Kleemeyer,
Peter König,
Florian Krause,
Marlene Meyer

Peter Bosch
Institute of Cognitive Science
University of Osnabrück

Workshop on "Cognitive and linguistic mechanisms of
anaphoric reference in literary and non-literary text"
Courant Research Center "Text Structures"

The plan

1. Context: Are German demonstratives bound?
2. Basic distinctions among pronoun occurrences
3. An eye-tracking experiment
DPro function referentially – not bound

Martina Wiltschko (1999):

a) Peter glaubt, daß {er/der} dumm ist.

b) Jeder Mann glaubt, daß {er/der} dumm ist.

Hinterwimmer (2009) discusses sentences like the following – which seem to demonstrate that DPro can be bound by a c-commanding quantifying DP:

(4) Klaus, stellte [jedem Studenten]_k eine Frage, die der_k nicht beantworten konnte.

[Klaus put one question to [every student]_k that [DPro_k] could not answer.]
Pronouns may function in (at least and uncontroversially) two fundamentally different ways:

(i) as free referential expressions ("R-expressions")
(ii) as expressions that are syntactically and semantically bound by their antecedent ("anaphors")

It is commonly assumed that

- reflexive and reciprocal pronouns are always bound,
- demonstrative pronouns are always free, and
- personal (and possessive) pronouns may function either way.

Interpreting pronouns

**In a little more detail**

A pronoun may either

1. refer autonomously – like any other referential expression, i.e., independent of the reference of other DPs, controlled only by the salience of its referent ("first mention pronoun").
   
   (1) This is my friend Karl.
   (2) She is the one who invited me to a Martini.

2. it may depend on the interpretation of another DP – in one of several ways...
Interpreting pronouns

When the interpretation of a pronoun **depends on another DP** this may be due to

i. the pronoun being *c-commanded* and *syntactically bound* by that DP.

We speak here of **bound pronouns** (in a narrow sense of "bound").

This relation is obviously only possible within a sentence and is not based on a relation of reference.

(1) John thought *he* would be late.
(2) Everyone thought *he* would be late.
(3) Fred told Jane *she* would be late.

Interpreting pronouns

When the interpretation of a pronoun **depends on another DP**, this may, alternatively, be due to

ii. the pronoun occurring referentially,

a. referring to the same entity that is referred to by another referential DP in discourse (*strict coreference*)

(4) John took the train. **He** went to Berlin.

b. or referring to an entity that was introduced into the discourse indirectly by another, not necessarily referential, DP (*discourse reference*)

(5) A man called. **But he** didn't leave a message.
(6) John wanted to catch a fish. **He** wanted to eat it for dinner.
Interpreting pronouns

1. The pronoun *refers autonomously*

2. The pronoun's interpretation *depends on another DP*
   i. The pronoun is c-commanded and thus syntactically bound by that DP (*bound pronoun*)
   ii. The pronoun *occurs referentially*
      a. and refers to the same entity that is referred to by another referential DP in discourse (*strict coreference*)
      b. or referring to an entity that has been introduced into the discourse indirectly by another (not necessarily referential) DP (*discourse reference*)

Pronouns under 2i and 2iib are sometimes represented as bound variables in a logical representation language.
An eye tracking study

We wanted to know whether the difference between bound and referential pronouns can be detected online in processing – to the extent that processing is reflected in focussing behaviour.

We only looked at personal and possessive pronouns in German – contrasting bound an coreferential occurrences.

Both types in our stimulus materials had referential antecedents and their referents visible in the visual display.

Linguistic stimuli (one set of 12)

Emergency call out in the country.

Today [The vet (fem)] is coming to see [the farmer].

[She] has come for the sick animals and notes that

1 [he] has not been using the new treatment that [she] had prescribed.

2 [she] had not prescribed the new treatment that [he] has been using.


4 [her] new treatment is unlikely to find [his] approval.
Dringender Notfall auf dem Land.

Die Tierärztin besucht heute den Landwirt. Sie ist wegen der kranken Tiere vorbeigekommen und stellt fest, dass

1. er die neue Behandlung, die sie verschrieben hatte, gar nicht angewendet hat.

2. sie die neue Behandlung, die er angewendet hat gar nicht verschrieben hatte.

3. seine Vorstellungen nicht mit ihrer Behandlung übereinstimmen.

4. ihre neue Behandlung wohl nicht seine Zustimmung findet.

Visual stimuli (one of 12 displays)
Participants

60 native speakers of German, age between 18 and 50 (average 24.8); 32 male, 28 female;

Hypotheses

1. Only referential expressions, and not bound pronouns, cause an increase in focussing frequency (linking of visual attention to reference)

2. First mention referential expressions cause a greater increase in focussing frequency than do second mention referential expressions.
naturalistic visual stimuli – and their drawback

Fixations allocated to one of the referents (coloured) or beyond ROI (grey) in part of one stimulus image (one subject).
Die Tierärztin besucht heute den Landwirt. Sie ist wegen der kranken Tiere vorbeigekommen und stellt fest...
Die Tierärztin besucht heute den Landwirt. Sie ist wegen der kranken Tiere vorbeigekommen und stellt fest,..
Results

R1: Slot5 bound, after R2 in Slot4
R2: Slot5 referential, after R1 in Slot4

R1: Slot4 bound, after R1 in Slot3
R2: Slot4 referential, after R1 in Slot3

Results (Slot 4, all conditions)

all pronouns relating to R1 in slot4 are bound
all pronouns relating to R2 in slot4 are referential
clear rise for referential pronouns, no rise for bound pronouns.

note overspill from reference to R1 in preceding Slot3

??? bound pronouns maintain level of attention & referential pronouns raise level of attention
Results (Slot 4, all conditions)

<table>
<thead>
<tr>
<th>Referent 1 in Condition 2</th>
<th>Slot 4</th>
<th>12600 ms</th>
<th>Slot 5</th>
<th>14000 ms</th>
<th>Diff. Slot 4</th>
<th>Diff. Slot 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>bound</td>
<td>27.4%</td>
<td>28.6%</td>
<td>28.9%</td>
<td>15.8%</td>
<td>≈</td>
<td>≈</td>
</tr>
<tr>
<td>Referent 1 in Condition 4</td>
<td>26.9%</td>
<td>27.9%</td>
<td>24.5%</td>
<td>21.5%</td>
<td>≈</td>
<td>1%</td>
</tr>
<tr>
<td>bound</td>
<td>ref</td>
<td>14.1%</td>
<td>28.6%</td>
<td>27.9%</td>
<td>18.3%</td>
<td>14.5%</td>
</tr>
<tr>
<td>Referent 2 in Condition 3</td>
<td>ref</td>
<td>8.5%</td>
<td>31.7%</td>
<td>34.9%</td>
<td>21.9%</td>
<td>23.2%</td>
</tr>
</tbody>
</table>

all pronouns relating to R1 in slot4 are bound
all pronouns relating to R2 in slot4 are referential

- note overspill from reference to R1 in preceding Slot3
- clear rise for referential pronouns, no rise for bound pronouns.

?? bound pronouns maintain level of attention & referential pronouns raise level of attention

Results (Slot 5, all conditions)

all pronouns relating to R1 in slot5 are bound
all pronouns relating to R2 in slot5 are referential

all pronouns in Slot5 are preceded by pronouns in Slot4 that relate to another referent

>> no processing difference detected between bound and referential pronouns.
Results (Slot 5, all conditions)

<table>
<thead>
<tr>
<th>Referent 1 in Condition 1</th>
<th>Slot 4</th>
<th>12600 ms</th>
<th>Slot 5</th>
<th>14000 ms</th>
<th>Diff. Slot 4</th>
<th>Diff. Slot 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 %</td>
<td>17.4 %</td>
<td>15.7 %</td>
<td>bound</td>
<td>-6.6 %</td>
<td>14.6 %</td>
</tr>
<tr>
<td>Referent 1 in Condition 3</td>
<td>23.9 %</td>
<td>18.1 %</td>
<td>12.2 %</td>
<td>bound</td>
<td>-5.8 %</td>
<td>13.9 %</td>
</tr>
<tr>
<td>Referent 2 in Condition 2</td>
<td>9.3 %</td>
<td>11.3 %</td>
<td>9.9 %</td>
<td>ref</td>
<td>2 %</td>
<td>20 %</td>
</tr>
<tr>
<td>Referent 2 in Condition 4</td>
<td>11.6 %</td>
<td>13.1 %</td>
<td>12.5 %</td>
<td>ref</td>
<td>1.5 %</td>
<td>18.1 %</td>
</tr>
</tbody>
</table>

all pronouns relating to R1 in slot5 are bound
all pronouns relating to R2 in slot5 are referential
- no overspill; all pronouns in Slot5 are preceded by pronouns in Slot4 that relate to another referent

>> no processing difference detected between bound and referential pronouns.

Results

Hypotheses

1. Only referential expressions, and not bound pronouns, cause an increase in focussing frequency (linking of visual attention to reference)

   >> falsified

2. First mention referential expressions cause a greater increase in focussing frequency than do second mention referential expressions.

   >> supported
Discussion

Results show no difference in processing between bound and referential pronouns. – Why?

Some potential explanations:

a. There is no difference.
   But reading time studies, and probe verification studies, and eye tracking during reading did show a difference (Clifton & Frazier 2000, Shapiro & Hestvik 2003, Koorneef et al 2011).
   – Still, reading is not quite the same as listening.

b. The simple direct link between referentiality of an expression and focussing frequency cannot be maintained.
   – Perhaps already the association of a depicted object with an expression causes focussing increase? – Visual world eye tracking is not reading; we are concerned with cross-modal integration.

>>> 

Some potential explanations:

c. perhaps all pronouns in our experiment were actually processed referentially.

   – It is commonly assumed that bound pronouns are actually ambiguous between a bound and a referential reading – evidenced by observations of VP ellipsis, e.g.,

   (1) Jane said she was sick, and Kate too.

Only the bound reading is often thought to have a processing priority, i.e., is used first.

In our case the visual presence of a referent, plus a general drive for integrating modalities, may have forced a referential interpretation.