“Backward“ Binding as a Psych effect

A binding Illusion?

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Main goal: Provide experimental evidence for exceptional EXP-Binding in German

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1. Backward Binding: Psych effect or binding illusion?
Backward Binding as a Psych effect

What is a psych effect and how is it special?

- triggered by exceptional properties of non-agentive experiencer object structures; leads to behavior that violates grammatical rules
- occur in a large number of languages & affect central phenomena of grammar (e.g., islandhood, word order or control) & violate specific rules in several languages (i.e. clitic doubling and genitive of negation) (see Landau 2010 for an overview of core and peripheral psych effects)

Assumption: experiential/mental domain is grammatically relevant; [exp] is a relevant grammatical feature of verb meaning
Backward Binding as a Psych effect

Psych effects are restricted to a special subclass of EO verbs

- Reinhart 2001: Some subjects in EO structures are ambiguous between Causer and Subject Matter (SM) interpretation > psych effects only with SM subjects

- Arad 1998: Some EO structures vary between eventive vs. stative reading > psych effects only with stative reading

- different types of EO_{ACC} verbs/class II psych verbs
  - stative EO_{ACC} verbs: no agentive reading - *depress, worry*; German: *interessieren, bedrücken*
  - „labile“ EO_{ACC} verbs: alternate between agentive & non-agentive reading - *shock, annoy*; German: *ärgern, nerven, stören*
Backward Binding as a Psych effect

Backward Binding (BB) violates basic principles of Binding Theory

- B&R (1988) - Backward Binding (BB) with Italian EO verbs:
  “Perhaps the most notorious puzzle raised by psych-verbs of the preoccupare class [class II psych verbs] is their anomalous behavior with respect to the theory of Binding.”

(1) Questi pettegolezzi su di sé; preoccupano Gianni; più di ogni altra cosa.
  ‘These gossips about himself worry Gianni more than anything else.’

(2) *Questa pettegolezzi su di sé; descrivono Gianni; meglio di ogni biografia ufficiale.
  ‘These gossips about himself describe Gianni better than any official biography.’

- Principle A (Binding Theory; BT):
  local c-command requirement for syntactic binding of anaphors
Backward Binding as a Psych effect

EO verbs seem to have special syntactic or discourse properties

- How/Why is there a potential psych effect? It is argued that EO-Antecedents are subject/topics of a clause either syntactically or semantically & subjects are suitable binders.

  - Finer-grained syntax: EXP-BB is derived backward binding: EXP-antecedent semantically binds from its base position (B&R 1988, Pesetsky 1987, 1995) (theta-grid [EXP, TH]; case grid [ACC, −])

  - Finer-grained semantics: Thematic hierarchy/aspectual prominence/inherent topicality of the participants (Jackendoff 1972, E. Grimshaw 1990, Kiss 2002, among others)

  - One global solution: BB anaphors are logophoric anaphors, which do not require c-command (Broccias 1997)
Backward Binding as a Psych effect

**BB effects provide evidence for the special syntax of EO verbs**

- BB in OE structures seems to violate Principle A of BT
  
  \[(3) \ [Pictures of each other_i]_{\text{NOM}} \text{worried}_{\text{EXP}} [the linguists_i]_{\text{ACC}}.\]

- Nominative/"subject“ anaphors: the subject antecedent should be structurally reconstructable → BB is derived & not base generated
  
  \[(4) \ a. \ His_i \text{mother seems to everybody}_i \text{to be the best}. \]
  
  \[b. \text{seems to everybody}_i [his_i \text{mother to be the best}]\]

- BB with psych verbs not reconstructible (in a simple transitive analysis) → apparently violates grammatical rule

- BB is documented cross-linguistically; e.g. Italian, English, Chinese, Hungarian, Japanese (among others)

→ BB structures are used for assumptions about the nature of psych structures
Backward Binding as a Psych effect

BB structures occur with different types of anaphors

(5)  a. His$_i$ health worried$_{\text{EXP}}$ every patient$_i$.
b. *His$_i$ doctor visited$_{\text{AG}}$ every patient$_i$. (Reinhart 2001)

- Further & frequent structure types in the literature

(6)  a. Each other’s supporters worried$_{\text{EXP}}$ Freud and Jung.
b. Each other’s remarks annoyed$_{\text{EXP}}$ John and Mary.
c. *Each other’s parents harmed$_{\text{AG}}$ John and Mary.
d. *Each other’s teachers insulted$_{\text{AG}}$ John and Mary. (Pesetsky 1987, 1995)

- Only reference and evaluation of BB as psych effect in German: Platzack 2009

(7) *Bilder voneinander beunruhigten die Linguisten. (German)
‘Pictures of each other worried the linguists.’

- German: In general, structures containing reflexives & reciprocals are odd, i.e. die X von sich/voneinander
Backward Binding as a binding illusion

Should we consider BB as indicator for the nature of psych verbs?

• Varying intuitions about the wellformedness of BB structures within and across languages

• Varying assumptions about the critical factors: verb type, subject type, animacy, volitionality, aspect, type of anaphor

• Picture-NP-anaphors/possessive reciprocals: problematic case - sensitive to pragmatic factors. > BT for true argument reflexives, but not for picture-NPs; analysis as logophors (i.e. bound or anaphoric pronouns) (Pollard & Sag 1992, Reinhart & Reuland 1993), experimental study on the coreferential reading of picture-NP-reflexives (Goldwater & Runner 2006)

No stabile empirical observations as support for conclusions about the nature of psych verbs or the grammatical modeling (θ roles, EXP base generation)?
Backward Binding as a binding illusion

Empirical data is not adequately controlled for proper binding configurations

- Structures with locally backward bound possessives (Reinhart’s examples)
  
  (8)  a. His children\textsubscript{i} visited the patient\textsubscript{i}. \textit{coreference, no c-command}
  
    b. ??His\textsubscript{i} children visited every patient\textsubscript{i}. \textit{variable binding, c-command}
  
- The violation of the c-command requirement in the bound variable configuration in (8b) leads to WCO effects

- Coreferential interpretation with DPs in (8a) does not require c-command in order to be interpreted properly

- WCO effects are theoretically predicted for object antecedents binding subject anaphors

- Evidence for exceptional binding based on this kind of structure-type is only valid under pronominal variable binding: Psych effect $\Rightarrow$ WCO tolerance
Backward Binding as a binding illusion

Generic operator potentially trivialize Q-Binders

- Bound variable interpretation of possessive pronouns requires coindexation to (inherently non-referring) quantifiers in order to guarantee an underlying binding configuration and covariation between binder and bindee.

(9) A guide ensures that every tour to Louvre is fun.
   a. Yesterday, a guide ensured that every tour to Louvre is fun.
   b. In general, a guide ensures that every tour to Louvre is fun.

„the generic operator leads to a trivialization of the universal so that each time a relevant portion of the world is considered, a single guide is involved in each situation of a tour to Louvre“ Fox & Sauerland (1996)

=> The quantifier cannot ensure semantic binding (existential, E-type)
=> We have coreference of pronouns even with presence of Q-Binder
Backward Binding as a **binding illusion**

**Q-trivialization might underlie the BB structures**

- OE-structures have derived subjects. The pronoun can be interpreted as bound variable (c-command fulfilled pre-derivational).

  \[ (9) \text{Yesterday, his}_i \text{ health worried every patient}_j. \quad [\text{his}_i\ldots[\text{EXP}\ldots\text{Quant}_i[\text{his}_i]]] \]

- In agentive structures, the pronoun cannot get bound variable interpretation (c-command violation)

  \[ (10) \text{*Yesterday his}_i \text{ doctor visited every patient}_j. \quad [\text{his}_i\ldots\text{AG}\ldots\text{Quant}_i] \]

- Referential NPs: The pronoun is coreferential with 'Peter', (discourse binding; pragm.)

  \[ (11) \text{Yesterday, his}_i \text{ mother visited Peter}_j. \quad D_i[\text{his}_i\ldots\text{AG}\ldots\text{Peter}] \]

- The pronoun is coreferential with the quantifier bound to the generic operator

  \[ (12) \text{Usually, his}_i \text{ doctor visits every patient}_j. \quad \text{GEN}_i[\text{his}_i\ldots\text{AG}\ldots\text{E-Quant}_i] \]
Backward Binding as a binding illusion

We find similar interaction effects of A- and D-quantification with indefinites

- Indefinites are ambiguous in opaque contexts (Fodor & Sag 1982)
  
  (13) a. *He wants to marry a woman*. (spec/non-spec)
      b. *He married a woman*. (strong spec-interpretation)

- this is also possible for Qs: quantificational (Q-) vs. pronominal interpretation

  (14) a. *Er könnte jede Frau anrufen*. (pron., E-type)
      b. *Er hat jede Frau angerufen*. (Q)
Backward Binding as a binding illusion

Generic potential also varies with verb types and lexical information

“perhaps the best one can do is to assume that [existential] readings and [universal] readings are both generally available, but certain sentences may strongly disfavour one of them due to specific properties of their meaning."

(…)

“For a sentence like “a student interviewed every professor”, it is very hard or impossible to get the reading where every professor has wide scope over a student (in contrast with, e.g., "a mechanic inspected every plane")."

Chierchia (1992)

—> factors like verb type (stage-level/individual-level) and subject type influence the generic potential of a structure.

—> Individual tendency to get access the generic reading of a structure
Backward Binding as a binding illusion

WCO effects occur under violation of syntactic or linear prominence rules

- WCO typology: two relevant conditions: syntactic and/or linear prominence (Bresnan 1998); English needs both, in German at least one condition must be fulfilled

(15) a. ✓ …dass jeder_{NOM} seine Mutter_{ACC} mag. (syntactic & linear)
   b. ✓ …dass seine Mutter_{ACC} jeder_{NOM} mag. (syntactic)

‘…that everyone likes his mother.’

c. ✓ …dass jeden_{ACC} seine Mutter_{NOM} mag. (linear)
   d. ✗ …dass seine Mutter_{NOM} jeden_{ACC} mag. (neither)

‘…that his mother likes everyone.’
2. Backward Binding Experiment: Method & Material
Hypotheses

Summary of the facts & resulting hypotheses

1. Psych effects affect central phenomena & occur cross-linguistically > indicates [exp]-relevance for grammatical component

2. „Backward“ binding in German is blocked by prohibition against WCO/ c-command violation WCO effects disappear under generic readings

H1: Genericity
Generic structures/opaque contexts license Backward „Binding“ (illusions) compared to particular/transparent contexts.

H2: Verb type
EO structures with SM subjects license Backward Binding compared to agentive structures.
Method

We conducted a simple pre-study in order to verify material and method

- Absolute binary judgments (y/n grammaticality task): primarily qualitative (output-related)\(^1\) but proportions reveal quantitative results (well-formedness)\(^2\)
  
  \(^1\) Featherston 2005
  
  \(^2\) Bader & Häussler 2010

- 12 target items, additional control and filler items

- 27 test subjects (3 randomized lists): age \(\bar{\sigma} 28,5\); 54% female

- 2x2 factorial design: ASPECT (particular, generic)
  
  VERBTYPE (agentive, experiencer)

- Web-based questionnaire, software: OnExp 1.3 (GAU Göttingen), unpaid, 15 mins

- Data analysis: obtain non-numerical data; Mixed effect Logistic regression using R version 3.1.0 ; glmer\{lme4\}
Consider restrictor-less universal quantifiers for a proper binding configuration

- Quantified expressions (Q+restrictor) potentially relate to discourse referents: every professor

- Non-distributive universal quantifiers also show potential topicality, i.e., in German alle

  (16) Der Unfall hat alle schockiert.
  =the accident has all shocked

- Universal distributive bare quantifiers as binder, i.e. In German jed-e(r), kein-e(r)

  (17) Der Unfall hat jeden schockiert.
  =the accident has everyone shocked
Material: Sentence aspect

Sentence aspect can be specified with explicit operators such as adverbials

Generic reading: trigger E-type reading of the universal Q

• Q-Adv.: introduce explicit generic operators

• Tense: Present tense (preferred for generic interpretations)

  In general, his health worries everyone.

• Additional opacity operator licensed by periphrastic subjunctive, e.g., would, may, should

  In general, his health might worry everyone.

Particular reading: ensure proper binding configuration

• Temporal Adverbials & Past tense

  Yesterday his health worried everyone.
Material: Verb type

**EO verbs and agentive verbs are the most opposite pair of verb classes**

**EO verbs:**

- Accusative experiencers (B&R’s, Class II): Theme$\text{NOM}$ - Experiencer$\text{ACC}$

- non-causative interpretation (cf. Subject type)

**Agentive verbs:**

- Uncontroversial regarding backward binding (also in accounts of BB as peripheral psych effect)

- canonical transitives: Agent$\text{NOM}$ - Patient$\text{ACC}$

  begrüßen (‘greet’), beraten (‘advise’), kritisieren (‘criticize’), überprüfen (‘check’), hänseeln (‘tease’), besuchen (‘visit’), schlagen (‘hit’), untersuchen (‘examine’), unterstützen (‘support’), umarmen (‘hug’), anrufen (‘call’), ausfragen (‘interrogate’)

- agent vs. causer: stative passive test *ist besucht/*ist umarmt/*ist angerufen (...)

**Causative verbs** are controversial and won’t be considered for now
We can identify SM-subjects by primary choice of prepositions $by_{CAU}$ vs. $about_{SM}$

(18) a. $Her_i health_{SM} worried Lucie_i$.  
$= easiest:$ health is subject matter of Lucie’s worry

b. ??$The doctor’s letter_C worried Lucie.$  
$= cause$ construal is more natural: letter causes worry about something else

- SubjectExperiencer versions with $about$-PPs represent subject-matter subjects (Pesetsky 1995)  
$Lucie worries about the doctor’s letter.$ (subject-matter-only)

- Corresponding prepositions in German are $VON$ vs. $ÜBER$

Assumption 1: For some verbs, the SM- or C-option is pre-determined. $VON$-selecting verbs do not license subject matter subjects

Assumption 2: The subjects of EO verbs predominantly selecting $ÜBER$-PPs in their SE-paraphrase prevents C-interpretations of the subjects
Choose *about*-selecting verbs as EO subclass to ensure subject matter selection

- Observation: 3 Classes of EO verbs in German with a strong tendency to select one over the other or both:

  PP-Class I: *VON*-selecting EO verbs
  (ist) angewidert von/*über, provoziert von/*über, genervt von/*über

  PP-Class II: *ÜBER*-selecting EO verbs
  (ist) beunruhigt *von/über, verärgert *von/über, amüsirt *von/über

  PP-Class III: Verbs selecting both
  (ist) enttäuscht von/über, erschrocken von/über, begeistert von/über

- We chose PP-Class II and some PP-Class III verbs for the items:
  deprimieren, verärgern, entsetzen, betrüben, verwundern, erstaunen, erfreuen,
  schockieren, amüsieren, bestürzen, empören, beunruhigen
Material: Animacy

Animacy naturally varies with verb types: How can we control for it?

- Agents are restricted to animate individuals (volitionality featured);
- Subject matters of EO structures are best encoded with inanimate subjects. “Animate“ individuals represent actions/properties, as in *The doctor worried Lucie*.

**Assumption 1:** Direct adjustment of animacy by animate NPs causes differences with respect to processing cost and plausibility.

**Assumption 2:** Triggering salience of animate contributors more indirectly will „conceptually align“ agentive and experiential structures.

- We implement explicit existence of individuals by complex possessor noun phrases containing individual-related abstract nouns and animate posessors
  
  *the opinions of his father, the statements of his friends, the wishes of his wife*

- We adjust agentive structures with respect to complexity.
  
  *the colleagues of his father, the parents of his friends, the friends of his wife*
Material: Target items

The items vary in verb type and sentence aspect

- Items contain verbs according to the VERBCLASS values: agentive [agt] and experiential [exp]
- and inducing ASPECT according to the values particular [par] and generic [gen]

[agt, par]: Gestern haben die Eltern seiner Freunde jeden begrüßt.
‘Yesterday, the parents of his friends welcomed everybody.’

[exp, par]: Gestern haben die Aussagen seiner Freunde jeden deprimiert.
‘Yesterday, the statements of his friends depressed everybody.’

[agt, gen]: Im Allgemeinen würden die Eltern seiner Freunde jeden begrüßen.
‘In general, the parents of his friends would welcome everybody.’

[exp, gen]: Im Allgemeinen können die Aussagen seiner Freunde jeden deprimieren.
‘In general, the statements of his friends would depress everybody.’
Material: Control items

Control items ensure that target structures theoretically have binding potential

- **Type 1**: backward referential: same structure, but referential „Binder“ instead of QP (high „yes“ rate expected)

> Heute haben die Kollegen seiner Abteilung Robert besucht.
> =today have the colleagues of his department Robert visited
> 'Today, the colleagues of his department visited Robert.'

- **Type 2**: forward passives: same material but structure enables forward binding (high „yes“ rate expected)

> Heute wurde jeder von dem Leiter seiner Abteilung besucht.
> =today was everybody of the manager of his department visited
> 'Today, everybody was visited by the manager of his department.'
Material: Filler items

Filler items must fit the experimental conditions of two marked elements

• **Type 1**: principle B violation (satisfy „no“-votings)

  *Am Tag zuvor hat* **er** *den Bürgermeister* angesprochen.*
  =the day before has **he** the mayor spoke-to
  'The day before, **he** spoke the mayor.'

• **Type 2**: embedded representative/individual (mid-type filler item)

  *Die Daten von* **ihm** *hat Klaus* angefordert.*
  =the data of **him** has Klaus ordered-up

• **Type 3**: embedded benefactive (mid-type filler item)

  *Das Formular für** ihn** konnte **der Vater** abholen.*
  =the printed form for **him** could the father collect
3. Results, Conclusion & Outlook
Results

Experiencer verbs and generic sentence aspect increase acceptability rates

• Grand mean: \( y \approx 31\% \) \( n \approx 69\% \)

• Means per condition:

<table>
<thead>
<tr>
<th>YES</th>
<th>VERB AG</th>
<th>VERB EXP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPECT PAR</td>
<td>.23</td>
<td>.34</td>
</tr>
<tr>
<td>ASPECT GEN</td>
<td>.28</td>
<td>.41</td>
</tr>
</tbody>
</table>

Means of positive decisions for items per condition (incl. SE)
Results

Experiencer verbs significantly increase likelihood of yes-decisions

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>Estim.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Int.)</td>
<td>-2.9338</td>
<td>0.0004</td>
</tr>
<tr>
<td>ASPECT=gen</td>
<td>0.5656</td>
<td>0.068</td>
</tr>
<tr>
<td>VERBTYPE=exp</td>
<td>1.2118</td>
<td>0.0001***</td>
</tr>
</tbody>
</table>

grammaticality~verb type+aspect+(1|subject)+(1|item)
Results

Control item rates show that target item structure is unproblematic

• Type 1: backward referential (proper name) (40 obs)
  \(\text{Heute haben die Kollegen seiner} \, Abteilung \text{ Robert} \, \text{besucht.}\)
  ‘Today, the colleagues of his department visited Robert.’

• Type 2: forward passive (Q-Subject) (40 obs)
  \(\text{Heute wurde jeder} \, \text{von dem Leiter seiner} \, \text{Abteilung besucht.}\)
  ‘Today, everyone has been visited by the manager of his department.’
Conclusion

• H1: Higher acceptability rates for generic structures, but no solid evidence for gen/opaque contexts licensing backward „binding“ (illusions)
  ➤ effect narrowly missed p<.05
  ➤ depends on E-type reading of the Q-Binder - individual differences!

• H2: EO structures (with SM subjects) seem to license backward binding compared to agentive structures.
  ➤ evidence for psych effect
  ➤ 34% positive decision for [exp, par]: weak acceptance rate for backward binding (vs. 85% backward coreference & forward binding [exp, par])
  ➤ WCO tolerance based on other properties than designated argument structure of EO verbs

Backward Binding of EO verbs are effects in the domain of non-wellformedness
Outlook

Pre-study reveals solid methodological base for follow-up studies

• Test other **verb types**:  
  1. Is BB a peripheral Psych effect? (see assumptions about causatives)  
  2. Some causatives also exhibit varying theta structures  

  **von vs. über**: Causer vs. Subject Matter  
  **von vs. durch**: Causer vs. Source  

  + Test different subject types for EXP (subject matter hypothesis)  

  „…that backward binding is licensed by the causative nature of the construction rather than its psych properties.“ (Landau 2010)

• Test **datives**: argued to show much stronger effects (evidence for word order psych effects in German; corpus study Bader and Häussler 2010b/forced choice study Temme & Verhoeven (subm))  
  36% y for EXP_{ACC} in particular contexts
Outlook

• Test different languages

• Test type of Q and of anaphor-NP to contribute research about binding configurations for locally bound possessives, binding illusions and topicality potential of Qs

• Test type of verbs under aspect-driven classification (no direkt link between SM-subject licensing and potential agentivity)

There’s still a lot to be done!

Thank you!
Bader & Häussler 2010. Toward a model of grammaticality judgments.
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- - 2001. Experiencing derivations
Temme & Verhoeven. revised. Verb class, case, and order: A cross-linguistic experiment.