Preliminary work on the experimental study of

Backward Binding as Psych effect – A binding illusion?

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1 Introduction

Backward binding (henceforth BB) is argued to be one of many special properties exhibited by psychological predicates or more specifically object-experiencer (EO) verbs. Based on Binding Principle A, which states that true syntactic binding requires c-command, structures are not expected to allow non-derived subject anaphors. Psych verbs, however, seem to license such structures under certain conditions compared to canonical transitive action verbs. Compare the structures in (1) and (1).

(1) a. His$_i$ health worried every patient$_i$.

   b. *His$_i$ doctor visited every patient$_i$. (Reinhart 2001)

BB as a psych effect is discussed in theoretical literature such as Pesetsky 1987, 1995; Belletti & Rizzi 1988; Brochias 1997; Cançado & Franchi 1999; Reinhart 2001; Platzack 2009, and Landau 2010, among others. Most researchers derive BB effects under preservation of binding principle A, whether it is based on syntactic (c-command) or lexical-semantic relations (θ-command).

In consideration of the general existence of psych effects, the special binding properties of EO verbs are not unexpected. They seem to be one of many effects of the special syntax and semantics of these predicates. In order to explain how
unexpected linking leads to unexpected grammar, researchers frequently argue that experiencer objects are non-canonical objects. As to the BB data, this means that experiencers are technically underlying subjects that can serve as an antecedent at a pre-derivational level (Belletti & Rizzi 1988). Another point of view is that experiencers represent very prominent participants. Compared to canonical objects, they are necessarily animate and fully involved in the relevant situation. Assumptions on binding based on prominence hierarchies rather than structural relations enable object antecedents as long as they are more prominent than the bound subject anaphor, e.g., in Lee (2002).

By means of psycholinguistic studies and corpus evidence, some psych effects have already been confirmed, e.g. for psych effects on word order see the corpus studies of Bader & Häussler (2010) and Verhoeven (revised); the production studies of Lamers (2012) and Verhoeven (2014); Temme & Verhoeven (subm.) for cross-linguistic evidence based on judgments. But as far as is known for BB as a psych effect, there are no experimental investigations; although there are some experimental findings regarding syntactic binding and coreference in general (Hirschberg & Ward 1991, Gordon & Hendrick 1997, Carminati et al. 2002, Goldwater & Runner 2006).

Based on observations associated with weak crossover (WCO) data in Fox & Sauerland (1996) we will discuss the feasibility of the observation that BB configurations in fact provide a binding illusion. As a consequence, the grammaticality of BB structures does not arise from a special verb type being present, but rather relies on the possible generic interpretation of the relevant structure. According to this, BB structures under true binding configurations should be ungrammatical. For a proper analysis of BB effects, true binding configurations should be taken into account to constitute the basic material for empirical testing.
The alternative analysis of BB data does not necessarily indicate that there is no difference between verb class and the interpretation of their nominal relations at all. For example, the potential prominence of the non-canonical experiencer objects may be stronger compared to other object types, therefore supporting coreferential interpretations of the structures, which would not occur with non-experiencers.

In the following, we present a preliminary discussion about the experimental investigation of both types of nominal relations, namely binding and coreference. Both are able to constitute the underlying concept for BB data evaluations seen in the previous literature. Before we turn to the details of our methodological options, we specify the idea of BB as a binding illusion triggered by the interplay of universal quantification and event quantification.

2 Backward Binding as A Binding Illusion

According to a well-known fact with respect to pronominal binding, related nominals can be analyzed as being coindexed without true semantic binding. In this case, they end up with a coreferential interpretation and do not require a c-command relation. A bound variable interpretation of pronouns requires coindexation to (inherently non-referring) quantifiers in order to guarantee an underlying binding configuration and covariation between binder and bindee. Compare (2) and (2).

\[
(2) \begin{align*}
& \text{a. His children visited the patient.} & \text{coreference, no c-command} \\
& \text{b. ??His children visited every patient.} & \text{variable binding, c-command}
\end{align*}
\]

The violation of the c-command requirement in the bound variable configuration in (2) leads to WCO effects\(^1\), whereas in ((2) the coreferential interpretation does not

\(^1\) The WCO diagnosis is based on the theoretical assumption of Quantifier Raising at LF. Note that this characterization is worthy of discussion (cf. Postal 1993). Compare the relevant examples with subject anaphors (i) with a standard example of WCO (ii).

\[
\begin{align*}
(i) & \quad \text{His mother likes every man.} \\
(ii) & \quad \text{His mother likes everything.}
\end{align*}
\]
require c-command in order to be interpreted. Thus, evidence for exceptional ("backward") binding with certain verb types is only valid under pronominal variable binding such as in (2). WCO effects are theoretically predicted for object antecedents binding subject anaphors. However, there seem to be grammatical versions of this configuration. Compare the structures (3) and (3) below. It becomes apparent that the WCO effect disappears under generic readings of one and the same structure. Apparently, the bound variable interpretation of the pronoun is available.

(3) a. ??Last year, her, thesis year was the hardest for every student.
    b. Her, thesis year is the hardest for every student.

According to Fox & Sauerland (1996, henceforth F&S), the (implicit) generic operator in (3) is responsible for inducing a binding illusion. They primarily analyze scope (ambiguity) illusions of existential and universal quantifiers in generic statements. The structure in (4), for example, is a double object construction in which universal quantifiers seem to have unexpected wide scope.

(4) a. Yesterday, I gave [a tourist][every leaflet]. \( (\exists > \forall, \forall > \exists) \)
    b. In general, I give [a tourist][every leaflet]. \( (\exists > \forall, \forall > \exists) \)

In the time-bound version in (4), quantifier scope is rigid. The universal quantifier cannot take scope over the existential quantifier. The fact that generic statements seemingly allow reverse scope is due to an illusion induced by the generic operator: it builds portions of the world, in which there is one tourist in each of the single

(ii) \[Which man\] did his mother like t.
In (ii) we find an overt movement across the possessive nominal, whereas in (i) it is assumed to be covert. However, in both structures, the non-derived version does not offer a c-command relation between the Q/Wh-binder and the bindee. But even without the WCO characterization of the structures in (i), true semantic binding is ruled out since the c-command requirement is not fulfilled.
situations who gets one/any leaflet. Since in (4) there is only one leaflet in every situation, the truth condition of the universal quantifier is trivially fulfilled.\(^2\)

We will now show briefly how the analysis is applied to the WCO data in (3). According the F&S analysis, the generic operator quantifies over situations and portions the world into relevant singular situations, in which there is one individual in each of the situations that trivially fulfills the requirement that every individual has the predicated property.

(5) For every relevant situation s, (the student in s)\(_{her’s}\) thesis year is the hardest for every student.

The paraphrase in (5) illustrates that F&S analyze the subject pronoun as an E-type pronoun, a definite expression of which the interpretation in this type of structure depends on the generic operator. Thus, the basic relation between both nominals is not a question of semantic binding between a universal quantifier (‘every student’) and the possessive pronoun (‘her (thesis year)’).

Episodic structures on the other hand have no generic operator that creates the conditions under which the binding illusions occur. There is no potential for E-type interpretations of the pronoun (coindexed but not semantically bound) and binding is excluded since the c-command requirement for semantic binding is not fulfilled, just as the Binding Theory predicts.

We have seen that the interaction of nominal and event quantification (also referred to as D- and A-quantification) leads to unexpected effects. The presence of a

\(^2\) In case the readings are not accessible, we provide two more examples for scope illusions from F&S. See (iii) and (iv).

(iii) In general, [a guide]\(\exists\) ensures that [every tour to the Louvre]\(\forall\) is fun. (\(\exists>\forall, \forall>\exists\))

(iv) At linguistic conferences, [a grad student]\(\exists\) checks that [everybody]\(\forall\) has a badge. (\(\exists>\forall, \forall>\exists\))
generic operator seemingly licenses otherwise restricted domains for quantifiers and creates variable binding illusions under c-command violations. We can find further interesting “genericity effects”\(^3\) in clitic-doubling environments. As pointed out in Alexopoulou (2008), Greek left dislocated universal quantifiers cannot be doubled. Compare (6). This restriction on clitic left dislocation (CLLD) seems to disappear under generic interpretations (6).

(6) a. To Yani *(ton) idha sto PARTY.

the Yani-acc him saw-1sg at-the party

‘Yanis I met at the Party.’ (Alexopoulou 2008:(1))

b. KANENA fititi dhen *(ton) idha sto parti.

no-acc student-acc not him saw-1sg at-the party

‘No student did I see at the party.’ (Alexopoulou 2008:(2))

c. KANENA dhen ton apoliun etsi.

no one-acc not him fire-3pl like-this

‘No one do you fire like this.’ (Alexopoulou 2008:(8))

A similar effect arises in Romance clitic languages, such as Italian, Spanish or Romanian. Arregi (2003) confirms that in Spanish, too, some quantifiers are excluded in CLLD, an observation that supports his analysis of Spanish CLLD as contrastive topicalization. While definite NPs (7) and quantified expressions (7) can be dislocated, a structure with a fronted (unrestricted) quantifier like *something* is ungrammatical (7).

(7) a. Estos libros, Juan los leyó ayer.

these books Juan them read yesterday

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\(^3\) Note that it is not only genericity that interacts with D-quantification. There are other temporal, aspectual or modal (TAM-) operators that support these effects.
‘These books, Juan read yesterday.’

b. Algunos libros, Juan los leyó ayer.

some books Juan them read yesterday

‘Some books, Juan read yesterday.’

c. *Algo, Juan lo leyó ayer.

something Juan it read yesterday

‘Something, Juan read yesterday.’

Furthermore, Gutiérrez-Rexach (2000)\(^4\) incorporates the illusionary effect of the interaction of quantifier doubling and aspect into the analysis of Spanish CLLD data. In general, it is assumed that the only possible reading of doubled NPs in Spanish is specific, but under generic reading this effect seems to disappear. The structure in (8) contains the doubled quantifier \((lo) \ uno\), which may have non-specific reading, compared to the quantifier in the corresponding perfect and future structures in (8) and (8) (Gutiérrez-Rexach 2000:352 with ref. to Franco 1993:86).

\((8)\) a. Juan lo invitaba a uno y luego se olvidaba.

Juan him invited-IMPERF. a one and later SE forgot-imperf.

‘Juan used to invite somebody and then forget all about it.’ (Franco 1993:86) (specific, non-specific)

b. Juan lo invite a uno y luego se olvido.

Juan him invited-PERF. a one and later SE forgot-perf.

‘Juan invited somebody and then forgot about it.’ (specific) (G.-Rexach 1999:354)

c. Juan lo invitara a uno y luego se olvidara.

\(^4\) He looks into a non-‘leísta’ Castillian variety (dialect of Madrid).
Juan him will-invite a one and later SE will-forget

'Juan will invite somebody and then he will forget about it.' (specific)

G.-Rexach’s analysis is close to F&S’s idea about the influence of event quantification on nominal quantification and he makes detailed assumptions about the type of quantifiers involved.5 As we will see below, the type of quantifier is indeed relevant for true binding conditions and needs to be handled with caution. Moreover, although the restrictions on quantifiers hold cross-linguistically, the type of the quantifiers showing these effects may vary between languages.

The cross-linguistic data indicate that some quantifiers apparently have properties that disable them to serve as topics. It is reasonable to assume that the same properties are responsible for their requirements with respect to binding, which means, consequently, that their cross-linguistic interactive behavior with aspectual variation should also be considered for the investigation of true binding effects.

As we have seen on the basis of WCO data before, generic readings change judgments about violating binding configurations. This may also be relevant for some of the BB data we discuss with respect to psych verbs, i.e. that the source of the BB effects may be related to aspectual factors rather than to the grammar of a special verb type. Let us revisit the data from Reinhart (2001) in (9) and evaluate their potential with respect to this hypothesis.

(9) a. His health worried every patient.

5 G.-Rexach refers to the classification of quantifiers (or NPs in general) as Principal Filters (strong quantifiers) or non-Filters (weak quantifiers) (cf. Barwise & Cooper 1981), on which Spanish doubling seems to depend. This analysis, however, is not shared by Dočekal & Kalluli (2012) and their observations in Albanian CLLD, since some weak quantifiers can also be doubled. They refer to the differing topical status of quantifiers and analyze them via witness sets (based on ideas in Endriss 2009, Szabolcsi 2010).

Strong quantifiers are: the, both, all, every, each, most, neither; weak quantifiers are: a, some, one, two, many, few, no, among others. The observations indicate that there is a language-specific perspective required in order to define certain Q-types as potentially referential/topical.
b. His solution appealed to every student.

c. *His doctor visited every patient.

d. ??His doctor's letter worried every patient. (Reinhart 2001)

Technically, there are some typical generic features missing in these structures. First, there is no explicit generic operator (Q-Adverb) such as in general or always. However, generic operators can also be introduced implicitly. Second, the structures in (9) are presented in Past tense, which generally prevents a strong generic understanding. Although simple present is the most typical tense used for generics\(^6\) (10), they can also be built with Past (10) or Future tense (10).

\[(10)a.\] John plays football.

\[b.\] John played football (his whole life).

\[c.\] John will play football (as long as he lives).

Hence, under Past tense, we can easily generalize a statement, e.g. by inducing a relevant (“sometime”- or “before”-like) reading. It simply leads to a generalization of the statement within a given time frame.

\[(11)a.\] His grades annoyed every student.

\[b.\] His grades annoyed every student, before.

\[c.\] ??Yesterday, his grades annoyed every student.

Despite the temporal anchoring, the structure in (11) is still ambiguous between a generic (11) and a non-generic reading (11). Thus, tense does not ensure an episodic reading. As previous observations indicate, the WCO effect leads to lower acceptability of the latter.

\(^6\) For now, we do not differentiate generics and habituals.
As for the ambiguous structures without any explicit operator or time frame, it is reasonable to assume that the reader, confronted with a structure such as in (11) above, would somehow “repair” the WCO effect with the help of a generic operator in order to obtain the most useful interpretation. Intuitively, the source of the tendency to “repair” WCO is the interpretation of the direct object universal. A statement about every existing individual or entity (with either positive every/each or negative no) has strong truth conditions. Compared to episodic interpretations, the generic operator leads to the effect that the universal quantification now tolerates exceptions (Carlson 1977/1989, Krifka et al. 1995). The effect is exemplified in (12) and (13).

(12)a. In general, every boy is brave.
   b. => John is not brave.

(13)a. At the party yesterday, every boy was brave.
   b. =>/\ John was not brave.

Even with the universal requirements of every, (12) can follow from (12), but not in the episodic version, cf. (13) and (13).

Let us now come back to the relevant BB data associated with experiencer predicates. The contrasting data from Reinhart (2001) repeated in (14) indicate that, compared to agentive verbs, experiencer-object verbs license BB. As already mentioned above, this is attributed to either the underlying syntactic or thematic relations of experiencer-object structures.

(14)a. His_i health worried_{EO} every patient_i.
   b. *His_i doctor visited_{AG} every patient_i.

However, in the example in (14) it is not controlled whether the relevant structure is to be understood as a generic statement or not. This is important for at least two
reasons. As we have discussed above, according to the F&S’s (1996) analysis for universal scope under generic reading, which we take into consideration here, the generic version of the structures would not represent true variable binding at all. But moreover, we may have varying tendencies to initially assume a generic operator for different verb or event types, e.g., stative vs. non-stative events. Chierchia (1995) for example proposes to analyze all individual level predicates as inherent generics. Although it is mainly the class of experiencer-subject verbs that is classified according to stage- and individual-level properties, there are some EO verbs which can encode permanent states. Languages differ with respect to the existence of a class of purely stative EO verbs, but many verbs of the class of eventive psych verbs have the potential to be used without inducing a change of state. For them, Glasbey (2006) assumes that they have the special effect to license both internal (inherent) and external (derived) generification.

The previous discussion shows that the BB psych structures may not have been judged under equal conditions. It follows, then, that the judgments are not based on binding properties of experiential and non-experiential structures. The two possible interpretations of (14) are paraphrased in (15).

(15)a. From time to time, his health worried every patient.

b. Yesterday, his health worried every patient.

In summary, we are confronted with the question whether (at least parts of) the basic BB data is either rated or even based on interactions with (event-)quantificational properties of the relevant structures. It is possible that the configurations reveal binding illusions rather than violations of binding principles caused by a certain verb type.
3 Two ways to go: Coreference and Binding

We have seen that there is a valid reason to assume that the effect of grammaticality and ungrammaticality of BB structures is based on principles located higher than thematic or structural principles and that it runs parallel to WCO data discussed independently from BB. Nevertheless, since experiencers are sometimes argued to be more referential or topical than canonical patient or theme objects, we can still expect a verb type effect on the basis of coreference.

But the effect based on true binding is also not generally precluded. It is possible that experiencer-object structures are more tolerant with respect to crossover prohibitions than other structures. Such an effect would rather be based on differing base structures between the verb classes or event types than interpretational properties, since it requires proper c-command.

In the following, we discuss the consequences of the discussion above with respect to the control of empirical data and establish possible ways for experimental hypotheses testing. The main goal of the studies is to answer the question whether we find BB effects with regard to different verb types at all. Evidently, the test structures need to be controlled for their underlying nominal relations. We will now discuss the two experimental options and their factors in more detail.

3.1 Genericity and Referentiality

Regardless of the theoretical prediction of the general lack of WCO effects in generic structures, we can investigate the binding properties of different types of verbs in order to test whether certain verbs license BB nonetheless. In order to do that, we need to consider a binding configuration where coreference is maximally excluded, but with true attention to the semantic factors.
But what is a proper binding configuration? It depends on several factors, though we will here assume the following as the most important: genericity and referentiality\(^7\). As outlined in the last section, the WCO effect appears in non-generic structures, whereas generic readings are strongly accessible for unbound interpretations of pronouns. Thus, it is important to control for these structure types, e.g. with the help of explicit markers for genericity and non-genericity and their preferred verbal temporal markers, exemplified in (16).

\[(16)a. \text{Yesterday, her health worried Lucie.}\]
\[b. \text{In general, her health worries Lucie.}\]

The discussion in the last section also revealed that cross-linguistic restrictions for quantifiers do not apply to the entire class of quantifiers, which furthermore indicates that true binding is required with a small group of quantifiers only, i.e. the least referential ones. We therefore need a more detailed classification of quantifiers. Above all, we can distinguish quantifiers and quantified expressions – also called q(uantificational)- and r(erefential)-quantifiers, respectively (based on Fordor & Sag (1982)’s classification of indefinites). The relevant difference can be derived from the presence of an explicit restrictor, which comes along with quantified expressions such as every student in contrast to bare quantifiers like everybody or nobody. The noun in quantified NPs (QNPs) already introduces a potential discourse referent (Burkhardt 2005). Based on Reinhart’s (1982) link between the potential referentiality and topicality of a nominal, many authors argue that quantifier phrases can also be more or less topical (e.g., Endriss 2009 for German, Szabolcsi 2010 for Hungarian). Although QNPs are not necessarily interpreted as specific, they introduce individuals defining a certain group (‘every student’= everybody in the group of students I refer

\(^7\text{Referentiality is used here to describe a potential quality of a nominal to be referential; it is not its actual reference.}\)
to) and therefore have higher referential potential, i.e. they have a higher potential to be linked to the context. Thus, explicit restriction supports a coreferential relation between the pronominal subject NP and the quantified object in BB structures.

To sum up, a proper binding configuration requires a time bound (episodic) event and the least referential binder, i.e. universal quantifier without an explicit restrictor, in order to exclude the any tendency of coreferralility in the relevant BB structures.

In case that BB under proper control of the binding configuration is ungrammatical in general, the intuitional data from the literature can still be explained by potential “backward coreference” effects occurring with certain verb types. In principle, the structures supporting coreferential interpretations have exactly opposite demands compared to binding configurations. They ideally contain referential nominals such as proper names.

The previous remarks were related to binding structures in general. We now turn to the details of the factors which are argued to be relevant for BB as a psych effect.

3.2 Verb and Subject types

First and foremost, the assumption of BB psych effects is based on the special syntax of EO verbs compared to canonical transitives. It is generally agreed upon that agentive structures prohibit backward binding, whereas causatives are controversial (see Pesetsky 1995).

For the investigation of psych effects we need to take a closer look at EO verbs in general. It has already been shown that only a subclass of these verbs licenses special structural behavior. The class of EO structures that is known to show clear effects with respect to BB is the one exhibiting Subject Matter subjects. According to
Reinhart (2001), Subject Matter (SM) subjects are derived as internal arguments. Thus, at a stage before derivation, they are in a proper configuration in order to be c-commanded by the object binder (cf. Belletti & Rizzi’s 1988 account on theme subjects; Class III type verbs). Causer (C) subjects, on the other hand, are derived as external arguments and lack c-command at any stage of the derivation of BB structures. It follows from this account that we should expect BB effects, which are truly based on binding relations and differing argument structures. Note that the availability of SM subjects interacts with stativity, a property that we have identified as relevant for the aspectual (i.e. generic) tendencies of EO structures.

However, there are some problems that come along with the C/SM-distinction. Some verbs license both C and SM subjects, but the distinction between them is quite vague. It is argued that there is a logical relation between EO-structures and their corresponding subject-experiencer alternatives (cf. Pesetsky 1995, adopted in Reinhart 2001). Compare (17) and (17).

(17) a. John worried about the television set.

Note that the object role introduced with about in (17) can only be analyzed as subject matter. The relevant relation between the two structures is that (17b) does not necessarily entail (17a). It is possible that the television set triggers the relevant feeling, but the participant is actually worrying about something else. Pesetsky illustrates this effect with the following context example: “John could be a detective – seeing the television set in a suspect’s living room sets off a chain of worries; e.g. What could a completely blind man be doing with a color television? (…). John is not worried about the set – it provokes worries about other matters.” (p. 57). Note that
Reinhart (2001) illustrates more specifically that the subjects of most EO-structures are ambiguous between the C and SM reading and thus not all of them are interpreted as Causers.

This kind of relation is said to confirm distinct roles for one type of argument, but the example principally shows that the causal or non-causal interpretation requires a strongly manipulated context. However, independent from surrounding context, there are lexical subject types which are more likely to be interpreted one or the other way. As Reinhart (2001) points out, the subject in (18) is an SM-subject, whereas the subject in (18) most likely simply causes the emotion rather than being the subject matter of it.

(18)a. Her health\textsubscript{SM} worried Lucie.

b. The doctor’s letter\textsubscript{C} worried Lucie.

Thus, it depends on contextual information whether the subject is interpreted as subject matter or cause of the expressed emotion. Contextual information can be provided (sentence) externally and/or internally. The lexical meaning of the arguments can internally lead to interpretational tendencies, such as in (18). According to Reinhart (2002), the interpretation of an ambiguous subject depends on external information, e.g. the expression of an alternative causer. The examples in (19) and (20) illustrate the influence of the embedding context. They show the primary interpretation of the subjects in (19) and (20) and additionally, in (19) and (20), we attempt to construct a contextual environment that changes the out-of-the-blue intuitions respectively.

(19)a. The doctor’s letter worried Lucie.

b. She expected some important letters on Monday. Some arrived on
c. The fact that the doctor’s letter has not arrived on time caused Lucie to worry about the letter, i.e. its arrival.

(20) a. Her, health\textsubscript{SM} worried Lucie. 
   b. [She, wants to take a vacation]\textsubscript{SM}, but [her, health]\textsubscript{C} worried Lucie. 
   c. The fact that Lucie suffers poor health made her worry about her vacation plans.

Based on the effects of contextual manipulation, we would expect that if certain subjects in the EO version have predominant causer readings, they should be incompatible with previously introduced or specified causers. However, as far as is known, there are no unambiguous formulations or tests provided in the literature by which the distinct roles can be identified.

The distinction between C and SM subject roles is crucial for the investigation of BB effects, since it follows from the different subject types that the corresponding BB structures are also rated differently, cf. (21).

(21) a. His, health\textsubscript{SM} worried every patient. 
   b. ??His, doctor’s letter\textsubscript{C} worried every patient. (Reinhart 2001:378)

Due to the overall context-dependency, the control of subject types in the sense of Pesetsky’s and Reinhart’s approach is an additional challenge to the experimental investigation of BB effects. Moreover, it is a problematic postulation of distinct roles, especially due to the lack of external evidence for the C and SM role (for a more detailed discussion, see for instance Arad 1996 or Kutscher 2009).

The choice of thematic roles and their relation is partly based on absolute properties such as animacy. This can be shown by several interactions between
structure type and animacy. First, agentive verbs are generally restricted to animate subjects (for some exceptions, see the discussion in Fauconnier 2011), since, from a conceptual perspective, volitional actions can only be induced by humans. Second, C and SM subjects show tendencies with respect to animacy, i.e. that animate causers as well as inanimate subject matters are the more plausible options. Moreover, animate subjects potentially trigger agentive readings in experiencer causatives and therefore generate structures that lose their psych reading (22).

(22)a. \text{Peter}_{AG/SM} shocked me.

b. Peter’s behavior \text{C/SM} shocked me.

If there are any relevant differences to be found between verb types under true binding, we can presume that some verbs seem to violate binding principles. Given the amount and distribution of effects suggesting verb types to be special and the strict observance of proper binding configurations for pronominal anaphors, an empirically supported difference in acceptability of BB across verb types suggests different underlying structures.

As mentioned above, differences between verb types which can be found under coreferential interpretations can rather be attributed to the pragmatic nature of EO vs. non-experiential structures, i.e., the experiencer argument is more prominent than non-experiencer objects. However, it provides no evidence for assumptions regarding the syntactic structure of the type of verbs. Note that we must not overlook that the theoretical advantage of a coreferentiality approach is the syntactic homogeneity of all types of structures.
4 Test structures

In the last section, we discussed the conditions for the relevant BB structures and hypothesized how potential results have an effect on the theory of BB and its underlying factors. In the following we explore how to implement these conditions in order to obtain the relevant structures for controlled studies. A further discussion will be about the type of method we use for the investigation of the different backward dependencies.

The two main factors for a proper binding/coreferential relation we consider for our studies are genericity and referentiality. Due to their ambiguous and scalar nature, both dimensions are difficult to control. We implement binding (and coreference) configurations which provide the strongest possible base for experimental purposes under the present conditions.

4.1 Genericity and Referentiality

The most important rule for creating proper binding configurations is the avoidance of strong genericity and referentiality. In order to reinforce the tendency of either generic or non-generic readings, the manipulation of tense and the use of explicit generic or episodic operators or Q-adverbs is essential.

In order to avoid referentiality potential, we consider universal quantifiers without explicit restrictors, which may support contextual linking. Typical universal quantifiers are *every* or *no*. The relevant and least referential versions are *everybody* and *nobody*; *jeder* and *niemand* in German respectively.

In the case of coreference, there is no need to avoid genericity of the structures or referentiality of the arguments. One problem that comes along with coreference is the all in all context-dependency. Both dimensions as well as the type of subject and lexical material in general should be held consistent in order to get leveled material.
4.2 Verb and subject type

Since BB effects with causative verbs are arguable, we concentrate on the clear cases, namely EO verbs and agentive verbs. As already argued above, we must pay special attention to the type of inanimate EO subjects in order to get the proper binding or coreference relations.

The theoretical postulation of a distinct SM role requires further elaboration in order to consider it for experimental purposes. Due to inherently difficult conditions for controlling complex contexts in experimental frameworks, we refrain from embedding context as “manipulator” for primary subject interpretations. Instead, we concentrate on the primary morphological pattern of argument selection while paraphrasing EO structures as subject experiencer structures as a criterion to identify verbs that predominantly select SM subjects. As already stated by Pesetsky (1995), the ‘about’-phrase in (23) is solely linked to the SM role and cannot be interpreted as the causer of the emotion.

(23) John is worried about [the television set]_SM.

The association of prepositions with specific thematic roles may indeed give us some evidence for primary subject interpretation. We focus on the German causative prepositions von (‘by’) and über (‘about’) complements for EO verbs. If we accept über to indicate an SM role and von a simple C (or agent) role, we can identify the primary concepts of the verbs with the help of the relevant paraphrases. This test reveals different groups of EO verbs. There is a class that primarily licenses von-paraphrases (24), while others rather license über-complements (24). Still others license both of them more equally (24).

(24) a. angewidert von/*über (etwas sein), ermüdet von/*über, begeistert
von/*/über, provoziert von/*/über, fasziniert von/*/über, verunsichert von/*/über, genervt von/*/über, beeindruckt von/*/über, motiviert von/*/über, gelangweilt von/*/über


We argue that verbs such as in (24a), i.e. those which do not (or marginally) allow über-paraphrases in their stative use, do not license SM subjects at all. Thus, in order to select the relevant class of verbs for the test material, we restrict the class of EO verbs to verbs that license about X as a paraphrase for their subject. However, as Reinhart (2001) points out, some of the EO structures are ambiguous with respect to their subject interpretation. The sentence internal context, i.e. the lexical meaning of the subject argument, can manipulate the initial interpretation of a structure. Recall that the subject in Her health worried Lucie is most likely the subject matter of Lucie’s feelings. Thus, we also avoid verbs with a solid tendency to choose von-paraphrases in order to maximally reduce the likelihood for causative structures, which would not reveal strong BB effects. The relevant verbs that now serve as a basis for our material are repeated in (25).

(25)erstaunen, erfreuen, betrüben, beunruhigen, empören, bestürzen, entsetzen, verärgern, schockieren, amüsieren, verwundern
Note that it is not argued here that every difference between the types of arguments indicates distinct roles, i.e. matters somehow syntactically. However, we chose to control the type of subjects in order to consider possible syntactic differences.

An additional result from the discussion in Section 3 is that for EO verbs, inanimate subjects should be preferred to animate subjects in order to compare the unmarked structures for each verb class – that is, animate subjects for agentive verbs and inanimate subjects for EO verbs, as illustrated in (26). Aside from the support of SM subject interpretations we get from inanimate EO subjects, it also prevents potential effects of plausibility, since no class needs to deal with its unmarked version. Furthermore, we avoid agentivity to arise in ambiguous EO structures.

(26)a. AG: NOM[+anim] ACC[+anim]
   b. EO: NOM[-anim] ACC[+anim]

The assumption that animacy can also be relevant for binding effects is problematic for the structure-specific decisions we made so far, since we now compare binding of animate vs. inanimate anaphors. One possible adjustment is to presuppose the existence of an animate source for verbal EO concepts with the help of complex anaphors with embedded explicit animate NPs such as ‘his mother’s opinion’ for inanimate and ‘his mother’s boyfriends’ for animate subjects.

However, evidence for animacy restrictions in theoretical literature are mainly based on data from long-distance reflexives and more or less related to the salience of antecedents. As far as is known, there is no reason to assume that animacy is a relevant factor that divides (27) from (27).

(27)a. Hisᵃ plans appeal to himᵃ.
   b. His colleaguesᵃ appeal to himᵃ.
However, we take care of possible remaining differences that might affect syntax by considering EO control structures with animate subjects.

4.3 Methods

The question of grammaticality and ungrammaticality, which we address in the context of binding configurations, is consistent with binary decision tasks, i.e., yes/no-grammaticality judgments. We will evaluate the frequencies of the categorical judgments acceptable and unacceptable. Moreover, the co-indexed relation of subject and object nominal is predetermined (via instruction and color coding).

A similar method in order to investigate coreferentiality is the decision about referential status of the pronoun. The participants decide whether the relevant possessive pronominal is “backward” coreferential with the object of the sentence or whether they refer to a nominal outside the clause. Thus, we count the decisions for the subject pronoun exhibiting coreference (index $i$ in (28)) or disjoint reference (index $j$ in (28)) with respect to the object.

(28) His$_{i\neq j}$ problems annoy [the man]. ($i \neq j$)

For our purposes, we will refer to the two values as internal and external reference, whereas external reference means reference with an individual that is not identical to the sentence object (here: ‘the man’).

The task is formulated in terms of the question Does the marked (=color-coded) word (=pronoun) refer to “X” (=the individual expressed by the object) or to someone else?. The participant confirms his or her answer by marking one of the alternatives X or someone else.

4.4 Examples

In (29) below, we provide an example for every relevant type of structure.
(29) a. [Gestern haben die Eltern seiner Freunde jeden-ref begrüßt-exp. ]_gen
   b. [Normalerweise begrüßen-exp die Eltern seiner Freunde jeden-ref. ]_gen
   c. [Gestern haben die Eltern seiner Freunde Robert+ref begrüßt-exp. ]_gen
   d. [Normalerweise begrüßen-exp die Eltern seiner Freunde Robert+ref. ]_gen
   e. [Gestern haben die Aussagen seiner Freunde jeden-ref beunruhigt+exp- ]_gen
   f. [Normalerweise beunruhigen+exp die Aussagen seiner Freunde jeden-ref. ]_gen
   g. [Gestern haben die Aussagen seiner Freunde Robert+ref beunruhigt+exp- ]_gen
   h. [Normalerweise beunruhigen+exp die Aussagen seiner Freunde Robert+ref. ]_gen

5 Summary

So far, we revealed some weak spots of the theory of BB as psych or verb type effect and discussed a possible alternative account. The main consequence is that the emergence of purely coreferential relations of nominals is not necessarily blocked under illusory quantifier binding. In order to examine proper binding configurations, we are supposed to consider the factors in more detail. Finally, we have shown how to implement the relevant factors (potential) referentiality and genericity and presented structures which are controlled with respect to it. Further data and pre study results will follow.

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