

BINDING IN PICTURE NPs REVISITED:
EVIDENCE FOR A SEMANTIC PRINCIPLE OF EXTENDED ARGUMENT-HOOD

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ABSTRACT – This paper investigates the distribution of pronouns and anaphors in picture NPs (cf. Keller & Asudeh 2001; Runner et al. 2003). I discuss the predictions of current LFG and HSPG binding theories, none of which make the right predictions. I present new results showing that the acceptability of pronouns is influenced by AGENTIVITY. That is, pronouns are less acceptable if their binder bears the agent-role of the predicate that also assigns an argument-role to the pronoun. This result is discussed with regard to the well-known constraints on pronoun against binding a co-argument. In light of recent findings by Kaiser et al. (2004a,b), the result raises the question whether AGENTIVITY of the binder is a factor in binding beyond the domain of picture NPs. On the methodological side, the current study shows that acceptability judgments – if properly elicited under well-controlled conditions – can provide meaningful linguistic insights.

I Introduction*

Early generative approaches to binding theory (cf. Jackendoff 1972) predicted strict complementarity of pronouns (e.g. *him*, *our*) and anaphors (e.g. *himself*, *ourselves*). For example, Chomsky (1981:188) defined the well-known principle A and principle B (I am not concerned with principle C here) as follows:

Principle A – An anaphor must be bound within its Governing Category.

Principle B – A pronoun must be free within its Governing Category.

Without going into detail as to the definition of Governing Category, it is clear that Chomsky’s account predicts anaphors and pronouns to be in strictly complementary distribution (for a recent account that predicts complementarity, see Kiparsky 2002). However, Huang (1983) provides examples like (1a,b) to show that pronouns (here *their*) and anaphors (here *each other*) do not have to be in complementary distribution.

- (1) a. They_i saw [each other_i’s friends]
b. They_i saw [their_i friends]

This lead Chomsky (1986) to revise principle A and B to incorporate the asymmetry in the relevant domains for pronouns and anaphors. The intuition behind Chomsky’s revision is that, for the anaphor in (1a), it is the whole sentence that forms its binding domain (i.e. the “Complete Functional Complex”), whereas, for the pronoun in (1b), it is the NP *their friends* that forms the relevant domain.¹ In other words, the anaphor in (1a) has to be bound within the sentence (which it is) and the pronoun has to be free within the NP (which it is).

The idea to account for apparent cases of non-complementarity by means of asymmetries in the domain restrictions has also been incorporated into LFG binding theories (e.g. Bresnan 2001; Dalrymple 1993, 2001) although the implementation is slightly different in spirit.

* I would like to thank Paul Kiparsky for sharing his intuition with me that agentivity is a determining factor for the acceptability of pronouns in picture NPs. I am grateful for discussions with and feedback from, especially, Ash Asudeh, Elizabeth Coppock, Dan Jurafsky, David Oshima, Ivan Sag, and Joan Bresnan, as well as several members of the LFG04 audience. As always, none of the above mentioned researchers necessarily shares the views presented here and all remaining mistakes remain mine, mine, mine. Finally, I am extremely grateful to my sponsors for making it possible for me to attend the conference and to visit the beautiful country of New Zealand.

¹ For a complete discussion of the formal implementation of this intuition, I refer the reader to Chomsky (1986) or to a recent overview by Everaert (2003).

A different approach is taken by HPSG binding theories (e.g. Pollard & Sag 1992, 1994; Manning & Sag 1998; Asudeh 1998) and, independently, by Reinhart and Reuland (1993). The core of this alternative is the idea of *exemption* – an anaphor *only* has to be bound by a dominating coargument if there is such a coargument.

In this paper, I investigate binding in the empirical domain of picture NPs. Picture NPs have received a lot of attention in the literature on binding because of the violations of core binding constraints (like Principle A and B) they seem to facilitate. More recently, empirical studies have also shown that picture NPs seem to facilitate non-complementary distribution of pronouns and anaphors. For example, Keller & Asudeh (2001) and Runner et al. (2002) have shown (2a) and (2b) to be equally grammatical while (3a) and (3b) aren't. In (2a) and (3a), the subject of the sentence binds a *pronoun*. In (2b) and (3b), the subject of the sentence binds an *anaphor*

Binding in picture NPs with a syntactic possessor

- (2) a. *John_i* finally saw Mary's picture of *him_i*.
b. *John_i* finally saw Mary's picture of *himself_i*.

Binding in picture NPs without a syntactic possessor

- (3) a. **John_i* finally painted a picture of *him_i*.
b. *John_i* finally painted a picture of *himself_i*.

The lack of a contrast between (2a) and (2b) is in conflict with accounts that predict strict complementarity of pronouns and anaphors (e.g. Chomsky 1981; Kiparsky 2002). But the examples in (2) and (3) are also problematic for any current state-of-the-art binding theory in LFG and HSPG, all of which do allow non-complementary distribution of pronouns and anaphors. Binding theories building on the notion of exemption (Pollard & Sag 1992, 1994; Reinhart & Reuland 1993; also Asudeh 1998; Manning & Sag 1998) wrongly predict (2b) to be ungrammatical and (3a) to be grammatical. Current LFG binding theories, which do not include a notion of exemption, (e.g. Bresnan 2001; Dalrymple 2001) make the right predictions for examples like (2a,b) and (3b), but they make the wrong predictions for examples like (3a).²

In this paper, I present new evidence from the study of binding in picture NPs. I show that *agentivity of the binder* is a determining factor for the acceptability of examples like (2) and (3). I propose that pronouns are ungrammatical in examples like (2a) and (3a) if the binder is interpreted as the agent/creator of the picture NP. The ungrammaticality of pronouns in such cases is then reduced to the fact that they would be bound by a co-argument. In other words, what matters for the grammaticality of a pronoun in examples like (2a) and (3a) is the semantic interpretation of the binder with respect to the picture NP's argument structure.

The remainder of this paper is organized as follows. Section II defines the empirical domain investigated in this paper and provides an overview of previous empirical studies, the employed methodology and the results. Section III summarizes the relevant predictions made by current binding theories in HSPG and LFG. Although the conclusions of the current paper pertain to principles that govern the distribution of pronouns, I will provide all necessary background for anaphors as well, since I take it to be impossible to understand the binding behavior of one kind of pronominal without understanding the other.³ Section IV discusses previously suggested refinements to current binding theories, especially the *Pronoun Distribution Principle* (Asudeh & Keller 2001) and sets the ground for the experimental hypotheses considered in this paper. Section V spells out the hypotheses, presents the experiment, and discusses its results. Finally, Section VI summarizes the conclusions.

² The reasoning behind the above-mentioned predictions will be provided in Section III.

³ Throughout this paper, I use the term pronominal to refer to pronouns and anaphors together.

II The empirical domain of picture NPs

Throughout this paper, I'll use the term picture NPs to refer to an NP that is (a) headed by a representational noun like *picture*, *book*, *painting*, etc., and (b) optionally contains the arguments of the head noun, as in, e.g., *a picture of John*, *Chomsky's book*, or *the film about Carl*. Although the study I present in Section V focuses on picture NPs with both possessors and *of*-PPs, as in *Andy Warhol's print of Marilyn Monroe* (cf. (2) and (3) above), the findings should generally extend to other picture NPs with arguments headed by case-marking prepositions, as in, e.g., *the story about Kasper Hauser*.

Due to their theoretical significance picture NPs have received a fair amount of attention in the empirically oriented literature on binding. Most relevant for the current discussion are two series of studies by Keller & Asudeh (2000, 2001; based on Keller 2000) and Runner and his colleagues (Runner 2000; Runner et al. 2002, 2003). Before I present their results, I briefly address some methodological issues.

Keller & Asudeh (2000, 2001) used an offline judgment task paradigm to elicit normalized acceptability ratings. Runner and his colleagues used a more complicated but also more sensitive online decision task paradigm. They used eye-tracking to determine which candidates in a visual context were considered as binders. In this paradigm, participants were looking at a board with pictures of discourse referents while listening to short, task-oriented monologues that referred to one or more of those referents. In addition to the board with pictures, several dolls depicting the same referents as those shown on the pictures were placed in front of participants. The monologues instructed participants to pick up a certain doll and to touch a certain picture with it. A minimal pair of example monologues is shown below:

- (4) a. Look at Joe. Have Ken touch Harry's picture of him.
b. Look at Joe. Have Ken touch Harry's picture of himself.

As shown above, the discourses contained an anaphor or pronoun. Runner and his colleagues tracked participants' eye-movements while they heard the pronominal to determine which of the discourse referents (depicted in the pictures) was taken to be the binder of – and therefore co-indexed with – that pronominal. This methodology enabled Runner et al. to tap directly into the resolution process without having any interference due to participants being asked for conscious judgments about the acceptability of sentences (for a critical review of the merits and limits of acceptability judgments, see Schütze 1996). Conveniently, Runner et al.'s results confirm the results of the much simpler offline judgment studies by Keller & Asudeh (2000, 2001). This argues that Keller & Asudeh's methodology is sufficiently sensitive and stable for investigations of binding in picture NPs. This is relevant to the current paper because the experiment presented below in Section V employs the same methodology as Keller & Asudeh's studies. Below, I therefore limit myself to summarizing Keller & Asudeh results.

Keller & Asudeh (2000, 2001) asked participants to rate each sentence with respect to a reference sentence (which was the same for all trials and participants). This procedure, called magnitude estimation (Stevens 1975), has been shown to produce reliable results for linguistic acceptability judgments (e.g. Bard et al. 1996; Cowart 1997) and WebExp (Keller et al. 1998), the software package used by Keller & Asudeh for their experiments, has successfully been employed in numerous linguistic studies.⁴ Sentences were presented in random order with minimal pairs never occurring adjacent to each other. To distract participants from the real purpose of the study, half of the stimuli were fillers.

⁴ See Keller 2000 for a detailed discussion of magnitude estimation, the use of acceptability judgments in linguistic research, and the WebExp software package. See <http://www.language-experiments.org> for a list of current and past linguistic studies employing the WebExp software package and magnitude estimation.

The minimal stimulus pair that most of the discussion in this paper is concerned with, is given below (for both pronouns and anaphors). Whereas in (5) a possessive phrase intervenes between the pronouns and its binder (the subject), this is not the case in (6).⁵

Binding in picture NPs: Subject binds; intervening possessor

- (5) a. *John_i* finally saw Mary's picture of *him_i*.
 b. *John_i* finally saw Mary's picture of *himself_i*.

Binding in picture NPs: Subject binds; no intervening possessor

- (6) a. **John_i* finally painted a picture of *him_i*.
 b. *John_i* finally painted a picture of *himself_i*.

Comparing the mean normalized judgments for examples like (5) and (6), Keller & Asudeh observed (as indicated in the examples) that (a) anaphors were perfectly grammatical regardless of whether there was an intervening possessor in the picture NP or not; (b) pronouns were only grammatical if there was an intervening possessor in the picture NP. Prima facie, both of these findings are surprising. With respect to (a), under the assumption that the possessor is the subject of the picture NP, anaphors should have to be bound within the picture NP.⁶ With respect to (b), under the assumption that the picture NP forms a Complete Functional Complex (i.e. contains all its thematic roles) in both (5) and (6), a subject-bound pronoun would be free in the Complete Functional Complex and should therefore be grammatical. Less surprisingly, Keller & Asudeh further observed that anaphors but not pronouns were grammatical if bound by the possessor, as in the following example:

Binding in picture NPs: Possessor binds

- (7) a. **Mary* finally saw *John_i's* picture of *him_i*.
 b. *Mary* finally saw *John_i's* picture of *himself_i*.

Keller & Asudeh's observations (2000, 2001), also supported by Runner et al. (2003), are summed up in Table 1. In the examples discussed above, pronouns are as acceptable as anaphors (indicated by '~' in Table 1 and throughout the paper) only if bound by the subject with an overt intervening possessor. In all other cases under discussion anaphors are significantly more acceptable than pronouns (indicated by '>').⁷

Intervener \ Binder	Yes	No
Possessor	ANA > *PRO	-
Subject	ANA ~ PRO	ANA > *PRO

TABLE 1 – Results of Keller & Asudeh (2000, 2001) and Runner et al. (2003)

Before I discuss the predictions of existing HPSG and LFG binding theories in light of the results in Table 1, I introduce one additional observation made in Keller & Asudeh (2000, 2001). Rather than being a special case (as suggested in Asudeh & Keller 2001), this observation, I argue below, provides a highly relevant insight into binding in picture NPs. Keller & Asudeh (2001)

⁵ In the experiments conducted by Keller & Asudeh (2000, 2001), the set of sentences that contained overt possessors differed from the set of sentences without an overt possessor in terms of the types of verbs used. Keller & Asudeh investigated the effect of different aspectual classes of verb for sentences without a possessor but only used achievement verbs (e.g. *saw*, *found*) for sentences with overt possessors. I will come back to this difference below.

⁶ For a recent discussion of the analysis of possessors (in terms of their argument-role and their syntactic/c-structural position), see Alexiadou et al. (to appear).

⁷ The '*' in Table 1 indicates ungrammaticality. The criteria for ungrammaticality will be addressed and slightly revised in Section IV.

observed that the bad mean acceptability ratings for subject-bound pronouns in the absence of a possessor (as in e.g. (6a)) were significantly improved when the verb wasn't a "+existence accomplishment verb" (henceforth 'creation verb' or '+creation verb'), as in (8a), but a -existence accomplishment or an achievement verb (henceforth grouped together under the label '-creation verb'), as in (8b).

- (8) a. **John_i* painted a picture of *him_i*.
 b. *John_i* found/burned a picture of *him_i*.

Keller & Asudeh (2000, 2001) originally analyzed this effect as due to the aspectual class of the verb. Later, Asudeh & Keller (2001) proposed an account that makes reference to complex predicates. I will discuss their proposal in Section IV. In Section V, I propose an alternative analysis based on semantic roles and argument structure. For now, it suffices to point out that all current standard HPSG (e.g. Pollard & Sag 1994; Manning & Sag 1998) and LFG (e.g. Bresnan 2001; Dalrymple 2001) binding theories remain agnostic about the effect of creation verbs.

III Predictions of HPSG and LFG binding theories

In this section, I summarize the core concepts of current HPSG and LFG binding theories and review their predictions in light of the empirical results summarized in the previous section. The review is almost entirely limited to examples like the ones discussed in the previous section. Since all binding theories under discussion make the correct predictions for examples in which the possessor is the binder of the pronominal, cf. (9) below and Table 1 above, the discussion focuses on cases with a subject-bound pronominal, as in (10) - (11) (the corresponding results are summarized in the last row of Table 1).⁸

- (9) John saw *Peter_i*'s picture of *himself_i*/**him_i*.
 (10) a. *John_i* painted Catherine's picture of *him_i*.
 b. **John_i* painted a/the/every picture of *him_i*.
 (11) a. *John_i* painted Catherine's picture of *himself_i*.
 b. *John_i* painted a/the/every picture of *himself_i*.

I begin with the predictions for pronouns. It seems fair to say that the majority of binding theories (including Bresnan 2001; Chomsky 1981, 1986; Chomsky & Lasnik 1995; Dalrymple 1993, 2001; Kiparsky 2002; Manning & Sag 1998; Pollard & Sag 1992, 1994; Reinhart & Reuland 1993) share the same underlying intuitions about the distribution of pronouns – pronouns cannot be bound by a coargument. Although binding theories differ with respect to how this intuition is implemented, Everaert (2001, 2003) points out that the different formalizations mostly make the same predictions. As I show in the next paragraph, this is also the case for pronouns in examples like (10).

Building on Pollard & Sag (1992, 1994), Manning & Sag (1998:111) define the HPSG constraints on the distribution of pronouns and anaphors on the hierarchically organized lexical argument structure. A pronoun must be locally a-free (i.e. it cannot be co-indexed with another member of the same ARG-ST list). The subtle difference to current LFG binding theories (e.g. Bresnan 1985, 2001; Dalrymple 1993, 2001:285) is that LFG binding constraints are defined on the functional structure (f-structure) rather than argument structure (a-structure).⁹ In LFG terms, pronouns must be free within their *minimal Coargument Domain*, i.e. the minimal f-structure

⁸ If not noted otherwise, grammaticality judgments are based on the above-mentioned empirical studies or on the study introduced in Section V.

⁹ See Manning (1996a) for a discussion of the advantages of an argument structure-based binding theory.

containing a predicate (PRED) and all grammatical functions (GF) it governs. Since the f-structure of a picture NP contains a PRED value, and since the picture NPs arguments (e.g. the pronoun in the *of*-PP in the above examples) are governed by this PRED, a subject-bound pronoun is free in its co-argument domain. For (10), pronouns are therefore predicted to be grammatical. This holds regardless of whether the sentence contains an overt possessor (POSS), as in (10a), or not, as in (10b) above.¹⁰ The same chain of reasoning (formulated on ARG-ST) holds for current HPSG binding theories. Thus, both HPSG and LFG binding theories make the wrong predictions for subject-bound pronouns in the absence of an intervening possessor, as in (10b).

Next, I turn to the predictions for the grammaticality of anaphors in examples like (11), repeated below as (12).

- (12) a. *John_i* saw Catherine's picture of *himself_i*.
 b. *John_i* painted a/the/every picture of *himself_i*.

Both HPSG and LFG binding theories state constraints on anaphors on the same level as constraints on pronouns (ARG-ST and f-structure, respectively). In LFG terms, an anaphor must be bound within the *Minimal Complete Nucleus* (cf. Complete Functional Complex, Chomsky 1986). The Minimal Complete Nucleus of an anaphor is the minimal f-structure containing a subject function (SUBJ) and the anaphor. This raises an interesting question for examples like (11a). If the possessor is analyzed as bearing the picture NP's SUBJ function, the phrase *Catherine's picture of himself* forms the anaphor's Minimal Complete Nucleus and the anaphor must be bound *within* this phrase. This would incorrectly predict (11a) to be ungrammatical. The alternative view, taken by Bresnan (2001:216) and Dalrymple (2001:160), is to analyze the possessor as being *subject-like* but not actually bearing the SUBJ function. Instead, both Bresnan and Dalrymple analyze the possessor as bearing the POSS function of the picture NP's PRED (see also Chisarik & Payne 2003; Laczkó 2004 for recent LFG analyses of possessors). Thus, in their accounts, the Minimal Complete Nucleus is the f-structure corresponding to the whole sentence and examples like (11a) are correctly predicted to be grammatical. Note that, assuming optional suppression of the picture NP's POSS/SUBJ argument (e.g. by a lexical rule), either of the two alternative LFG analyses correctly predicts examples like (11b) to be grammatical.

In sum, LFG binding theories like Bresnan (2001) and Dalrymple (2001) get three out of the four cases discussed above right, namely (10a) and (11a,b), but make the wrong prediction for subject-bound pronouns if no intervening possessor is present, as in (10b). The evaluation of current LFG binding theories is given in Table 2, where the incorrect prediction is highlighted by boldface and italics.

Intervener \ Binder	Yes	No
Possessor	ANA > *PRO	–
Subject	ANA ~ PRO	ANA ~ <i>PRO</i>

TABLE 2 – Predictions of the LFG model (Bresnan 2001; Dalrymple 2001)

HPSG binding theories differ slightly from LFG accounts with regard to their predictions for anaphors in examples like (12). Whereas LFG describes the asymmetry in distribution of pronouns and anaphors by means of *domain* constraints (the Coargument Domain is the relevant domain for pronouns, and the Minimal Complete Nucleus is the relevant domain for anaphors; cf. Dalrymple 2001:285), HPSG accounts (e.g. Pollard & Sag 1992, 1994; Asudeh 1998; Manning & Sag 1998) uses the same domain constraint for both pronouns and anaphors but incorporate an additional

¹⁰ Even if the possessor is present and analyzed as governed by the picture NP's PRED, the subject of the sentence lies outside the pronoun's co-argument domain.

notion, called *exemption*, for anaphors.¹¹ An anaphor is exempt from binding theory in case it is not outranked by *any* of its coarguments (i.e. if there is no less oblique argument on the same ARG-ST as the anaphor). In all other cases, an anaphor is subject to the usual binding constraints, i.e. the anaphor must be locally a-commanded by its binder (the binder must be a less oblique argument on the same ARG-ST as the anaphor). In other words, an anaphor must be locally a-commanded by its binder *iff* it is locally a-commanded by anything at all. This raises a similar question as the one discussed above for the LFG account. Is the anaphor locally a-commanded in examples like the ones in (12)? This is clearly not the case in (12b) because there is no element (at least not on the surface) that could *locally* a-command the anaphor. The anaphor is therefore predicted to be exempt from binding theory and cases like (12b) are correctly predicted to be grammatical.

It gets slightly more complicated for cases with an intervening possessor, as in (12a), repeated below as (13).

(13) *John_i saw Catherine's picture of himself_i.*

The question here is whether the possessor in (13) is bearing a less oblique role than the anaphor, which arguably bears the patient/theme/object role. If the answer is 'yes' (as analyzed in Pollard & Sag 1994 and Manning & Sag 1998), then the anaphor would have to be bound by the possessor and (13) would wrongly be predicted to be ungrammatical. This HPSG model fares slightly worse than the best LFG model. Pollard & Sag (1992, 1994) get two out of the four examples discussed above right. The evaluation summary of Pollard & Sag's (1992, 1994) binding theory is given in Table 3. As mentioned at the beginning of this Section, both the standard LFG and the standard HPSG model make the correct predictions in case the possessor is the binder (cf. the first column of Table 2 and Table 3).

Intervener \ Binder	Yes	No
Possessor	ANA > *PRO	–
Subject	*ANA < PRO	ANA ~ PRO

TABLE 3 – Predictions of the HPSG model (Pollard & Sag 1992, 1994; Manning & Sag 1998)

If, on the other hand, the possessor wasn't analyzed as an argument of the picture NP, the anaphor in (13) would be *exempt from binding theory* (since it would not be locally a-commanded by anything) and (13) would be correctly predicted to be grammatical. Note, however, that such an analysis would entail that the possessor is not an argument of the picture NP and therefore not an element of the ARG-ST that the anaphor is an element of. Without additional changes, this would wrongly predict pronouns to be grammatical in examples like (9), repeated below as (14). In a nutshell, so far, this alternative HPSG account avoids one problem but creates another one.

(14) **John saw Peter_i's picture of him_i.*

The latter problem (the wrongly predicted grammaticality of (14)) can be avoided by a minor modification of principle A suggested to me by Ivan Sag (p.c.). Instead of basing exemption on the presence of an a-commander, the modified principle A would state that 'a locally *s*-commanded anaphor, must be locally a-bound.', where an anaphor is *s*-commanded if it is a-commanded by an *a-subject* (i.e. preceded on the ARG-ST list by an element that is also a member of the SUBJ list). In this approach possessors would still be analyzed as arguments and therefore appear on ARG-ST. While maintaining the exempt status for anaphors in examples like (13), this approach correctly

¹¹ For the notion of exemption see also Reinhart & Reuland (1993). Exempt anaphors are also discussed in e.g. Culy (1997) and Kuno (1987).

predicts the ungrammaticality of (14) because the possessor is a coargument of the pronoun.¹² This alternative HPSG approach makes the same predictions as the LFG binding theories summarized in Table 2, which is not surprising given that it more or less parallels the spirit of the LFG accounts discussed above in an HPSG framework (the notion of s-command serves the same purpose as the Minimal Complete Nucleus).

In sum, neither the standard LFG nor the HPSG model makes satisfying predictions given the current analysis of picture NPs. Furthermore, both models leave the ‘intervention effect’ unaccounted for – i.e. none of the models provided explains why subject-bound pronouns are acceptable only in case there is an intervening possessor.¹³ Finally, recall the contrast between (15a) and (15b), mentioned at the end of section II. The grammaticality of a subject-bound pronoun is significantly reduced if the verb is a +creation verb (compared to –creation verbs). Without further modification, none of the current binding theories captures this contrast.

- (15) a. **John_i* painted a picture of *him_i*.
b. *John_i* found/burned a picture of *him_i*.

Next, I discuss a revised HPSG binding theory suggested by Asudeh & Keller (2001) that has been argued to accommodate the empirical observations of Keller & Asudeh (2000, 2001) and Runner et al. (2003).

IV Previously suggested refinements

Based on Pollard & Sag’s (1994) HPSG model, Asudeh & Keller (2001) propose a revision of predication-based binding theories (e.g. Williams 1987, 1992; Pollard & Sag 1992, 1994; Reinhart & Reuland 1993; Manning & Sag 1998; Asudeh 1998). Asudeh & Keller’s proposal has three parts, two of which are considerations independent of binding theory. The first suggested refinement pertains to the analysis of possessive phrases in terms of their function/argument role (and is therefore independent of binding theory). Second, Asudeh & Keller introduce an addendum to current binding theories, the *Pronoun Distribution Principle*. The third part of their proposal aims at integrating the effect of creation verb on the acceptability of pronouns mentioned at the end of the previous section. For Asudeh & Keller this effect is a property of the creation verb. In the remainder of this section, I will discuss the three parts of their proposal in the order mentioned.

IV-a The analysis of the possessive phrase

Parallel to current LFG analyses of possessive phrases (e.g. Bresnan 2001; Dalrymple 2001) and contrary to Pollard & Sag (1994), Asudeh & Keller suggest that the possessor argument of an NP (including picture NPs) does *not* outrank the object argument of that NP.¹⁴ The immediate consequences of this alternative to Pollard & Sag’s analysis have already been outlined in the previous Section. On the one hand, the distribution of anaphors is accounted for correctly. In

¹² The sensitivity of anaphors to subject binders (formalized via s-command in HPSG) is well motivated from languages other than English (Ivan Sag, p.c.; cf. Dalrymple 1993). For the idea of an ‘a-subject’, see Manning (1996b).

¹³ Even though this paper focuses on HPSG and LFG binding theories, note that many of the observations made above hold in essentially the same way for GB binding theories (e.g. Chomsky 1986; Chomsky & Lasnik 1995). Furthermore, note that binding theories that predict strict complementarity of pronouns and anaphors (e.g. Chomsky 1981; Kiparsky 2002) are at odds with the fact that both anaphors and pronouns are acceptable in the presence of an intervening possessor if bound by the subject, cf. (10a) and (11a) above.

¹⁴ Asudeh & Keller (2001:10) refer to Williams (1985) for an argument that possessors “are not a subject or any other sort of external argument” and to Barker (1995:6), according to which the NP in a genitive possessive phrase is not an argument of the NP *at all*. Note, however, the literature on possessive phrases is still split with regard to the question whether genitive possessor phrases are subjects (or, for that matter, to which extent possessors resemble subjects of verbs). For a recent discussion, see Alexiadou, et al. (to appear).

examples like (16), the anaphor can be bound by the possessor or the subject. More precisely, it is predicted that the anaphor in (16) is only subject to discourse-based constraints on binding, because it is exempt from binding theory (since there is not other argument of the picture NP that could locally a-command the anaphor/outrank the anaphor on ARG-ST).

(16) Hannah_i found Peter_j's picture of himself_{i/j}.

On the other hand, as it stands, the first refinement incorrectly predicts (14), repeated below as (17), to be grammatical since the pronoun would not be bound by a co-argument.

(17) *John saw Peter_i's picture of him_i.

IV-b The Pronoun Distribution Principle

This is where the Pronoun Distribution Principle (henceforth PDP; Asudeh & Keller 2001:11) enters the picture. The PDP states that pronouns aren't fully grammatical if their binder is the closest potential binder for an anaphor in the same position as the pronoun.¹⁵ In other words, if one was to substitute the pronoun with an anaphor and the binder was the *closest* grammatical binder of that anaphor, the anaphor would be preferred over the pronoun.¹⁶ This in turn reduces the grammaticality of the pronoun.

Pronoun Distribution Principle (Asudeh & Keller 2001:11)

A pronoun is fully grammatical *iff* a reflexive [i.e. an anaphor; F.J.] in the same position would not be bound by the closest potential binder (under the same assignment of indices).

The PDP predicts reduced grammaticality of pronouns in examples like (18). In (18a), an anaphor in the pronoun's position could be bound by the subject (cf. (19a)) because the anaphor would be exempt (nothing a-commands it) and the subject is also the closest binder. In combination with the analysis of possessive phrases given above, an anaphor in (18b) would be exempt, too, and could therefore be bound by the possessor (cf. (19b)), which is also the closest potential binder.¹⁷

Reduced grammaticality of pronouns due to the Pronoun Distribution Principle

- (18) a. ?*John_i saw a picture of him_i.
 b. ?*John saw Peter_i's picture of him_i.
 (19) a. John_i saw a picture of himself_i.
 b. John saw Peter_i's picture of himself_i.

In examples similar to (18a) but with an intervening possessor, e.g. (20), anaphors are not bound by the closest potential binder (the possessor). The revised binding theory therefore predicts *pronouns* in (20) to be fully grammatical. As shown in Table 1, Section II this prediction is correct. In the domain of picture NPs, examples like (20) are the only environments in which anaphors and pronouns are fully acceptable.

(20) John_i saw Peter's picture of him_i/himself_i.

¹⁵ For references on the well-established notion of "the closest potential binder", see Asudeh & Keller (2001:11).

¹⁶ A variety of reasons for the apparent preference of anaphors over pronouns have been discussed in the literature, including pragmatic considerations of specificity (Reinhart 1983), and featural economy (Kiparsky 2002). Here I do not discuss this preference further.

¹⁷ Recall that sentences like (18a) were only rated as absolutely unacceptable if they contained a verb of creation (cf. Section II). The contrast between "?*John_i saw a picture of him_i" and "?*John_i painted a picture of him_i" is addressed in the next section.

The predictions of Asudeh & Keller’s (2001) proposal are summarized in Table 4. Changes to Pollard & Sag (1994) are given in boldface. If we interpret “reduced grammaticality of pronouns” to refer to cases in which pronouns were judged less acceptable than anaphors, the revised model seems to make correct predictions only for the data considered here (cf. Table 1). The revised HPSG model therefore fares better than any of the standard models described in the previous section.

Intervener	Yes	No
Binder		
Possessor	ANA > ?*PRO	–
Subject	ANA ~ PRO	ANA > ?*PRO

TABLE 4 – Predictions of Asudeh & Keller (2001)

This raises the question whether it is possible to improve current LFG binding theories by incorporating the PDP (note that the first part of Asudeh & Keller’s proposal, namely the analysis of genitive possessive phrases as non-subjects, already is a part of LFG current binding theories; cf. Section III).

The predictions of current LFG binding theories after incorporation of the PDP are subtly different from (and, as I will show shortly, also more adequate than) Asudeh & Keller’s (2001). Since the possessor is analyzed as an argument of the picture NP, possessor-bound pronouns are predicted to be ungrammatical – rather than only being reduced in grammaticality. Thus, for the cases considered here, the PDP applies only to examples like (18a) above. This is summarized in Table 5 where differences from current LFG binding theories (e.g. Bresnan 2001) are given in italics and differences from Asudeh & Keller’s model are marked by boldface.

Intervener	Yes	No
Binder		
Possessor	ANA > *PRO	–
Subject	ANA ~ PRO	ANA > <i>?*PRO</i>

TABLE 5 – Predictions of LFG binding theories with Pronoun Distribution Principle

Asudeh & Keller (2001) use “?*” to mark examples with pronouns that were rated significantly lower than comparable examples with anaphors but still significantly higher than examples that constitute violations of core binding theory as in e.g. (21).

(21) *Hannah_i criticized her_i.

A closer examination of Keller & Asudeh’s (2000, 2001) data and the data collected in the experiment presented in the next section suggests that the prediction of the revised LFG model (in Table 5) is more accurate than the Asudeh & Keller’s (2001) proposal.¹⁸ The mean acceptability ratings for examples with a possessor-bound pronoun (cf. (18b) above), do not justify a distinction between *their* degree of ungrammaticality and the ungrammaticality resulting from violations of core binding theory (see Section V-b for examples that were used to defined the range of violations of core binding theory). The mean acceptability ratings of subject-bound pronouns in the absence of an intervening possessor, however, *are* significantly higher than the ratings of sentences violating core binding theory.¹⁹ Thus the revised LFG model is empirically more adequate than the Asudeh & Keller’s (2001) HPSG-based model and therefore the best model considered here so far.

¹⁸ The experiment employed the same methodology and procedures as Keller & Asudeh (2000, 2001).

¹⁹ For more details, I refer the reader to my LFG’04 handout available online at <http://www.stanford.edu/~tiflo/>.

IV-c Verbs of creation as complex predicates

As mentioned at the end of Section II, Keller & Asudeh (2000, 2001) also observed that examples like (18a) are *completely* ungrammatical (not just reduced in grammaticality) if the sentence predicate is a +creation verb, as in (22):

Pronoun bound by subject; no possessor; + creation verb

(22) **John_i painted a picture of him_i.*

Asudeh & Keller account for this contrast by positing that +creation verbs form a complex predicate with their picture NP argument, thereby identifying the agent argument of the verb with the agent/creator argument of the picture NP, as illustrated in (23). Thus cases like (22) are predicted to be ungrammatical because the pronoun is bound by a co-argument (in HPSG terms, the pronoun is locally a-bound).

(23) paint a picture: <AGT, PAT>

Asudeh & Keller's (2001) proposal also makes a prediction about examples similar to (22) but with an intervening possessor. Since the effect is assumed to be essentially based on argument structure, it should not be affected by the absence or presence of an intervening possessor. Thus examples like (24), which are equally acceptable with pronoun or anaphor, are predicted to be ungrammatical with a pronouns if the verb is +creation.²⁰

Pronoun bound by subject; intervening possessor; - creation verb

(24) *John_i found Mary's picture of him_i.*

Unfortunately, Keller & Asudeh's experiments tested verb contrasts only for examples *without* an intervening possessive phrase. In their studies, all verbs for stimuli containing an intervening possessor were achievement verbs (i.e. –creation verbs), just as *found* in (24). While the fact that pronouns in those examples were judged grammatical is compatible with the prediction made above, the lack of contrasting examples with +creation verbs means that the prediction cannot be considered proven. In Section V, I will present results that argue against the complex predicate hypothesis of Asudeh & Keller, even though they confirm the prediction that the grammaticality of examples like (24) depends on whether the verb is of type +creation or –creation. Instead, I argue below, it is the likelihood of the binder being interpreted as the agent/creator of the picture NP (and therefore as a co-argument of the pronoun bearing the picture NP's patient role) that is the determining factor behind the observed contrasts in the grammaticality of pronouns.

V The experiment

In this section, I present new results from an experiment that shows that it is agentivity/argumenthood generally rather than *only* verb specific interpretations that determine the grammaticality of pronouns. This argues against attributing the effect of agentivity on the grammaticality of pronouns to the type of verb and more specifically, against the complex predicate hypothesis. Instead, the findings argue for a view in which the observed acceptability ratings are due to the argument structure of picture NPs and the likelihood with which the binder of a pronoun (as the patient argument of a picture NP) is interpreted as the agent of the picture NP.

²⁰ Admittedly (thanks to Ash Asudeh and Ivan Sag for discussion), this prediction only follows under what I take to be a favorable interpretation of Asudeh & Keller's (2001) Complex Predicate Hypothesis. Otherwise their hypothesis would make no prediction at all about examples with an intervening possessor and a +creation verb.

In the remainder of this section, I outline the experimental hypothesis and its predictions (Section V-a), and summarize the employed methodology (Section V-b) and stimuli (Section V-c), and the results (Section V-d). In Section V-e, I discuss the results and their relevance for binding theory, specifically binding in picture NPs.

V-a The Agentivity Hypothesis and its predictions

The experiment was intended to investigate the hypothesis that the contrast observed by Keller & Asudeh (2000, 2001) between examples like (15a) and (15b), repeated below in (25), is due to the semantic role of the binder with respect to the picture NP (rather than being due to complex predicates, as argued in Asudeh & Keller 2001). A subject that is interpreted as an agent/creator of the picture NP cannot be the binder of a pronoun that bears an argument-role of that picture NP.

- (25) a. **John_i* painted a picture of *him_i*.
b. *John_i* found/burned a picture of *him_i*.

Like Asudeh & Keller's analysis, the AGENTIVITY HYPOTHESIS makes the prediction that the contrast in (25) carries over to examples with intervening possessors. Examples with intervening possessive phrases therefore constitute the empirical domain investigated in the experiment.

AGENTIVITY HYPOTHESIS

A subject that is *semantically interpreted* as an agent/creator of the picture NP cannot be the binder of a pronoun that bears an argument-role of that same picture NP (because of Principle B of binding theory).

The AGENTIVITY HYPOTHESIS rest on the assumption that picture NPs optionally allow identification of their subject (i.e. their agent/creator) with the subject of the verb they are an object of (in other words, the intuition that Asudeh & Keller had about creation verbs is extended to all verbs). The likelihood of the optional reading being employed by a hearer depends on whether the hearer has reason to believe that this is the intended interpretation. This chain of reasoning, for the purpose of the experiment, leads to two predictions, which are discussed below along with their operationalizations. The first prediction is that +creation verbs (in the configurations considered in this paper) result in ungrammaticality of pronouns independent of whether there is an intervening possessive phrase or not, cf. (26) – judgments omitted. This prediction is built on the assumption that the presence of a +creation verb in (26) should force participants to interpret the subject of the sentence as the agent/creator of the picture NP. The prediction is summarized below.

Pronoun bound by subject; +creation verb

- (26) *John_i* painted a/the/Mary's picture of *him_i*.

Prediction 1: GENERALIZED EFFECT OF CREATION VERBS

The effect observed by Asudeh & Keller (2001) for +creation verbs is not limited to sentences without an intervening possible binder. Instead, for all instances of examples like (26), a subject-bound pronoun in the picture NP is significantly reduced in grammaticality because the +creation verb identifies the subject as the agent/creator of that picture NP.

The second prediction of the AGENTIVITY HYPOTHESIS is that not just the type of verb but *any* manipulation that biases participants to interpret the subject as the agent/creator of the picture NP should correspondingly reduce the mean acceptability ratings of cases with subject-bound pronoun (which, as in all examples above, bears the patient role of the picture NP). This is summarized below for one specific manipulation. The second prediction states that examples like (27) with a salient creator (like *Picasso*) as subject and a subject-bound pronoun are less acceptable than an example in which the subject is not a salient creator. The judgment for (27) is omitted.

Pronoun bound by subject; intervening possessor; -creation verb; subject is salient creator

(27) *Picasso*_i burned *Mary*'s picture of *him*_i.

Prediction 2: EFFECT OF SALIENT CREATOR

Sentences (with –creation verbs) where the subject is a salient creator binding a pronoun have reduced grammaticality compared to sentences where the subject binds a pronoun but is not a salient creator.

V-b Experimental methodology

To elicit well-controlled acceptability judgments, I conducted an experiment using the same methodology, procedure, and software as Keller & Asudeh (2000, 2001; cf. Section II above). Twenty-one participants from various parts of the U.S. (two subjects were later excluded by an outlier analysis) judged 96 sentences (including 48 fillers) with regard to the same reference sentence. For each participant, sentences were presented in random order.²¹

In order to understand the results presented below, keep in mind that the elicited judgments are a measure of *acceptability*. That is, while it is possible to *bias* participants to a certain interpretation of a sentence they are to judge, the effect will be reflected as a tendency rather than an absolute, categorical distinction (cf. Schütze 1996). Rather than dismissing empirical evidence though, this is just to say, that mean judgments have to be seen in light of judgments on a reference sentence. The results presented below are normalized (i.e. they range from 0 to 1). In addition, a group of filler stimuli was used to define the interval of mean acceptability ratings for violations of core binding theory. Some examples are given in (28). In the figures in the results section this interval is marked by dashed lines. All cases with mean acceptability rating within or below that interval are considered ungrammatical.²²

Examples used to define the interval of 'ungrammatical' sentences

- (28) a. **She*_i visited *Lisa*'s brother at college.
b. **Mary* asked *him*_i about *Michael*'s parents.

V-c Stimuli

To test for a GENERALIZED EFFECT OF CREATION VERBS, I compared the mean normalized acceptability ratings for sentences with or without +creation verbs in which the pronominal is subject-bound (recall that the subject only contained sentences with possessors). A minimal pair is given below (grammaticality judgments are omitted).²³

VERB is +creation; Subject binds; intervening possessor

(29) *Manray*_i took *Mary*'s photo of *him*_i/*himself*_i.

VERB is –creation; Subject binds; intervening possessor

(30) *Manray*_i burned *Mary*'s photo of *him*_i/*himself*_i.

To test for an EFFECT OF SALIENT CREATORS, I compared the mean normalized acceptability ratings for sentences in which the subject was a salient creator with sentences in which it wasn't.

²¹ For more details on the methods and procedure, see Jaeger (2004).

²² It is important to understand why the interval of mean normalized judgments does not start at zero. While each individual judgment is normalized, it is still the case that the lowest *mean* normalized judgment for any stimulus was approximately 0.2 on the scale from 0 to 1 (this is due to variation across subjects; in other words, there was no stimulus that everyone agreed upon as entirely ungrammatical). Effectively, the *mean* normalized judgments varied from 0.2 to 0.85.

²³ Not all participants seemed to know that *Manray* is a famous photographer. This may have weakened the effect for this and similar examples.

The sentences always contained a salient creator either as the binder or as the possessor (to avoid them being rated as more acceptable simply because they contained a famous person).

Subject is salient CREATOR; VERB is -creation; Subject binds; intervening possessor

(31) Manray_i burned Mary's photo of him_i/himself_i.

Possessor is salient CREATOR; VERB is -creation; Subject binds; intervening possessor

(32) Mary_i burned Manray's photo of her_i/herself_i.

V-d Results

I first present the results pertaining to the prediction of a GENERALIZED EFFECT OF CREATION VERBS and then turn to the results relevant for the predicted EFFECT OF SALIENT CREATORS.²⁴

The results for the first part of the experiment are summarized in Figure 1. Just as for sentences without a possessor, there is a significant effect of creation verbs on the acceptability of pronouns. Subject-bound pronouns are less acceptable if the verb is +creation than if it is -creation. The effect is even strong enough to make pronouns less acceptable than anaphors if the verb is a +creation verb (even though pronouns and anaphors are equally acceptable for -creation verbs, as shown in Keller & Asudeh 2000, 2001, and replicated here). These results support Prediction 1.

As for the second prediction, there *is* a significant main effect of salient creators on the acceptability of pronouns. The results are summarized in Figure 2. Pronouns are less acceptable when they are subject-bound by a salient creator than if their binder isn't a salient creator. Even though slightly weaker than the effect of creation verbs, the effect is strong enough to make pronouns bound by a salient creator subject less acceptable than anaphors under the same condition.²⁵ These results support Prediction 2.

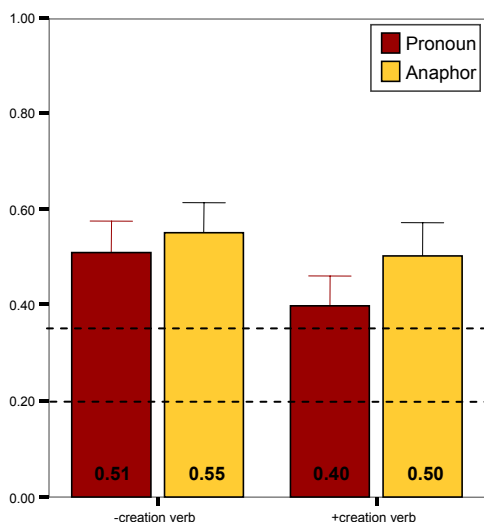


FIGURE 1 – Mean normalized acceptability of examples like (29) and (30) depending on whether the verb is +/-creation (subject binds; possessor present).

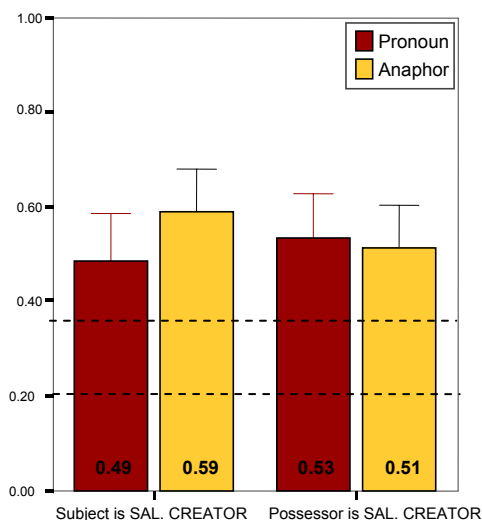


FIGURE 2 – Mean normalized acceptability of examples like (31) and (32) depending on whether the subject is a salient creator (subject binds; possessor present; -creation verb).

²⁴ Throughout this paper, I have opted to omit the numerical results of statistical tests. Instead I limited myself to stating whether an effect was significant or not. All analyses were performed with repeated measure ANOVAs with both subjects and items as random factors (cf. Clark 1974).

²⁵ Recall also that participants apparently didn't know some of the names used as lexicalizations of salient creators, e.g. *Manray*. The EFFECT OF SALIENT CREATORS is probably stronger than revealed in this experiment.

In sum, both predictions are met and the results support the AGENTIVITY HYPOTHESIS. This becomes even clearer if one takes the two factors (salient creator, and verb semantics) together to define a scale of likelihood of the subject being interpreted as the agent of the picture NP. On this scale, the subject is most likely to be interpreted as the agent/creator of the picture NP in examples like (29), followed by examples like (31), and finally, with the lowest likelihood in examples like (32). As shown in Figure 3, this scale has the predicted (significant) effect on the acceptability of pronouns. The more likely the subject is to be interpreted as the agent/creator of the picture NP, the less acceptable are the mean normalized acceptability ratings for pronouns.

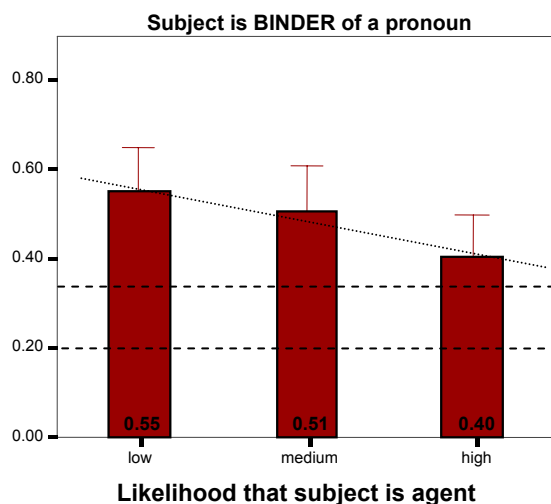


FIGURE 3 – Mean normalized acceptability of pronouns in examples like (29), and (31) and (32) depending on the likelihood of the subject being interpreted as the agent of the picture NP (subject binds; possessor present).

V-e Discussion

The results argue that Asudeh & Keller’s (2001) analysis of the effect of verbal semantics on the acceptability is too narrow. While the GENERALIZED EFFECT OF CREATION VERBS is compatible with Asudeh & Keller’s (2001) Complex Predicate Hypothesis (cf. Section IV-c), the AGENTIVITY HYPOTHESIS subsumes both the GENERALIZED EFFECT OF CREATION VERBS and the EFFECT OF SALIENT CREATORS under one simple principle and should therefore be preferred over the Complex Predicate Analysis. For examples like the ones in (33) and (34), it is the agentive interpretation of the subject that matters, and not only the verbal semantics. Attributing the effect to the verb/complex predicates rather than agentivity fails to capture the relevant generalization about binding.²⁶

Contrast between +/- creation verbs; Subject binds; no possessor

- (33) a. **John_i* painted a picture of *him_i*.
 b. *John_i* found/burned a picture of *him_i*.

Contrast between +/- creation verbs; Subject binds; intervening possessor

- (34) a. ?**Manray_i* took *Mary’s* photo of *him_i*.
 b. *Manray_i* burned *Mary’s* photo of *him_i*.

²⁶ Note, however, that both Asudeh & Keller (2001:14) and Runner (2002:173) provide independent evidence for their proposal that +creation verbs and picture NPs form complex predicates.

Before I discuss some of the consequences for future research, it is worth mentioning that one of the results is not quite as strong as expected. Although the effect of creation verbs on the acceptability of pronouns is clearly significant, pronouns weren't judged as absolutely ungrammatical (the mean acceptability ratings are just above the ratings for violations of core binding theory). This raises the question whether the identification of the subject as the agent/creator of the picture NP is an optional process for the hearer even if the meaning of the sentence (or for that matter, anything in the context) unambiguously identifies the subject as the agent/creator. I (have to) leave this question open for future investigation. More generally, it is unclear whether the observed effects are due to lexical properties of the picture NPs (and maybe other types of nouns), or a more general semantic principle.

One of the questions the current study poses for future research stems from the *interpretation* of the AGENTIVITY effect. On the one hand, the effect could be due to the fact that the binder is interpreted as a 'creator'.²⁷ In this case, the effect would simply follow from certain preferences based on which semantic role a binder has. I will refer to this interpretation as AGENTIVITY-1. On the other hand, the effect could be due to the fact that the binder is the agent/creator of the picture NP. I will refer to this interpretation as AGENTIVITY-2. In this case, the effect argues for the relevance of extended argument structure. I use the term *extended* argument structure to stress that, for all examples discussed above with a subject-bound pronoun, the binder was not in the (surface) position of the picture NP's subject (the binder was not *in* the picture NP at all). If one wants to maintain that AGENTIVITY-2 is the correct interpretation of the observed effect, this leads to the conclusion that some mechanism has to identify the subject of the sentence as the agent/creator of the picture NP.²⁸ In this sense, it is *extended* argument-hood that matters. The AGENTIVITY-2 HYPOTHESIS is especially appealing because it reduced the cases discussed above to the well-known constraint against co-arguments as binders of a pronoun (i.e. the principle of Obviation; incorporated into many binding theories as Principle B).

The only study I know of that may be taken to provide evidence for either of the two interpretations of AGENTIVITY is Kaiser et al. (2004a,b). Kaiser and her colleagues investigated sentence like (35) using an eye-tracking paradigm. They found that participants were significantly less likely to choose the subject *Peter* (rather than the object *Andrew*) as the antecedent of the pronoun if the verb was marking the subject as a receiver of information, e.g. *told*, than if the verb was marking the subject as a source of information, e.g. *heard*.

(35) Peter {told/heard from} Andrew about the picture of him on the wall.

Kaiser and her colleagues analyze the effect as support for Tenny's (1996, 2003) proposal that receivers of information are preferred binders of short distance pronouns. Alternatively, the results can be interpreted in terms of AGENTIVITY-1 since verbs like *tell* assign an agentive creator-role to their subject, while verbs like *hear* don't.²⁹

²⁷ The effect cannot be reduced to the binder being an agent since, for the cases discussed here, the binder was always the subject, and therefore, since all verbs had agentive subjects, always an agent. Thus the contrast between examples like (29) and (30) could not be due to the fact that the binder is an agent.

²⁸ The mechanism that accomplishes this could be part of syntax (e.g. movement out of the picture NP's subject position into the subject position of the sentence), or semantic/pragmatic identification due to established co-reference (which, without further constraints, clearly is too general). Although, admittedly, the nature of the mechanism and the constraints on when it applies are of great interest, I do not discuss this any further here. In lack of further evidence for the distribution of the AGENTIVITY effect, this would seem premature.

²⁹ At this point, it is important to be more precise about what I have so far informally referred to as the agent/creator role. As Ash Asudeh has pointed out to me, one could argue that *hear*, too, assigns a creator role (to its object). Although this it is admittedly necessary to be more precise about the nature of the AGENTIVITY effect, for the current purpose it is sufficient to state that I am exclusively concerned with logical subjects that bear a creator role. Since the notion of logical subject is defined in argument structure terms, this means that the relevant level of description for the AGENTIVITY effect is argument structure or, as suggested above, extended argument structure.

Under this assumption, the results of Kaiser and her colleagues would follow naturally from the analysis proposed here, whereas I do not see a straight-forward extension of Kaiser et al.'s (2004) and Tenny's (2003) proposal to account for the data discussed here. Although the results of Kaiser et al.'s experiments may be taken to argue in favor of AGENTIVITY-1, clearly more research is needed to decide between the AGENTIVITY-1 and AGENTIVITY-2 analysis.

The confirmation of the AGENTIVITY HYPOTHESIS also raises the question of how general the observed effect is. There are two ways in which the observed effect could be more general. First, AGENTIVITY could turn out to be a factor in binding beyond picture NPs. Thus, understanding precisely when *extended* argument-hood matters (i.e. in which configurations not only argument-hood but extended argument-hood matters), is an interesting subject for future studies. Second, if future research reveals that AGENTIVITY-2 rather than AGENTIVITY-1 turns out to be the correct interpretation of the current findings, extended argument-hood should depend neither on the binder's argument-role nor on the argument-role of the pronoun. It should only matter whether, after the mechanism for extended argument-hood has applied, the pronoun and its binder are assigned argument-roles by the same predicate.

Consider the two examples in (36). Both contain a subject-bound pronoun, which bears a recipient role (rather than being a patient as in all of the above examples). The examples differ only in that, in (36a), the subject is identified as the agent/issuer of the donation and therefore as an extended co-argument of the pronoun. If this factor is strong enough to influence the likelihood of the binder (i.e. the first object) being interpreted as the agent/creator of the donation, (36a) should be judged less acceptable than (36b). I leave it to future research to test this prediction.

- (36) a. Mary issued the bank [a donation for her].
b. Mary showed the bank [a donation for her].

Finally, note that the confirmation of the AGENTIVITY HYPOTHESIS (regardless of which interpretation of the observed effects, AGENTIVITY-1 or AGENTIVITY-2, turns out to be correct) offers an alternative explanation for the reduced grammaticality of examples like (18a) without an intervening possessor, repeated below as (37). Recall (cf. Section IV-b) that, within a LFG account, this type of examples is the only remaining motivation for the Pronoun Distribution Principle (PDP) proposed in Asudeh & Keller (2001). Given the results of the current study, the reduced grammaticality of examples like (37), could be due to an inherent bias to interpret the subject as the agent/creator of the picture NP – even in cases in which nothing in the sentence biases a hearer towards that interpretation (e.g. no salient creator; no creation verb).

Pronoun bound by subject; no possessor

- (37) ?**John*_i saw a picture of *him*_i.

Although conclusive evidence is needed, the results presented above suggest that it may be possible to derive Asudeh & Keller's PDP as a descriptive generalization from the AGENTIVITY HYPOTHESIS. This could ultimately relate the PDP to well-established constraints on binding of co-arguments (namely, Principle B).³⁰

³⁰ Note that the current proposal does by no means deny the importance of pragmatic factors in binding theory. Even though all effects observed in the experiment presented here can be accounted for by a clear principle, there are other known effects on the acceptability of pronouns (e.g. definiteness of the picture NP; cf. Keller & Asudeh 2001) that are unlikely to be reduced to co-argument-hood.

VI Conclusions

I have shown that the acceptability of a pronoun as an argument of a picture NP depends on (among other things) whether the binder is likely to be interpreted as an agent/creator. In Section V-e, I have proposed that this could eventually be due to *extended* argument-hood. According to the proposed analysis, a creator subject can be interpreted as the agent/creator of the picture NP, which makes the subject a co-argument of a pronoun bearing the patient-role of that picture NP. My proposal reduces the variation in the acceptability of pronouns in the domain of picture NPs to the well-known semantic principle of Obviation/Principle B (pronouns cannot be bound by a co-argument; e.g. Reinhart & Reuland 1993; Kiparsky 2002, among many others). More generally, the proposal predicts that the variation in the acceptability of pronouns being bound by expressions that lie outside their *syntactic/f*-structure co-argument domain depends on whether the binder is (via some semantic or syntactic mechanism) interpreted as a co-argument of the pronoun.

The current study also shows that it is possible to use acceptability judgments for linguistic investigation if they are elicited in a well-controlled way. Among other things, parts of the current study reliably replicated results found in Keller & Asudeh (2000, 2001) and also in the more sophisticated (but also more complicated) experiments by Runner et al. (2003).

VI-a Future research

Several questions for future research arise from the observations made in this paper. First, optimally, the experimentally verified results should be confirmed by a corpus-based study. Experimentally well-controlled elicitation of acceptability judgments is a valid tool of linguistic investigation but should be supplemented by distributional evidence from corpora. Second, as mentioned in the discussion of the experimental results, the current experiment raises many questions with respect to the precise nature of the AGENTIVITY effect. Thus it would be worthwhile to investigate the effect of agentivity or, more generally, the effect of extended argument-hood (see Section V-e) in other constructions. Finally, future studies should include a better handle on the contextual effects (saliency, topicality, empathy, perspective, etc.). The current study presented sentences out of context. Although contextual effects have primarily been considered in the research on anaphors (e.g. Culy 1997; Kuno 1987; for a recent overview, see Oshima 2004), they should also be considered in acceptability studies of pronouns. Recently, Kaiser et al. (2004a,b) showed that, at least in some instances, pronouns are clearly more susceptible to semantic/pragmatic factors than anaphors.

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