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Constraints on Donkey Pronouns

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Abstract

This article reports on an experimental study of *donkey pronouns*, pronouns (e.g. *it*) whose meaning covaries with that of a non-pronominal noun phrase (e.g. *a donkey*) even though they are not in a structural relationship that is suitable for quantifier-variable binding. We investigate three constraints, (i) the preference for the presence of an overt NP antecedent that is not part of another word, (ii) the salience of the position of an antecedent that is part of another word, and (iii) the uniqueness of an intended antecedent (in terms of world knowledge). We compare constructions in which intended antecedents occur in a context such as *who owns an N / who is an N-owner* with constructions of the type *who was without an N / who was N-less*. Our findings corroborate the existence of the overt NP antecedent constraint, and also show that the salience of an unsuitable antecedent's position matters. Furthermore, our findings show that uniqueness only matters in the *N-less* type construction and not in the *N-owner* type construction; we conclude that this supports a potential approach in terms of *dynamic semantics* over a competing *e-type approach*.

1 INTRODUCTION

Anaphoric pronouns, such as *he* in (1a), are nominal elements that receive their meaning from the preceding context, typically from a so-called *antecedent* (cf. King 2013 for a discussion of anaphora). In (1a), the NP *John* serves as the antecedent for the pronoun *he*; therefore, (1a) is understood to mean the same as (1b). The pronoun *he* in (1a) qualifies as a *referential pronoun*, a pronoun that directly refers to a fixed, contextually salient individual (here: John). (See Heim & Kratzer 1998: 239–242;

Büring 2005, for recent textbook overviews on the semantic typology of pronouns.)

- (1) a. **John** came to my party. **He** had a great time.
 b. **John** came to my party. **John** had a great time.

This article investigates the constraints on the interpretation of so-called *donkey pronouns*¹ (cf. Geach 1962; Evans 1977, 1980; Heim 1982), illustrated in (2a); donkey pronouns do not require the presence of any contextually salient individual. By contrast, they seem to be interpreted as complex definite descriptions, which can fail to have a referent altogether (an idea that goes back to Parsons 1978). To illustrate, (2a) below can be paraphrased as (2b).

- (2) a. No wise man who owns a **donkey** beats **it**.
 b. No wise man who owns a **donkey** beats **the donkey that he owns**.

The properties of donkey pronouns can be summarized as follows. Donkey pronouns co-occur with some expression that is quantificational (i.e. that would be modeled in a logical metalanguage as a quantifier, such as \forall or \exists). Their denotation co-varies with the value of the variables that are bound by the quantificational expression. To illustrate, (2a) conveys: *if Voltaire owns a donkey, Voltaire does not beat Voltaire's donkey; if Russell owns a donkey, Russell does not beat Russell's donkey; etc.*). In spite of entering such a relationship with a quantifier, donkey pronouns do not classify as *syntactically bound pronouns*, since the relationship between the antecedent *a donkey* and the pronoun *it* is not suitable for syntactic binding (cf. Reinhart 1983; Heim & Kratzer 1998; Elbourne 2005).

Most of the previous psycholinguistic literature on constraints on the interpretation of non-reflexive pronouns has focused on referential pronouns and on constructions that involve (cross-clausal) coreference between a referential pronoun and an intended antecedent (cf. Arnold *et al.* 2000; Sturt 2003; Brown-Schmidt *et al.* 2005; Runner *et al.* 2006; Foraker & McElree 2007; Kaiser *et al.* 2009; Kazanina & Phillips 2010). By contrast, few papers have, to our knowledge, looked at donkey pronouns to investigate constraints on their interpretation in a controlled fashion. The studies that have been conducted

¹ The commonly used name *donkey pronoun* stems from the fact that such pronouns were first discussed for the sentences *every farmer who owns a donkey beats it* and *if a farmer owns a donkey, he beats it* (see Geach 1962). Donkey pronouns are commonly taken to be a type of *e-type anaphora*, a term coined by Gareth Evans; it is not known what the 'e' stands for in this term (cf. issue 5.280 of *LINGUIST List*, <http://linguistlist.org/issues/5/5-280.html>, accessed 30 June 2014).

(e.g. Yoon 1994; Conway & Crain 1995; Geurts 2002; Foppolo 2009) have focused on different readings of donkey pronouns, i.e. the *weak* v. *strong* reading (e.g. as shown in (3); see Parsons 1978; Kanazawa 1994). We do not investigate this question in the current studies.

- (3) a. Every boy that stands next to a **girl** holds **her** hand.
 b. *strong reading*: Every boy that stands next to a **girl** holds the hand of **every girl** that stands next to him.
 c. *weak reading*: Every boy that stands next to a **girl** holds the hand of **at least one of the girls** that stands next to him.
 (Geurts 2002:135–136)

While studies of this *weak/strong* contrast investigate the different readings that are available for donkey pronouns, we focus on the perhaps more basic question of when a donkey pronoun is interpretable (and thus acceptable) to begin with. In particular, we quantitatively evaluate four constraints that have been argued in the theoretical linguistics literature to apply to (donkey) pronouns.

2 CONSTRAINTS ON THE INTERPRETATION OF PRONOUNS

We investigate four factors that have been argued to influence the acceptability of pronouns: (i) overtness, (ii) the position of the antecedent, (iii) uniqueness, and (iv) pragmatic factors concerning the existence of antecedent-related discourse referents.

2.1 Overtness

Pronouns have been argued to require an overt NP antecedent that must not be subpart of a word, henceforth labeled the *Overt NP (Antecedent) Constraint* (cf. Postal 1969; Ward *et al.* 1991; Ward 1997; Evans 1977; Kadmon 1987; Heim 1990; Chierchia 1992; Elbourne 2001). This constraint is known as *the anaphoric island constraint* in the literature on referential pronouns (Postal 1969 and see Ward *et al.* 1991, Ward 1997 for an overview of the literature) and as *the formal link problem* in the literature on donkey pronouns (Evans 1977; Kadmon 1987; Heim 1990; Chierchia 1992; Elbourne 2001). In a generalized form, it can be stated as follows: (i) pronouns require an overt noun phrase (NP) antecedent, and (ii) this overt NP antecedent cannot be a part of a word. Examples (4b) and (5b) (labeled *non-overt*) illustrate violations of the *Overt NP Constraint*, which arise from the fact that the intended antecedents (*father* and *treadmill*) are contained in other words; by

contrast, the *Overt NP Constraint* is fulfilled in examples (4a) and (5a) (labeled *overt*), where the intended antecedent is an NP in its own right.

- (4) a. *overt*: Every child who was without a **father** had lost **him** in the war.
 b. *non-overt*: Every child who was **fatherless** had lost **him** in the war.
- (5) a. *overt*: Every fitness-addict who owned a **treadmill** had a special place for **it** in the basement.
 b. *non-overt*: Every fitness-addict who was a **treadmill**-owner had a special place for **it** in the basement.

The nature of the Overt NP Constraint is debated. On the one hand, it is often argued that the Overt NP Constraint is a powerful constraint that regulates the link between a pronoun and its antecedent (e.g. Postal 1969 for referential pronouns; Heim 1990 and Chierchia 1992 for donkey pronouns). On the other hand, the Overt NP Constraint has been argued to be a violable constraint, which is often violated (for referential pronouns, see Anderson 1971, Ward *et al.* 1991; for donkey pronouns, see Ward 1997; Jacobson 2001). In our experiment, we manipulate overtness, systematically contrasting examples like (4a)/(5a) with their counterparts in (4b)/(5b). The first goal of this paper is thus to quantitatively evaluate the Overt NP Constraint, to determine whether constructions that contain pronouns without a suitable NP antecedent are indeed rated as less acceptable than constructions with pronouns that have such suitable NP antecedents. Second, we investigate the relationship between the Overt NP constraint and two further constraints: (a) salience of the syntactic position of the antecedent (i.e. whether the antecedent occupies a more v. less salient syntactic position), and (b) uniqueness (i.e. whether the antecedent picks out a unique object/individual in the world). We now elaborate on each of these constraints in more detail.

2.2 Salience of syntactic position

Another factor that has been proposed to affect the salience / prominence of a referent is the syntactic position of the intended antecedent (Ward *et al.* 1991; see also Kaiser 2003 and Kaiser & Trueswell 2008 for a discussion of the relevance of an antecedent's linear position). Consider the contrast in (6).

- (6) a. [?] [Every child who was **fatherless**] had lost **him** in the war.
 b. ^{?*} [Every **fatherless** child] had lost **him** in the war.

In accordance with Ward *et al.* (1991), the lower acceptability of examples like (6b) may be attributed to the less salient syntactic position of the antecedent (i.e. a modifier position), compared to the more salient position of the antecedent in (6a) (i.e. a predicate position). We will refer to this factor as the *Salient Position Condition*, stated as follows for our purposes: (i) an intended antecedent for a pronoun that is contained in another word (thus violating the *Overt NP Constraint*) is more acceptable in a more salient syntactic position than in a less salient syntactic position; (ii) the predicate position of a copula verb is more salient than the position of a pre-nominal attributive modifier to a noun phrase.

We evaluate the Overt NP Constraint and the Salient Position Condition in our experiment by manipulating both overtness and the syntactic position of a non-overt intended antecedent. It should be pointed out that the position of the antecedent, as stated above, cannot be crossed with overtness: the syntactic position of the antecedent can only be manipulated for non-overt antecedents (e.g. *every child who was fatherless* v. *every fatherless child* above). The core manipulation is illustrated in (7b)/(8b) v. (7a)/(8a).

- (7) a. *non-overt-postnom*: Every child who was **fatherless** had lost **him** in the war.
 b. *non-overt-prenom*: Every **fatherless** child had lost **him** in the war.
- (8) a. *non-overt-postnom*: Every fitness-addict who was a **treadmill**-owner had a special place for **it** in the basement.
 b. *non-overt-prenom*: Every **treadmill**-owner / **treadmill**-owning fitness-addict had a special place for **it** in the basement.

The core question we ask in our experiment is whether both the *Overt NP Constraint* and the *Salient Position Condition* apply. The motivation for asking this question can be stated as follows. If the *Overt NP Constraint* is a categorical constraint that must be fulfilled for a pronoun to be interpretable at all, we would not expect the *Salient Position Condition* to have an effect. If both constraints have an effect (i.e. if *overt* is more acceptable than *non-overt-postnom*, and *non-overt-postnom* is more acceptable than *non-overt-prenom*), then this would suggest that the Overt NP Constraint is graded, in the spirit of Ward *et al.* (1991), Ward (1997).

2.3 Uniqueness

Many approaches to pronouns (including, most recently, [Elbourne 2005](#); [Sauerland 2007](#)) assume that pronouns (and in particular donkey pronouns) have the syntax and semantics of definite descriptions. In this spirit, (9a) would be equivalent to (9b), and (10a) would be equivalent to (10b). Under such a view, (singular) pronouns of this type would inherit the *existence* and *uniqueness* presupposition of definite descriptions, as given in (9c) and (10c). The question of whether donkey pronouns have a uniqueness presupposition has been widely discussed in the literature, see Heim (1982, 1990), [Berman \(1987\)](#) and [Kadmon \(1987, 1990\)](#).

- (9) a. Every child who was without **a father** had lost **him** in the war.
 b. Every child who was without **a father** had lost **the father (that she used to have)** in the war.
 c. *Presupposition of (9b)*:
 For every child, there is a unique father that she used to have.
- (10) a. Every fitness-addict who owned **a treadmill** had a special place for **it** in the basement.
 b. Every fitness-addict who owned **a treadmill** had a special place for **the treadmill (that s/he owned)** in the basement.
 c. *Presupposition of (10b)*:
 For every fitness-addict, there was a unique treadmill that she/he owned.

An intuition that we observed prior to our experiment is that the Overt NP Constraint sometimes appears to be obviated more easily when the intended antecedent is likely to be unique in the world, thus allowing the reader/hearer to accommodate its uniqueness. To illustrate (11a) appears to be more acceptable than (11b); intuitively, this is connected to the world-knowledge that a child has exactly one (biological) father [i.e. uniqueness is satisfied in (11a)] whereas there is no reason to assume that a child has exactly one friend [i.e. uniqueness is violated in (11b)].²

² In the theoretical literature on donkey pronouns and definite noun phrases, the problem is often discussed that the presumed uniqueness presupposition of a donkey pronoun is often not satisfied. For instance, Heim's (1982: 89) sage plant example in (i) should be unacceptable if *it* presupposes that there is a unique sage plant in the context; this problem can be circumvented, for instance, by relativizing uniqueness to minimal situations, as argued by [Elbourne \(2005\)](#); our study tests whether uniqueness has any effect in sentences with donkey pronouns, possibly in the shape of a weak preference rather than a rigid constraint.

- i. Everybody who bought a sage plant here bought eight others along with it.

- (11) a. *unique*: Every child who was **fatherless** had lost **him** in the war.
 b. *non-unique*: Every child who was **friendless** had lost **him** in the war.

In our experiment, we systematically manipulated uniqueness in this way, crossing it with the *Overt NP Constraint* and the *Salient Position Condition* discussed above. We can state the *Uniqueness Condition* as follows: (i) donkey pronouns with an antecedent that qualifies as *unique* are more acceptable than donkey pronouns with an antecedent that qualifies as *non-unique*; (ii) an intended antecedent qualifies as *unique* if every situation that contains a possible referent for this antecedent contains exactly one possible referent; otherwise an intended antecedent qualifies as *non-unique*. The research questions that we address are: a) do all three constraints apply? and b) are the three constraints independent, or do they interact?

2.4 Item type (*N-less v N-owner*) as a fourth factor

For testing the *Uniqueness Condition*, we constructed two different sets of items. Half of our items were constructed by means of the schema *N-less / without a(n) N*, as illustrated in (12), whereas the other half were constructed by means of the schema *N-owner / owned a(n) N*, as illustrated in (13). The motivation for testing two different types of items is that uniqueness seems to play a different role in (13), as opposed to (12). The unique v. non-unique classification [e.g. *horse* v. *weapon* in (12)] was determined for all experimental items in a norming study [cf. Section 3, discussion around example (30)]. This norming study reflects the intuition that knights typically own at most one horse but more than one weapon.

- (12) *N-less condition*
- a. *unique overt / non-overt-postnominal*
 Many knights who arrived {without a **horse** / **horseless**} had left **it** in their castle.
- b. *non-unique overt / non-overt-postnominal*
 Many knights who arrived {without a **weapon** / **weaponless**} had left **it** in their castle.
- (13) *N-owner condition*
- a. *unique overt / non-overt-postnominal*
 Every fitness-addict who {owned a **treadmill** / was a **treadmill-owner**} had a special place for **it** in the basement.
- b. *non-unique overt / non-overt-postnominal*
 Every fitness-addict who {owned a **dumbbell** / was a **dumbbell-owner**} had a special place for **it** in the basement.

The examples in (12) differ from the examples in (13) in the following fundamental respect. The contents of the relative clauses in (12a–b) do not entail or presuppose that the respective knights have ever had a horse, or weapon, respectively; i.e. there can be a knight who is horseless and who has never had a horse. By contrast, the contents of the relative clauses in (13a–b) entail that the relevant fitness-addicts have a treadmill, or dumbbell, respectively; i.e. there cannot be a fitness-addict who is a dumbbell-owner and who has never had a dumbbell.³

Intuitively, uniqueness plays a completely different role in these two types of examples. In (13), the uniqueness presupposition may certainly make (13a) more natural than (13b), but it needs to be tested to what extent this is a real constraint. By contrast, it appears as if the uniqueness presupposition of *horse* in (12a) allows us to *accommodate* for the existence of the relevant horses in the first place, whereas this is not possible in the case of the non-unique *weapon* in (12b). Such an effect may be due to an intricate connection between a uniqueness presupposition and an existence presupposition of the donkey pronoun *it* in (12); informally, we can hypothesize that accommodation of uniqueness in (12) feeds accommodation of existence; as a consequence, if the uniqueness can be accommodated, as in (12a), accommodation of existence is facilitated. (Compare also Nouwen's 2003: 74 discussion of the role of uniqueness when pronouns have implied antecedents.)

We can now state two possible hypotheses regarding the relationship between the *Uniqueness Condition* on the one hand and the type of construction (*N-less* v. *N-owner*) on the other hand.

The first hypothesis, which we label the *Uniqueness-as-Constraint Hypothesis*, amounts to the view that all donkey pronouns have a uniqueness presupposition, which must be satisfied. The prediction can be stated as follows: donkey pronouns with an antecedent that is unique in the described situation are always more acceptable than donkey pronouns with a non-unique antecedent. Specifically, this hypothesis yields the expectation that the *unique* conditions are always better than the *non-unique* conditions.

The second hypothesis, which we label the *Uniqueness-as-Facilitator Hypothesis*, does not view uniqueness as a constraint; instead, it views uniqueness as a factor that facilitates the interpretation of a donkey pronoun whenever we cannot independently infer the existence of relevant discourse entities for the pronoun to refer to. This facilitation can be conjectured to proceed as outlined above. The prediction can be

³ The difference amounts to the following entailments: α owns a β / α is with a β entails that there is a β . By contrast, α does not own a β / α is without a β does not entail the existence of any β now or in the past.

stated as follows: in N-owner type constructions, there is no difference between donkey pronouns with a unique antecedent and donkey pronouns with a non-unique antecedent, since facilitation is not required; by contrast, in N-less type constructions, donkey pronouns with a unique antecedent are more acceptable than donkey pronouns with a non-unique antecedent. Specifically, this hypothesis yields the expectation that the *unique* conditions are better than the *non-unique* conditions in the N-less constructions, whereas there is no difference in the N-owner constructions.

Our experiment bears on two competing approaches to donkey pronouns, which we now address; specifically, we show that so-called *e-type approaches* to donkey pronouns are consistent with the *Uniqueness-as-Constraint Hypothesis*, whereas *dynamic approaches* are consistent with the *Uniqueness-as-Facilitator Hypothesis*.

2.5 Theoretical approaches

In the theoretical literature, there are two competing approaches to donkey pronouns, so-called *dynamic approaches* (based on Kamp 1981; Heim 1982; Groenendijk & Stokhof 1991, see van den Berg 1996a, b; Nouwen 2003; Brasoveanu 2006, 2008 for recent developments) and so-called *e-type approaches* (e.g. Cooper 1979; Evans 1980; Heim 1990; Heim & Kratzer 1998; Buring 2004, 2005; Elbourne 2001; 2005; Leu 2005). Consider the classical example in (14) (based on Geach 1962:117).⁴

(14) Every man who owns a donkey beats it.

Dynamic approaches assume that in (14), the pronoun *it* and the noun phrase *a donkey* can enter a relationship that can be formalized as a quantifier-variable relationship in a logical meta-language; this happens in the semantics, since (as pointed out above) such a relationship cannot be derived in the syntax. To give a specific illustration of how this works in the semantics, *Discourse Representation Theory* (DRT, Kamp 1981; cf. Geurts 2011 for a recent summary of the relevant ideas) derives the meaning of (14) as follows. Both of the non-pronominal noun phrases (i.e. *every man* and *a donkey*) introduce a discourse referent, which we may label x and y . The pronoun *it* must be identified with some discourse referent or other, which, prior to pronoun resolution, we can call u . It is a core assumption of DRT that the discourse referents that are

⁴ Geach's original example is given in (i); it is generally simplified to the version in (14) to avoid unnecessary complexities that arise from the use of *any*.

i. Any man who owns a donkey beats it. (Geach 1962: 117)

introduced in restrictive relative clauses are accessible in the matrix clause, allowing us to identify the discourse referent γ , associated with *a donkey*, and the discourse referent u , associated with the pronoun *it*. This gives rise to the intended reading.

A formal rendering of such a standard DRT analysis is given by Geurts (2011), as shown in (15) (slightly adapted from Geurts 2011). Informally, what (15a) states is the following: For every x , such that x is a man, γ is a donkey, and x owns γ , it follows that x beats an individual u . Due to the fact that discourse referents in the restrictive relative clause are accessible in the matrix clause, we can identify u with γ in the next step, as shown (in bold type) in (15b); by doing so, the denotation of the pronoun *it* is tied to the denotation of *the donkey*, giving rise to the covariation that we observe (*Bill beats Bill's donkey, John beats John's donkey, . . .*). In a final step, we can simplify, as in (15c), which makes the semantic binding relations explicit and captures the intuitive truth condition of the sentence (in words: *for every x , such that x is a man, γ is a donkey, and x owns γ , it follows that x beats γ*).

- (15) a. $[: [x, y: \text{man}(x), \text{donkey}(y), x \text{ owns } y] \langle \forall x \rangle [\underline{u}: x \text{ beats } u]]$
 b. $[: [x, y, \mathbf{u}: \text{man}(x), \text{donkey}(y), \mathbf{u} = \mathbf{y}, x \text{ owns } y] \langle \forall x \rangle [: x \text{ beats } u]]$
 c. $[: [x, y: \text{man}(x), \text{donkey}(y), x \text{ owns } y] \langle \forall x \rangle [: x \text{ beats } y]]$
 (based on Geurts's 2011 examples (16))

E-type approaches differ from dynamic approaches in assuming that donkey pronouns are semantically interpreted as proxies for definite descriptions (e.g. *that donkey*, or *the donkey that he owns*; cf. Parsons 1978). It has been debated in the literature on donkey pronouns whether such definite descriptions are contextually resolved (Cooper 1979; Heim & Kratzer 1998; Büring 2005), or resolved under structural identity (Büring 2004; Elbourne 2001, 2005; see also Heim 1990; Neale 1990). In the former view, the context contains information that allows us to 'expand' a pronoun like *it* into a complex DP *the donkey that he owns* in the semantics (e.g. by virtue of relational variables, cf. Heim & Kratzer 1998). In the latter view, a pronoun like *it* may contain an elided NP, i.e. have the structure $[_{DP} \textit{it} [_{NP} \textit{donkey}]]$, which is subject to constraints on NP deletion (cf. Elbourne 2005 for discussion). A view that has gained much approval in recent years holds that donkey pronouns involve some type of 'situation binding', where donkey sentences actually convey information about certain types of *situations* (cf. Heim 1990; Büring 2004; Elbourne 2005). This is illustrated by Büring's analysis of (14), which is given in (16).

- (16) For every x , s_b such that $s_b \leq s$ is a minimal situation of x owning a donkey, there is an extended situation s_e , $s_b \leq s_e$, such that x beats in s_e the unique donkey x owns in s_b . (Büring 2004: 39)

In words, (16) can be paraphrased informally as follows: The relative clause (*who owns a donkey*) describes a situation (s_b) that contains a man, a donkey, and an ownership relation between the two; this (abstract) situation s_b is a *minimal situation* in that it does not contain anything else. (This base situation s_b is part of the situation of evaluation s .) What the entire clause conveys is that every such situation s_b in which a man x owns a donkey can be expanded into a larger situation s_e . Each of these larger situations s_e is identical to the base situation s_b apart from the fact that in s_e the farmer x beats the unique donkey that x owns in s_b (and thus also in s_e). Having outlined the two types of approaches to donkey pronouns, we can now evaluate the findings of our study in light of them.

2.6 Uniqueness—predictions for *N-less* items

The observations with respect to uniqueness are central when evaluating the different approaches to donkey pronouns. Let us first discuss the *N-less* items, for which both dynamic theories and e-type theories make similar predictions. Since the overt conditions and the non-overt conditions share the core properties that we discuss, we can simplify by focusing on items in the overt condition. Consider thus example (17a); what is crucial at this point is that (17b) seems to be an adequate paraphrase for (17a).

- (17) a. *Sample item for N-less*
 Many knights [who arrived without a **horse/weapon**] had left **it** in their castle.
- b. *Paraphrase*
 Many knights [for whom there was no **horse/weapon** that they arrived with] had left **it** in their castle.

From the perspective of a dynamic approach, (17) implies that the existence of a discourse referent γ that is a horse (or weapon) is explicitly denied in the relative clause. Nevertheless, the pronoun requires such a discourse referent and thus plausibly triggers a *repair mechanism* in which accommodation for a referent is attempted. The existence of such accommodation was demonstrated by Chierchia (1995), as discussed by Elbourne (2005), who contrasts the unacceptable (18a) with the acceptable (18b).

- (18) a. ?? If a man doesn't have a car, Paul has it.
 b. If a man doesn't have a car anymore, Paul generally has it.
 (Elbourne 2005: 24)

The question then arises which factors determine whether such accommodation is successful or unsuccessful. One possible factor (cf. Nouwen 2003: 74) may be uniqueness of potential discourse referents. From the perspective of a dynamic approach, we can thus attribute the previously mentioned intuition that uniqueness matters in (17) to the fact that a horse or weapon must be accommodated for, which seems easier when the respective item is unique.

For concreteness' sake, we might characterize the repair mechanism that is triggered in (17) in terms of Chierchia's (1992) *mixed approach* to anaphora. Chierchia (1992: 156) argues that one way of explaining (18b) (and thus (17a)) in a dynamic approach would be to assume that dynamic approaches can resort to *e-type strategies* in exactly this type of configuration.⁵ To illustrate, he posits (19b) as the analysis of (19a), adopting the approach of Cooper (1979) and Engdahl (1986).

- (19) a. John doesn't have a car anymore. He sold it last month.
 (Chierchia 1992: 155)
 b. John doesn't have a car anymore. He sold f (John) last month.
 f : a function from people into the car they used to have
 (Chierchia 1992: 158)

Alternatively, we might implement the necessary repair mechanism in terms of the *abstraction procedure* of Discourse Representation Theory (DRT; Kamp & Reyle 1993: 309–314), a mechanism where a quantificational configuration gives rise to the introduction of a new, maximal (and thus unique) discourse referent, which can then serve as an antecedent for a pronoun.⁶ In examples like (20), abstraction gives rise to the introduction of a unique plural individual corresponding to the set of all books; this individual can serve as the antecedent of *they*.⁷

- (20) Susan has found every book which Bill needs. They are on his desk.
 (Kamp & Reyle 1993: 309)

⁵ In contrast to Chierchia (1992), we explicitly view this e-type strategy as a repair strategy that dynamic approaches can resort to. It would not apply to other constructions that are not in need of repair.

⁶ We are grateful to Rick Nouwen (p.c.) for pointing this out to us.

⁷ In a related area, Nouwen (2003) assumes that antecedents can be inferred in a 'last resort' operation, in order to derive the 'complement anaphora' reading of (i) where *they* refers to the set of senators who do not admire Kennedy. Most importantly for the present study, this last resort operation is sensitive to uniqueness / maximality of the intended antecedent.

- i. Few senators admire Kennedy. They admire Carter instead. (Nouwen 2003: 7).

Crucially, the necessity for some repair (or ‘last resort’) mechanism or other, and the idea that it gives rise to a uniqueness requirement, is a more general property of dynamic approaches. From the perspective of dynamic semantics, examples like (18a) and (18b) should be equally unacceptable, i.e. a strictly dynamic approach must be suspended in (18b), and, by analogy, in (17). Furthermore, current dynamic approaches such as Chierchia (1992: 160) and Nouwen (2003: 74) predict a crucial role of uniqueness in such configurations, much in line with e-type approaches. This is reflected by the fact that Chierchia’s (1992) mixed approach literally incorporates an e-type approach. Similarly, if we consider the option that (18b) may involve a variant of *abstraction*, Nouwen (2003:40) observes that DRT’s abstraction procedure may simply be viewed as a notational variant of a ‘run-of-the-mill’ e-type strategy (provided that abstraction is triggered by the pronoun, rather than by a configuration that involves quantification).

In a (non-dynamic) e-type approach, we can derive the same prediction [i.e. that uniqueness plays a role in (17)], and we can make this even more explicit by formulating the sentence meaning in (21) [for (17a)], adapted from (16) above. Considering the situations that (21) describes, it is evidently possible that the minimal situation s_b in (21) does not contain any horse/weapon whatsoever; therefore, a repair strategy has to set in to make the sentence interpretable. (Otherwise, the extended situation s_e would also fail to contain a unique horse/weapon.) The role that uniqueness plays in (21) is transparent, since the extended situation s_e that contains the base situation s_b must contain a unique horse/weapon. It is more likely that this is the case (and that the sentence can thus be given a felicitous interpretation) if the intended antecedent is unique to begin with (cf. *horse* v. *weapon*).

- (21) For every x , s_b such that $s_b \leq s$ is a minimal situation of x not arriving with a horse/weapon, there is an extended situation s_e , $s_b \leq s_e$, such that in s_e x has left in the castle the unique horse/weapon that x did not arrive with in s_b .

In brief, both the dynamic approach (which may need to resort to an e-type strategy in this type of construction) and the e-type approach predict that uniqueness matters in the case of *N-less* constructions (both in the *being without N* condition and in the *being N-less* condition). But, as shown in the next section, the two approaches can be teased apart when investigating the *N-owner* constructions.

2.7 Uniqueness—predictions for N-owner items

For the N-owner constructions, the predictions are less uniform. To understand the different predictions, it is worthwhile looking at the non-overt (postnominal) cases here, as in (22). What we observe here is that *treadmill-owner* and *dumbbell-owner* are underspecified as to whether the referent owns a single treadmill/dumbbell or several treadmills/dumbbells.

(22) *Sample item for N-owner*

Every fitness-addict who was a **treadmill-owner/dumbbell-owner** had a special place for **it** in the basement.

From a dynamic perspective, it is not clear that this poses any problems. Let us focus on the nonunique case (*dumbbell*). The meaning of the sentence prior to pronoun resolution would amount to (23), adapting the analysis in (15a) above. In words, (23) conveys that for every discourse referent x who is a fitness-addict and a dumbbell-owner, it is the case that x had a special place for some unspecified u , as denoted by the pronoun *it*.

(23) [$[\text{x: fitness-addict}(\text{x}), \text{dumbbell-owner}(\text{x}) \langle \forall \text{x} \rangle [\underline{\text{u}}: \text{x had a special place for u}]]$]

What needs to happen for the sentence to be felicitous is that we accommodate for another discourse referent y , which is a dumbbell owned by x to be identified with the discourse referent u , i.e. we need to make the step from (23) to (24a), which can then be simplified as in (24b).

(24) a. [$[\text{x}, \mathbf{y}, \mathbf{u}: \text{fitness-addict}(\text{x}), \text{dumbbell-owner}(\text{x}), \mathbf{dumbbell}(\mathbf{y}), \mathbf{u} = \mathbf{y}, \mathbf{x} \text{ owns } \mathbf{y}] \langle \forall \text{x} \rangle [\text{: x had a special place for u}]]$]
 b. [$[\text{x}, \text{y}: \text{fitness-addict}(\text{x}), \text{dumbbell-owner}(\text{x}), \text{dumbbell}(\text{y}), \text{x owns y}] \langle \forall \text{x} \rangle [\text{: x had a special place for y}]]$]

For the purposes of this article, we leave open how this additional discourse referent is introduced in the step from (23) to (24), but we conjecture, following Geurts (2011), that this process is related to *bridging* (cf. Haviland & Clark 1974; Clark 1977; Irmner 2009), illustrated in (25). In example (25), the definite description *the knife* can be used anaphorically even though no knife has previously been introduced.

(25) John was murdered yesterday. The knife lay nearby. (Clark 1977)

It is evident at this point that under a dynamic view such a process should not be sensitive to the uniqueness or non-uniqueness of the intended antecedent. There is no immediate reason why it should be more difficult to construe (24a) from (23) when the relevant discourse referent is non-unique (such as a *dumbbell*) than when it is unique (such as a *treadmill*).⁸

Contrastively, uniqueness effects would still be expected from the perspective of an e-type approach such as Elbourne's (2005) or Buring's (2005). Under such an approach, we expect (22) to have the denotation in (26), again adapted from (16). Crucially, what this sentence presupposes by virtue of treating the pronoun *it* as a definite description (such as *the treadmill / the dumbbell*) is the uniqueness of the respective treadmill or dumbbell in the relevant minimal situation. That is, (26) should be well-formed if the presupposition can be accommodated that for every fitness-addict x there is a unique treadmill/dumbbell, but (26) should be ill-formed otherwise. As a direct consequence, we expect to see a uniqueness effect, just as we would in the case of the N-less construction; the unique *treadmill* should be acceptable, whereas the non-unique *dumbbell* should give rise to a presupposition failure (or rather to a failure to accommodate the uniqueness presupposition).

(26) For every fitness-addict x , s_b such that $s_b \leq s$ is a minimal situation of x being a treadmill-owner/dumbbell-owner, there is an extended situation s_e , $s_b \leq s_e$, such that in s_e x has a special place for the unique treadmill/dumbbell that x owns in s_b .

Note that this makes the plausible assumption that (22) behaves like the example in (27), quoted from Kratzer (2014), i.e. (26) may need to be refined so that 'minimal' treadmill-owning and dumbbell-owning situations are construed as prototypical (or rather 'exemplifying' in Kratzer's sense), involving exactly one treadmill, but more than one dumbbell, respectively.

(27) When snow falls around here, it takes ten volunteers to remove it.

In brief, a dynamic approach does not predict a uniqueness effect with N-owner items (while predicting such an effect with N-less items),

⁸ The core difference between *N-owner* constructions and *N-less* constructions is that (22) presupposes the existence of some dumbbell or other, whereas *N-less* constructions do not. In the *N-less* constructions, we conjectured that uniqueness plays a role in a repair strategy. In the *N-owner* construction, no repair strategy of this type is needed, since a simple *bridging inference* is sufficient.

whereas an e-type approach makes the same prediction for N-less items and for N-owner items, at least in the non-overt conditions.⁹

By crossing uniqueness and the N-owner/N-less distinction, we can thus directly test the predictions from dynamic approaches against the predictions from e-type approaches. Dynamic approaches (and mixed approaches in the spirit of Chierchia 1992) predict an interaction between these two factors (where uniqueness should only matter in the N-less condition), whereas (non-dynamic) e-type approaches do not predict such an interaction (i.e. a potential effect of uniqueness should be equally strong in the N-owner condition and in the N-less condition).

3 EXPERIMENT

3.1 Procedure

We carried out an acceptability rating study using Amazon.com's Mechanical Turk. Participants received the following instructions:

Instructions

Please read each sentence, then answer the question immediately following, and provide the requested rating.

Please note that there is a correct answer for each question.

Because some Mechanical Turk users answer questions randomly, we will reject users with error rates of 25% or larger. Consequently, if you cannot answer 75% of the questions correctly, please do not fill out the survey.

Note: Please read the sentence before answering the question and giving the rating.

For the ratings, participants were asked to choose one of five choices for each sentence: 'Extremely unnatural', 'Somewhat unnatural', 'Possible', 'Somewhat natural' and 'Extremely natural'. For the analyses, these responses were converted to a numerical score, ranging from 1 (for 'Extremely unnatural') to 5 (for 'Extremely natural'). Participants responded to a total number of 102 sentences, consisting of 30 critical

⁹ For the overt conditions, it is unclear if such a conclusion holds, since the minimal situation itself may contain a unique treadmill/dumbbell, simply by virtue of the predicate *own a treadmill/dumbbell*.

items and 72 filler items. The experiment took approximately 25 minutes to complete.

3.2 Participants

We posted surveys for 125 workers on Amazon.com's Mechanical Turk using the Turkolizer software from [Gibson et al. \(2011\)](#). All participants were paid for their participation. Participants were asked to indicate their native language, but payment was not contingent on their responses to this question.

3.3 Design and materials

The experiment used a $2 \times 2 \times 3$ design, crossing uniqueness (unique, non-unique), word-type (N-less v. N-owner), and overtness/syntactic-position (overt, non-overt-prenominal and non-overt-postnominal). A sample 'N-less' item is shown in (28); a sample 'N-owner' item is shown in (29).

(28) *Sample item for N-less*

a. *overt & unique*

Many knights who arrived without **a horse** had left **it** in their castle.

b. *overt & non-unique*

Many knights who arrived without **a weapon** had left **it** in their castle.

c. *non-overt postnom & unique*

Many knights who arrived **horseless** had left **it** in their castle.

d. *non-overt postnom & non-unique*

Many knights who arrived **weaponless** had left **it** in their castle.

e. *non-overt prenom & unique*

Many **horseless** knights had left **it** in their castle.

f. *non-overt prenom & non-unique*

Many **weaponless** knights had left **it** in their castle.

(29) *Sample item for N-owner*

a. *overt & unique*

Every fitness-addict who owned **a treadmill** had a special place for **it** in the basement.

b. *overt & non-unique*

Every fitness-addict who owned **a dumbbell** had a special place for **it** in the basement.

- c. *non-overt postnom & unique*
Every fitness-addict who was a **treadmill**-owner had a special place for **it** in the basement.
- d. *non-overt postnom & non-unique*
Every fitness-addict who was a **dumbbell**-owner had a special place for **it** in the basement.
- e. *non-overt prenom & unique*
Every **treadmill**-owner / **treadmill**-owning fitness-addict had a special place for **it** in the basement.
- f. *non-overt prenom & non-unique*
Every **dumbbell**-owner / **dumbbell**-owning fitness-addict had a special place for **it** in the basement.

For the *N-owner* items, we alternated between *every N-owning X* and *every N-owner* in the prenominal conditions. We reasoned that these constructions should behave similarly because in both the antecedent occupies a not very salient position. We therefore included both variants for generalizability. The example in (29e–f) illustrates both. In addition, we controlled for the influence of the quantifier within both the N-less items and the N-owner items, by constructing 5 items each with *every*, *many* and *no*, respectively.

To determine uniqueness, we carried out a norming study in which we performed pairwise comparisons of intuitively unique and intuitively non-unique antecedents. We constructed 39 pairs of items, each consisting of two questions, such as the example in (30). Participants were asked to choose one of five answers for each question: ‘Extremely unlikely’, ‘Somewhat unlikely’, ‘Possible’, ‘Somewhat likely’ and ‘Extremely likely’. For the analyses, these responses were converted to a numerical score, ranging from 1 (for ‘Extremely unlikely’) to 5 (for ‘Extremely likely’).

- (30) a. *unique*
Given that a knight has at least one horse how likely is it that this knight has more than one horse?
- b. *non-unique*
Given that a knight has at least one weapon how likely is it that this knight has more than one weapon?

The ratings for the intuitively unique referents were significantly distinct from the ratings for the intuitively non-unique referents. A linear mixed effects regression yielded a main effect of uniqueness ($\beta = -1.62$, $t = -65.78$, $P < 0.001$); changing from non-unique to unique yielded a 1.62 point decrease in rating). We chose the 30 items where the

difference between the unique condition and the non-unique condition was strongest, as determined by the Wilcoxon t -test for comparison of mean ratings.

Each item was associated with a comprehension question, asking about some aspect of the test sentence (including the interpretation of the donkey pronoun). These were included to ensure that participants in the study read and understood the target sentences. Sample questions are given in (31).

(31) a. *Test item*

Every chef who was a mixing-bowl-owner had to sell it while looking for a new job.

Comprehension question

Did at least some chefs have to sell their mixing bowls while having a secure position in a restaurant? (*correct answer: No*)

b. *Test item*

Every bricklayer who was toolless had misplaced it at the construction site.

Comprehension question

Were there at least some bricklayers without a tool who had misplaced their tool(s) at the construction site? (*correct answer: Yes*)

The distribution of correct ‘yes’ and ‘no’ responses was balanced across items so that every experimental list contained the same number of yes and no answers. We included 72 filler items, which were similar in style and difficulty to the target sentences.

To ensure that any observable effects were due to the relationship between the pronoun and its antecedent as opposed to the overall plausibility and/or the frequency of the antecedent-containing *N-less* or *N-owner* phrase, we performed a plausibility norming study, where we used *something/someone* instead of the donkey pronoun, as illustrated in (32). We used the same procedure and analyses as for the main experiment.

(32) a. *Plausibility Norming Study: Sample item for N-less*

Many knights who arrived {horseless / weaponless / without a horse / without a weapon} had left **something** in their castle.

b. *Plausibility Norming Study: Sample item for N-owner*

Every fitness-addict who {was a treadmill-owner / was a dumbbell-owner / owned a treadmill / owned a dumbbell} had a special place for **something** off in the basement.

The plausibility norming study revealed no main effects or interaction. In particular, a linear mixed effects regression yielded no main effect

of uniqueness ($\beta = 0.03$, $t = 0.45$, $P = 0.66$), no main effect of overtness ($\beta = 0.08$, $t = 1.23$, $P = 0.24$) and no interaction ($\beta = -0.14$, $t = -1.49$, $P = 0.14$).

3.4 Results

Only data from participants who indicated that they were native English speakers from the United States were analyzed. We also excluded participants with less than 75% accuracy on the questions. These two exclusion criteria left data from 108 participants that we used in the analyses below.

We fit a mixed-effects linear model predicting z-transformed acceptability ratings (means and standard deviations estimated within participants) from uniqueness (2-levels, sum-coded, centered), word-type (2-levels, sum-coded, centered) and overtness/syntactic-position (3-levels, deviation coded, centered). The overtness/syntactic-position was deviation-coded because we wanted to test both whether the overt condition differed from the non-overt conditions, and whether the prenominal non-overt condition differed from the postnominal non-overt condition.

Analyses reported here were conducted with the *lme4* package (Bates *et al.* 2008) for the statistical language R (R Core Development Team 2008). Recent results have shown that including only random intercepts in linear mixed-effects regressions can be anti-conservative, so we also include random slopes for all fixed effects grouped by participants in our model (Barr *et al.* 2013). Significance (p) values were estimated from (a) the t -statistic, and (b) conservative estimates of the number of degrees of freedom in the model. The estimates of the number of degrees of freedom in the model consisted of the number of observations (e.g. 3206) minus the number of intercepts fit in the model (the number of participants + the number of items = $108 + 30 = 138$) plus the number of slopes being fit in the model ($11 \times \text{participants} = 11 \times 108 = 1188$). Because of the large number of data points, reliable t -values are those that are larger than approximately 1.96.

The means in raw acceptability scores together with their 95% confidence intervals based on the standard error of the condition mean as estimated by the regression are presented in Figures 1 and 2: Figure 1 presents the data for the N-less conditions; and Figure 2 presents the data for the N-owner conditions. The results of the model (computed over z-transformed acceptability ratings, which are more normally distributed than raw acceptability scores) are summarized in Table 1. The

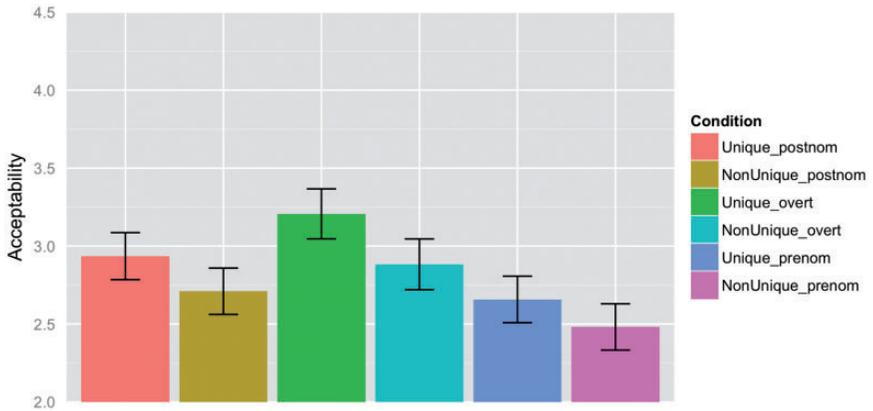


Figure 1 Acceptability ratings for the N-less conditions. Error bars show 95% confidence intervals.

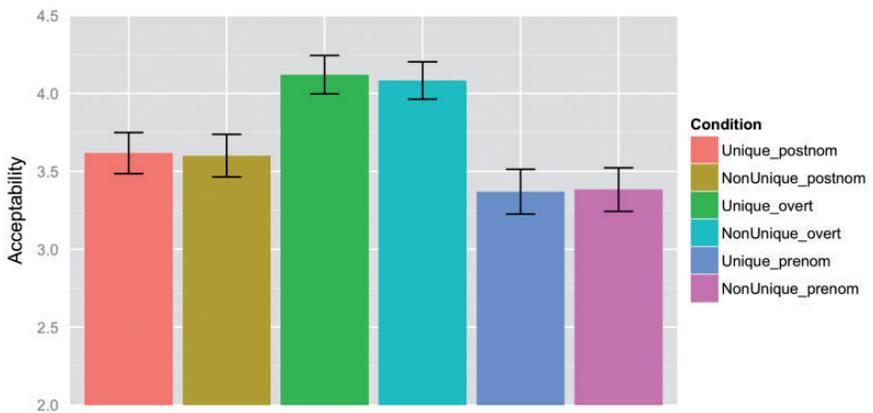


Figure 2 Acceptability ratings for the N-owner conditions. Error bars show 95% confidence intervals.

results demonstrated four main effects: a reliable prenominal v. postnominal effect, such that the postnominal versions were more highly rated; a large effect of overtness, such that sentences with overt antecedents were more highly rated than those without overt antecedents; an effect of noun-type, such that N-owner versions were rated better than N-less versions; and an effect of uniqueness, such that materials with unique referents were rated higher than those with non-unique referents. Critically for the predictions of the experiment, there was also an interaction between uniqueness and noun-type, such that the

	Beta	SE	t	df	P
(Intercept)	-0.33	0.06	-5.29	1880	<.001
Unique	0.10	0.03	3.40	1880	<.001
N-less v. N-owner	0.77	0.12	6.31	1880	<.001
Prenom v. Postnom	0.21	0.05	4.74	1880	<.001
Overt v. Prenom / Postnom	0.42	0.04	11.81	1880	<.001
Unique: N-less v. N-owner	-0.12	0.06	-2.06	1880	<.05
Unique: Prenom v. Postnom	0.02	0.07	0.22	1880	0.82
Unique: Overt vs Prenom / Postnom	0.09	0.07	1.34	1880	0.18
N-less v. N-owner: Prenom v. Postnom	-0.01	0.08	-0.17	1880	0.86
N-less v. N-owner: Overt v. Prenom / Postnom	0.21	0.07	3.29	1880	0.001
Unique: N-less v. N-owner: Pre v. Post	0.03	0.15	0.21	1880	0.84
Unique: N-less v. N-owner: Overt v. Pre / Post	-0.08	0.13	-0.58	1880	0.56

Table 1 Regression coefficients, standard errors, and *t* values for *z*-transformed ratings in the analysis of the experiment, crossing uniqueness (unique, non-unique), word-type (N-less v. N-owner), and overtness/syntactic-position (overt, non-overt-prenominal, and non-overt-postnominal)

uniqueness effect occurred only in the N-less versions (see Figure 1), but not in the N-owner versions (see Figure 2). Finally, there was an interaction between the noun type and the overtness of the antecedent. This means that overtness seemed to play a stronger role in the N-owner items than the N-less items, but from inspection of the ratings, overtness clearly applies in each noun type.

3.5 Discussion

The large effect of overtness and the reliable prenominal v. postnominal effect corroborate two claims that have been made in the literature on pronouns. First, the overtness effect confirms the existence of the *Overt NP Constraint*, as originally posited by Postal (1969). Second, the prenominal v. postnominal effect corroborates the view of Ward *et al.* (1991) that constructions in violation of the *Overt NP Constraint* still exhibit graded acceptability, contingent on factors such as the *Salient Position Condition*. The effect of noun-type (N-owner versions being better than N-less versions) can be taken to reflect the fact that N-less type constructions (as opposed to N-owner type constructions) do not entail the existence of the relevant discourse entities to be picked up by the pronoun. Most crucially, the interaction between uniqueness and noun-type corresponds to the predictions from the *Uniqueness-as-Facilitator Hypothesis* and not to the predictions from the *Uniqueness-as-Constraint Hypothesis*. We can thus reject the *Uniqueness-as-Constraint Hypothesis* in favor of the *Uniqueness-as-Facilitator Hypothesis*.

4 THEORETICAL IMPLICATIONS

4.1 *Uniqueness*

What we find is the following. A uniqueness effect arises in the N-less condition, as predicted both by a dynamic approach and by an e-type approach (see above). Contrastively, there is no uniqueness effect in the N-owner condition—neither in the overt condition nor in the non-overt conditions; as outlined above, this complete lack of a uniqueness effect is compatible with a dynamic approach, but not compatible with an e-type approach along the lines of (26). We can thus conclude that our experiment supports a dynamic approach over an e-type approach for the type of constructions that we tested.

4.2 *The Overt NP Constraint*

Let us now consider the predictions that the different types of theories make with respect to an overttness effect and a salient position effect, respectively. As Elbourne (2005: 20) points out, the *lack* of an overttness effect would be most problematic for a dynamic account, since dynamic theories rely on non-pronominal noun phrases (such as *a donkey*) to introduce discourse referents that can then be identified with the donkey pronoun. However, both dynamic approaches and e-type approaches to donkey pronouns are compatible with the *presence* of an overttness effect; they merely differ in the extent to which such an effect is predicted; as pointed out in the literature (e.g. Heim 1990), e-type theories that assume contextual resolution do not entail an overttness effect, since the context may, in theory, be able to expand a pronoun into any sufficiently salient definite description. However, even such contextual theories are compatible with the presence of an overttness effect, as argued by Ward *et al.* (1991), who treat the Overt NP Constraint as a pragmatic effect of salience, or lack thereof. Our finding of a strong overttness effect invalidates the intuition (which may arise, e.g. from the discussion in Ward *et al.* 1991 and Ward 1997) that the Overt NP Constraint may be an artifact of certain constructed examples, which would disappear in controlled experiments. We can conclude that dynamic theories and e-type theories are equally well suited to account for the Overt NP Constraint.

4.3 *The Salient Position Condition*

We have only tested the Salient Position Condition for cases in which the Overt NP Constraint is violated, following Ward *et al.* (1991). What we observed is that antecedents that are part of other words are more

acceptable in more salient positions than in less salient positions. It is plausible that this reflects a general fact about pronoun interpretation, since personal pronouns tend to refer to the most salient antecedents in the context (cf. Ariel 1990). The fact that salient position effects can be observed even though overtness is violated is meaningful for the following reason. It indicates that overtness as a violable constraint and salient position as a violable constraint are independent constraints, which apply in an additive manner; i.e. in conditions that violate overt-ness, violations of the salient position constraint can incur a further decrease in acceptability. Again, this is consistent with both dynamic approaches and e-type approaches; examples such as (33) have been discussed in the literature and are judged perfectly acceptable; any adequate theory of donkey pronouns (dynamic or e-type) must thus allow for accommodation of an intended antecedent (cf. also Geurts 2011, who assumes that every donkey pronoun involves *bridging*, Haviland & Clark 1974, an inference where discourse referents are accommodated for, potentially in the absence of a noun phrase that introduces them). It is plausible that this accommodation process is susceptible to the salience (or lacking salience) of an antecedent that is contained in another word.

- (33) a. [Every **Academy Award** winner] treasures **it** for the rest of his life. (Ward 1997: 203)
 b. [Every **Siberian husky** owner] needs to give **it** lots of exercise. (Jacobson 2001)

5 SUMMARY AND CONCLUSION

Our experiment yields the following insights. First, we confirmed the existence of the Overt NP Constraint, indicating that examples that have been claimed to be fully acceptable in violation of this constraint should not be considered the norm, but rather the exception; yet, there is an evident need for further investigation into the question of how such counterexamples are licensed. Specifically, we have seen that the Overt NP Constraint does not deterministically render a construction ungrammatical: we have found evidence that the salience of the position of an intended antecedent matters in cases where the Overt NP Constraint is violated; we have also found evidence that factors such as uniqueness (in the *N-less* construction) matter regardless of whether the Overt NP Constraint is satisfied or violated. Finally, we found an interesting pattern with respect to the uniqueness of an intended

antecedent; while antecedents in constructions such as *be without an N* or *be N-less* are generally more acceptable if they are unique than if they are not, no such effect occurs in constructions such as *own an N* or *be an N-owner*. We have contrasted a possible dynamic analysis with a possible e-type analysis; after working out the predictions of each approach, we have argued that these findings support the former and not the latter.

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APPENDIX: EXPERIMENTAL ITEMS

The items for our experiment were based on a uniqueness norming study. All items, as used in our experiment are given below. In the *N-less* cases (items 1–15), the phrase *X who was N-less* was replaced by the phrase *N-less X*. In the *N-owner* cases (items 16–30), the phrase *X who was an N-owner* was replaced by the phrase *N-owning X* in items (16), (17), (20), (21), (22), (25), (26), (27) and (30) and by the phrase *N-owner* (omitting *X*) in items (18), (19), (23), (24), (28) and (29). The *N-owning X* items are more similar to their overt and postnominal counterparts than the *N-owner* items; for this reason, we included 9 *N-owning X* items as opposed to 6 *N-owner* items.

- (1)
 - a. *unique overt*
Every child who was without a father had lost him in the war.
 - b. *non-unique overt*
Every child who was without a friend had lost him in the war.
 - c. *unique non-overt-postnominal*
Every child who was fatherless had lost him in the war.
 - d. *non-unique non-overt-postnominal*
Every child who was friendless had lost him in the war.
 - e. *unique non-overt-prenominal*
Every fatherless child had lost him in the war.
 - f. *non-unique non-overt-prenominal*
Every friendless child had lost him in the war.
- (2) Every bricklayer who was without a helmet / tool had misplaced it at the construction site.
- (3) Every citizen who was without a house / car had lost it during the recession.
- (4) Every banker who was now without a job / bonus had lost it when the economy was bad.
- (5) Many knights who arrived without a horse / weapon had left it in their castle.
- (6) Many robots that were without a motor / wheel no longer needed it when the new technology was successful.
- (7) Many captains who were without a wife / daughter had lost her when the ship went down.
- (8) Many graduate students that arrived without a computer / pencil had forgotten it at home in a hurry.
- (9) No woman who was without a mother / grandmother had missed her on mother's day.

- (10) No vehicle that was without a roof / window could be used without it when the weather conditions became severe.
- (11) Every room that was without a chandelier / lamp had it stolen during the blackout.
- (12) Many celebrities who were without an agent / fan had insulted him during a press conference.
- (13) No beach that was without a lighthouse / sea shell had lost it due to the eroding force of the ocean.
- (14) No child who was without a birthday cake / pancake had already eaten it before the party started.
- (15) No dental patient who was without a retainer / filling had lost it while eating soft chocolate cookies.
- (16) Every researcher that owned a server / computer had to shut it down during the thunderstorm.
- (17) Every chef who owned an oven / mixing bowl had to sell it while looking for a new job.
- (18) Many parents who owned a Nintendo Wii / TV had bought it in the Christmas sales.
- (19) Every student who owned a scanner / USB stick used to keep it in the office.
- (20) Every fitness-addict who owned a treadmill / dumbbell had a special place for it in the basement.
- (21) Many animal lovers who owned a shark / fish had imported it illegally from a tropical country.
- (22) Many women who owned a hairdryer / mirror used it at least once a day.
- (23) Many men who owned a farm / cow sold it during the financial crisis.
- (24) Many millionaires who owned a mine / diamond auctioned it off in hopes of making a profit.
- (25) Every businessman who owned a club / stock had bought it before the economic crisis.
- (26) No popstar who owned an island / boat wanted to sell it to pompous entrepreneurs.
- (27) No spy who owned a boat / gadget used it during the mission.
- (28) No student who owned a liquor ID / credit card had acquired it using illegal methods.
- (29) No teenager who owned a bicycle / video game donated it to children in need.
- (30) No old lady who owned a walker / umbrella regretted bringing it to the afternoon tea party.

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