The perils of interpreting comparatives with pronouns for children and adults

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Abstract

We present the results of three experiments investigating the interpretation of comparative constructions involving pronominal reference in which binding Principle C is violated. We show that both children and adults retrieve interpretations that are not predicted. On the one hand, children appear to represent elided pronominal material functionally instead of in a strict identity relation with a pronoun on the surface, generating interpretations that are entirely unexpected from the perspective of the adult grammar. On the other, adult participants often appear to ignore Principle C, being influenced by factors such as prosodic focus, the type of comparative (subject v. object), and structural position of the pronoun. We propose that the way in which the sentence processor is deployed in the incremental processing of such comparative constructions gives rise to so-called acceptable ungrammaticality.

1. Introduction

Over the last few decades, there has been a perennial and growing theoretical and developmental interest in comparative constructions. On the theoretical side, researchers have been concerned with identifying the syntactic and semantic structure corresponding to various types of comparative interpretations, providing explanations for the constraints on the range of comparisons expressed in natural language, and accounting for cross-linguistic variability in the comparative construction and the comparative morpheme (or lack thereof) (see Beck at al., 2009; Bhatt and Takahashi, 2011; Bresnan, 1973; Hackl, 2001; Kennedy, 1999, 2007; Kennedy & Merchant, 2000; Lechner, 2001, 2004; Merchant, 2009; Schwarzschild, 2008; von Stechow, 1984). On the developmental side, researchers have been concerned with documenting the licit and illicit productions of comparatives by children during their development, assessing the range of interpretations children assign to comparative constructions and how these interpretations compare with those assigned by adults, and appealing to cognitive psychology and (more recently) linguistic theory to account for children's divergence from adults (see Arii, Syrett, & Goro, 2014, 2017; Bishop & Bourne, 1985; Donaldson & Wales, 1970; Gathercole, 1979, 2009; Hohaus, Tiemann & Beck, 2014; Layton & Stick, 1979; Moore, 1999; Syrett, 2016).

Combined, these two lines of research reveal the complexity of comparative constructions, the challenges they pose for language development and processing, and the resulting difficulty of pinning down a precise theoretical analysis of types of comparatives and a representational explanation for children's non-adult-like interpretations. Put succinctly, comparative constructions are just hard, and some comparatives are harder than others. But of course, this statement does not form the basis of a linguistic investigation or theoretical analysis. It is imperative to target particular comparative constructions and investigate what precisely it is

about them that poses a challenge, and then to account for this formally. In this paper, we focus on one particular instantiation of comparative constructions that highlights an interplay between theoretical analyses of comparatives and the interpretations that children and adults assign: comparatives involving pronominal reference. There are two aspects that are particularly interesting about such cases, which we probe in three experiments.

First, any pronouns that are located in the first part of the comparative before the standard *than* clause (that is, in the *associate*) and c-command the degree head, will c-command anything that follows in the standard clause (the reasons for which we will demonstrate in the theoretical section that follows). Thus, given the binding constraints imposed by Principle C, potential co-construal between a pronoun in the first part of the comparative and an R-expression in the standard should incur a Principle C violation, and the sentence should be deemed ungrammatical. However, we will show that adults often allow co-construal between the pronoun and name in such cases, but not across the board. They do so in a way that suggests that structural position of the pronoun impacts the processing of these comparative sentences, which in turn impacts the availability of interpretations that should have been ruled out.

Second, the elided material in comparative constructions should be interpreted in parallel with the surface information with which it stands in an identity relation. Thus, the presence of any pronoun in the elided material should pick out the same referent as its surface prononimal counterpart. However, we will show that this is not consistently the case for children. Our findings offer strong evidence that children are indeed representing the elided material. However, their representation of the pronoun in the elided material diverges from adults, but in a way that reflects a necessary component of their representational repertoire.

The paper is structured as follows. In Section 2, we provide enough theoretical background on the syntactic and semantic representation of comparative constructions to generate testable hypotheses about c-command and pronominal reference for the three experiments that follow. In Section 3, we present Experiment 1. In Sections 4 and 5, we present Experiments 2 and 3, respectively. In Section 6, we discuss the results and set them in context with previous research showing related findings. In Section 7, we briefly conclude.

2. Theoretical Background

We start with some basic assumptions about the structure of comparatives in order to generate predictions regarding the relation between binding constraints and possible co-construal in these constructions. Following Lechner (2001) and Bhatt and Takahashi (2011), we assume that in an English comparative, such as the one in (1), there is a comparison of degrees (e.g., of tallness, or height), and while the surface form is phrasal, the comparative is underlyingly clausal (Bresnan, 1973, 1975), with elided material interpreted at LF, such that a property is predicated of each subject (i.e., that it is tall to some degree). The comparison holds true just in case there is a degree to which the first entity is d-tall and not the other is not.

(1) a. The Willis tower is taller than the Empire State Building [~~is d-tall~~].
b. meaning of comparative morpheme
assuming P, Q are degree predicates:
-er(P)(Q)↔∃d [Q(d)⋀¬P(d)]
c. resulting interpretation of (a):
-er (λd.The Empire State Building is *d*-tall) (λd.The Willis tower is *d*-tall)

We further assume that the degree head (*-er*) and the standard *than*-clause form a degree quantifier that is a syntactic specifier of a gradable predicate (e.g., *tall*). At LF, the standard *than*-clause is a sister to the degree head *–er*, and is therefore c-commanded by the same linguistic material that c-commands the degree head—anything before the gradable predicate (Bresnan, 1973; Kennedy, 1999; Hackl, 2000).

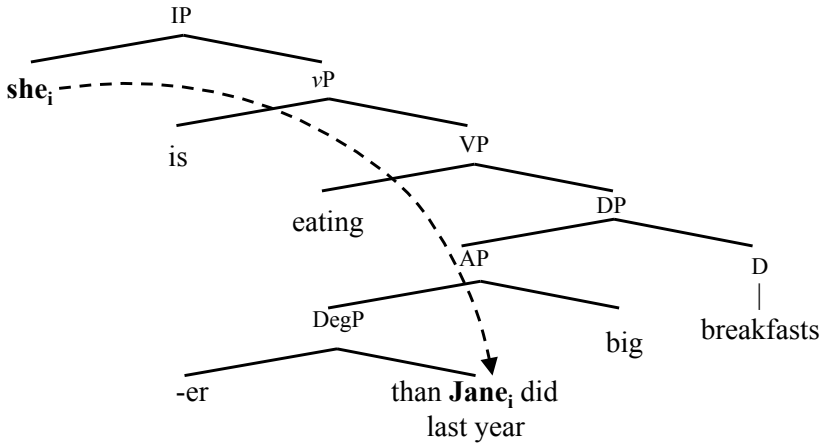
These facts arising from the structural configuration of comparatives have important implications for binding constraints. Here, we focus on binding Principle C in particular, which states that an R-expression must be free, i.e., must not have a c-commanding co-indexed antecedent (Chomsky, 1981/1993; Reinhart, 1983). The upshot is twofold. First, a pronoun appearing in the material in the first part of the comparative's main clause (leading up to the degree head) cannot be co-construed with an R-expression in the standard clause, because the pronoun would inevitably c-command the R-expression, and the latter would not be free. Second, it is not (just) the surface position of the pronoun that matters. The relationship between a pronoun and an R-expression is computed at LF. Possible co-construal (coreference) relations are thus evaluated based on both surface and elided material, and the structural relations that hold between them. We can illustrate the application of Principle C in comparatives by appealing to some of the target constructions appearing in the experiments reported in this paper, some of which were modeled after Bhatt & Takahashi (2011).

We will deal with the two main aspects of these comparatives—the structural relation between a pronoun and an R-expression occurring in the clause after the standard, and the presence of a pronominal element in the elided material—in turn. Let us begin by looking at an object comparative, as in (2). Here, the pronoun is in subject position, a position that c-commands the R-expression *Jane* in the standard clause, leading to the prediction that the pronoun and the name cannot be co-construed.

(2) Object comparative (pronoun in subject position)

a. **She**$_{*i/j}$ is eating bigger breakfasts than **Jane**$_i$ did last year.

b.

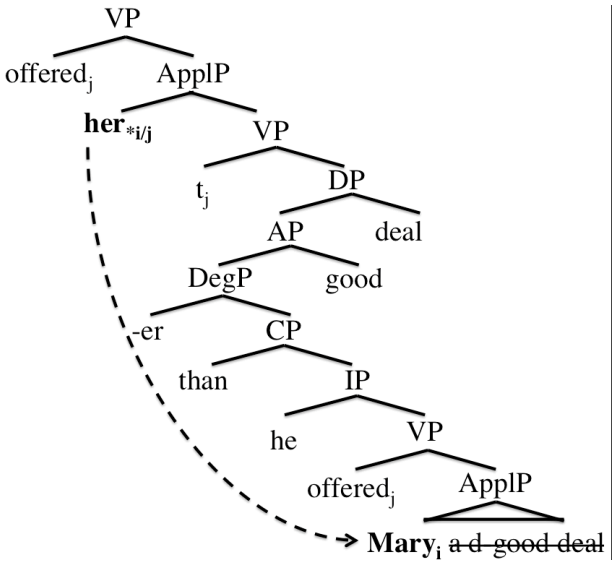


The same relation holds in (3). Here, the pronoun in indirect object position appears in the main clause before the standard clause (where *Mary* appears), and c-commands the name. Thus, once again, co-construal should be ruled out.

(3) Object comparative (pronoun in indirect object position)

a. The travel agent offered **her**$_{*i/j}$ a better deal than he offered **Mary**$_i$ last year.

b.



We noted above that we should not just direct our attention to the surface position of the pronoun and R-expression, since Principle C is evaluated at LF. In (2) above, we actually

assume, following Fox (2000) and Merchant (2000), that the degree phrase QR's to a position below the subject position at LF. Similarly, in (3), we assume that the degree phrase QRs to a scope-taking position adjoined to the AP, the lowest node of type <t> where DegP can be interpreted (Bhatt and Pancheva, 2004), which is still below the object pronoun.

Furthermore, subject comparatives with backwards anaphora (Carden, 1982) like (4)-(5) from Bhatt & Takahashi (2011) (their (12a-b)) illustrate the fact that the pronoun need not be located before the standard *than* clause and the name contained in the standard clause to incur a Principle C violation. B&T claim that the apparent difference in grammaticality between these two examples arises from the relative position between the pronoun and the R-expression once the elided material is filled in and interpreted at LF. In (4), the elided pronoun is in a position at LF to c-command the R-expression, while in (5), the c-command relation is reversed, and co-construal is licensed.

(4) *More people talked to **him$_i$** about **Sally** than about **Peter$_i$**'s sister.
*More people talked to **him$_i$** about **Sally**
[$_{CP}$ than ~~*d* many people talked to~~ [$_{TP}$ ~~**him$_i$**~~ [$_{T'}$ ~~about~~ **Peter$_i$**'s sister]]]

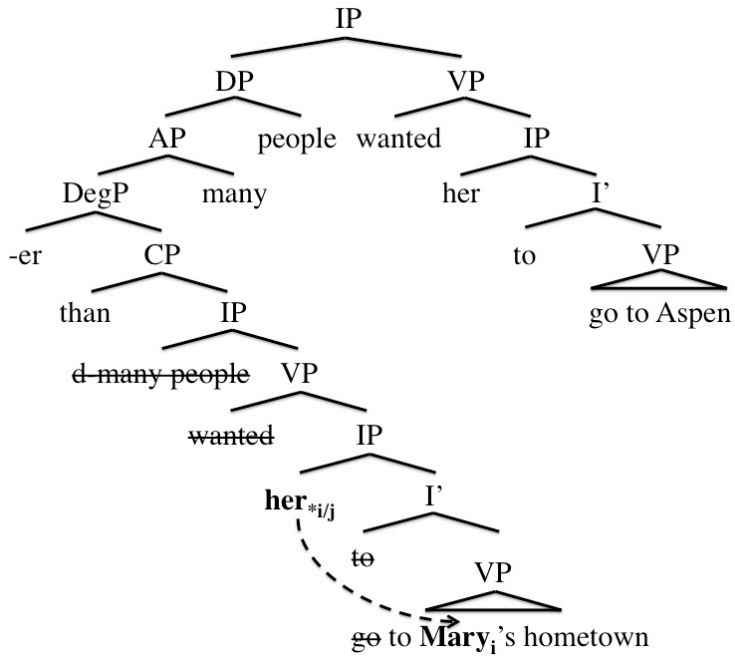
(5) More people talked to **Sally** about **him$_i$** than to **Peter$_i$**'s sister.
More people talked to **Sally** about **him$_i$**
[$_{CP}$ than ~~*d* many people talked to~~ [$_{TP}$ **Peter$_i$**'s sister [$_{T'}$ ~~about~~ ~~**him$_i$**~~]]]

In our experiments, we therefore include subject comparatives such as the one in (6), modeled after those above in that they feature a Principle C violation at LF. The corresponding structure shows the c-command relation between the pronoun and R-expression evaluated at LF. The open question is whether such sentences are actually deemed ungrammatical or unacceptable, even despite a supposed Principle C violation.

(6) Subject comparative

a. More people wanted **her**$_{*i/j}$ to go to Aspen than to **Mary**$_i$'s hometown.
More people wanted **her**$_{*i/j}$ to go to Aspen than [~~d-many people wanted **her**$_{*i/j}$ to go~~] to **Mary**$_i$'s hometown.

b.



This brief theoretical introduction is intended to capture the structure of the target comparative constructions with pronominal reference, which become the basis for the following experiments. No matter what the configuration of the comparative construction is, Principle C should always be active, and should invariably be implicated whenever a pronoun is in a position to c-command an R-expression. We thus predict that participants who represent not just the surface material, but also the elided material, of comparative constructions correctly should apply Principle C and bar co-construal between a pronoun and an R-expression accordingly when Principle C prevents it. This applies to children and adults alike.

There is supporting independent evidence from previous experimental work with children (see Crain & McKee, 1985; Crain & Thornton, 1998) and adults (see Kazanina *et al*., 2007) of experimental participants' strict adherence to Principle C. Thus, any departure from what is

expected from the application of grammatical binding constraints should signal challenges posed by this particular construction, rather than (lack of) knowledge of the binding constraints. In particular, given the way that the processor incrementally encounters pronominal information and elided material (or the evidence for it), in object and subject comparatives, we might predict interpretational differences linked to the structural position of the pronoun such that when there is a pronoun in subject position, the sentence processor is immediately recruited to look for a possible antecedent, and enlist knowledge of binding constraints in that search. However, when the pronoun comes later, the processor may prioritize another search over binding constraints (e.g., one to retrieve material that will generate a sensible interpretation). Moreover, when the processor is immediately called upon to interpret the comparative when *more* appears in subject position, we might predict that the processor is preoccupied by the search for the comparative alternative, pulling attention away from referential relations and towards comparative meaning and coherence. For example, so-called 'grammatical illusions' have been attested with subject comparatives (Phillips, Wagers, & Lau, 2011; Wellwood *et al*. 2018), suggesting that subject comparatives may diverge from object comparatives in the extent to which participants find otherwise ungrammatical comparatives to be acceptable.

One might, however, wonder whether the interpretation of our target constructions is simply beyond the capacity for children. We have reason to think not. While children have been known to produce deviant comparative constructions well through age five and six (Gathercole, 2009; Hohaus, Tiemann, & Beck, 2014; Moore, 1999), and occasionally interpret comparatives in a non-adult-like manner (e.g., Bishop & Bourne, 1985; Donaldson & Wales, 1970; Layton & Stick, 1979; a.o.) (see extensive discussion in Syrett (2016)), they have also been shown to successfully interpret basic comparative constructions correctly in recent experimental tasks in

which the cognitive pressure is low and the context supports the comparison (Syrett, 2015; Syrett & Lidz, 2011). Our line of research is the first (to our knowledge) that systematically probes how children and adults interpret comparatives involving pronominal reference.

Moreover, children possess the ability to interpret elided material that stands in a relation to surface material (specifically, instances of verb phrase ellipsis) (Foley *et al*., 2003; Matsuo & Duffield, 2001; Syrett, 2015; Syrett & Lidz, 2009, 2011). Thus, any departure from an adult-like interpretation should not signal a challenge in representing the elided material *per se*, but rather a developmental décalage (although not necessarily in the Piagetian sense) in the representation of that precise material (e.g., pronouns). With this knowledge in hand, we now turn to the presentation of three experiments designed to probe how adults (Experiment 1-3) and children (Experiment 3) fair with comparative constructions involving pronominal reference.

3. Experiment 1: Forced-Choice Task

3.1. Participants

45 undergraduates, all native speakers of English, participated. Adults in all of the experiments reported in this paper were undergraduates at Rutgers University – New Brunswick who received course credit in Linguistics or Cognitive Science for their participation. All participants were native speakers of English.

3.2. Materials and Procedure

The target items were all object and subject comparative constructions involving backwards anaphora, some of which were modeled after key examples discussed by Bhatt & Takahashi (2011) and elsewhere in the theoretical literature on comparatives. The full set of target items for all three experiments is listed in the appendix. All object comparatives featured a pronoun in the matrix clause, which c-commanded an R-expression in the standard *than*-clause. The pronoun

was either in the matrix subject position (as in (7)) or matrix object position (as in (8)). In either case, a violation of Principle C was expected under a co-construal relation with the R-expression, thereby yielding ungrammaticality.

(7) **She**$_{*i/j}$ is eating bigger breakfasts than **Jane$_i$** did last year.
She is eating bigger breakfasts than Jane [~~ate d-big breakfasts~~] last year

(8) The travel agent offered **her**$_{*i/j}$ a better deal than he offered **Mary$_i$** last year.
The travel agent offered her a better deal than he offered Mary [~~a d-good deal~~] last year

All subject comparatives featured one of two of types of matrix predicates and corresponding syntactic structures: ECM (e.g., *want*), as in (9)-(10), and ditransitives (e.g., *introduce*), as in (11). These items were designed as minimal pairs, where one was predicted to be grammatical and the other ungrammatical, based on whether or not a Principle C violation was incurred, based on the presence of the pronoun in the elided material, even though on the surface the pronoun always preceded the R-expression. In one variant, the pronoun was in the elided material in a position that c-commanded the R-expression in the standard phrase, as in (9), while in the other, the pronoun was in the elided material in a position that was c-commanded by the R-expression in the standard phrase, as in (10).

(9) More people wanted her$_{*i/j}$ to go to Aspen than to Mary$_i$'s hometown.
…than [~~d-many people wanted **her**$_{*i/j}$ to go~~] to **Mary**$_i$'s hometown.

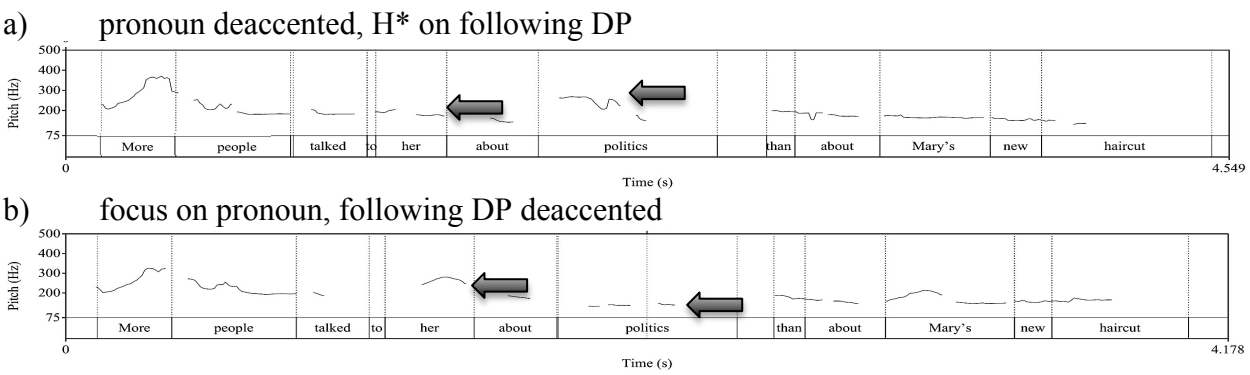
(10) More classmates wanted Alec to date her$_{i/j}$ than Jane$_i$'s next door neighbor.
…than [~~d-many classmates wanted~~] **Jane**$_i$'s next door neighbor [~~to date **her**$_{i/j}$~~].

(11) More cast members introduced her$_{*i/j}$ to the male lead than to Mary$_i$'s understudy.
…than [~~d-many cast members introduced **her**$_{*i/j}$~~] to **Mary**$_i$'s understudy.

There were six object and six subject comparatives. Controls included two sentences with antecedent-contained deletion involving licit and illicit co-reference. Stimuli were presented in pseudorandomized order.

All sentences were also recorded in a sound-attenuating recording booth by a female native speaker of English (the first author). Prosody was manipulated so that the pronoun was either deaccented and key syllable in the following DP received an H* pitch accent, or the pronoun was assigned contrastive focus, as shown in Fig. 1. Participants were randomly assigned to one of these two prosodic conditions. This manipulation was done for two reasons. First, placing contrastive focus on the pronoun favors an interpretation in which this individual is distinct from the one associated with the name that follows. Second, if the pronoun is deaccented, the relation between the possible co-construed individuals may be backgrounded against another highlighted comparison between other entities (e.g., locations, other individuals, etc.), thereby allowing the focus to shift to that comparison in lieu of co-construal relations.

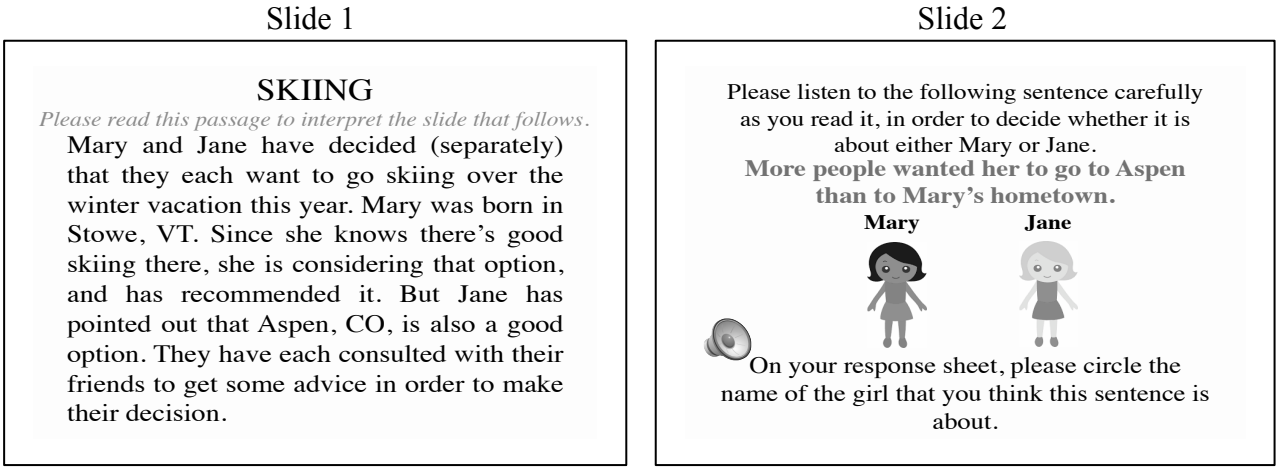
Fig. 1. Two pitch tracks for the target subject comparative sentence *More people talked to her about politics than about Mary's new haircut*



Each trial consisted of two slides, as illustrated in Fig. 2. Slide 1 featured a scenario involving two characters of the same gender (*Mary* and *Jane*). Their salience was approximately equivalent in the scenario, so as not to bias participants towards one or the other as a potential antecedent. After participants had read the scenario on Slide 1, they clicked to advance to Slide 2, in which they encountered a target sentence presented in written form accompanied by the same sentence presented twice consecutively in aural form. Participants were asked to read and

listen to the sentence, and decide which character it was about. They then circled their response (*Mary* or *Jane*) for each trial on a paper and pen questionnaire. They were instructed not to change their responses after they had been recorded. The experimental session began with a brief training session to acclimate participants to the task.

Fig. 2. Slides for one target trial involving a subject comparative in Experiment 1



We predicted that for comparative constructions involving a Principle C violation (all of the object comparatives and half of the subject comparatives), the sentence should be judged as unacceptable under a co-construal relation between the pronoun and R-expression appearing in the standard of comparison. At the same time, however, we predicted that our prosodic manipulation of pitch accenting would also exert an influence in that pitch-accented pronouns might enhance this ungrammaticality (if there is not already a floor effect of unacceptability), and deaccented pronouns might allow for some degree of (unexpected) acceptability.

We further predicted that if any ungrammatical comparatives were to be seen as acceptable under a co-construal relation, they would more likely be the subject than the object comparatives, given previous findings that participants are often 'lured' into accepting and producing otherwise ungrammatical subject comparatives (Townsend & Bever, 2001). We

therefore predicted that when given the choice between two possible antecedents, participants would by default systematically choose the antecedent representing disjoint reference when Principle C disallowed co-construal, but that this preference would be mediated by the pitch accenting on the pronoun (deaccented v. focused) and the type of comparative (subject v. object).

3.3. Results

Object comparatives

Recall that all target object comparatives involved Principle C violations, and were therefore predicted to be ungrammatical with a co-construal relation between the pronoun and R-expression in the sentence. As expected, participants almost never allowed co-construal relations between the pronoun and R-expression, regardless of the position of the pronoun, and systematically selected the referent representing disjoint reference. When the pronoun was in the subject position, percentage of accepting the 'co-construal' referent was 6.7%. The highest percentage (20%) was seen in the target sentences where it would have been anticipated: a *deaccented* pronoun in *non-subject* (indirect object) position.

Subject comparatives

Recall that subject comparatives were split between those that were grammatical and those that were not, based on the presence of the pronoun in the elided material relative to the R-expression in the standard clause. When Principle C ruled against co-construal, participants consistently selected the referent representing disjoint reference. However, their choices were influenced by syntactic structure. With ECM predicates (e.g., *want*), the acceptance rate was below 20%, while for ditransitives (e.g., *introduce*), it ranged between 26% and 32%. When Principle C allowed for the possibility of co-construal, participants chose the referent representing this relation between 23% and 58% of the time in these cases. Binomial logistic regression model with random

intercepts for subjects revealed significant effect of Principle C effect on responses indicating acceptability of co-construal (β = -1.52599; SE = 0.36237; $p < 0.01$).

3.4. Discussion

In this binary forced-choice task, participants were given the choice between two possible antecedents: one representing disjoint reference and the other representing a co-construal relation between the pronoun and an R-expression in the standard of comparison. We found that participants rather consistently preferred to select the antecedent representing disjoint reference across comparative types when Principle C barred co-construal. However, this does not mean that Principle C was the sole determiner, since participants were also inclined against selecting this referent in cases where Principle C was silent, thus reflecting a possible bias against a co-construal interpretation in these sentence types. Even so, participants were still willing to select the co-construed referent in some subject comparative cases, leading us to wonder whether participants would find co-construal relations *acceptable* in a judgment even if they might not *choose* this option in a preference task. More specifically, a forced choice task such as Experiment 1 introduces both possible referents, and participants are asked to choose between the two. Opting for one over the other does not mean that the referent that was not selected could not have been selected at all. A forced-choice task illustrates preference of one referent over another, but not acceptability of either choice. We therefore conducted Experiment 2.

4. Experiment 2: Truth Value Judgment Task

4.1. Participants

45 undergraduates, all native speakers of English, participated. None also participated in the previous forced-choice task presented in Experiment 1. Two additional participants were excluded due to non-native status.

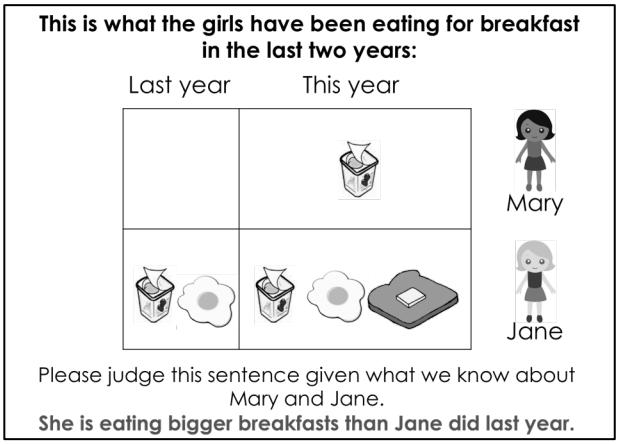
4.2. Materials and Procedure

The target sentences were the same types of object and subject comparatives with backwards anaphora as seen in Experiment 1. However, in this experiment, we increased the number of object comparatives to 12 and included six subject comparatives. Prosody was only manipulated for object comparatives in Experiment 2, because it was only with these comparatives in Experiment 1 where prosody seemed to exert an influence, if any. The pronoun was always deaccented for the subject comparatives. Controls included six control comparatives and four ACD controls with licit and illicit co-reference. As before, all target and control sentences were presented in a pseudo-randomized order.

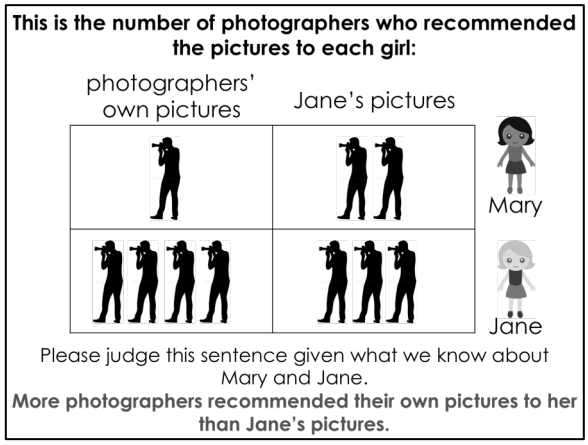
We ran a modified Truth Value Judgment Task (Crain & Thornton 1998). It was 'modified' in the sense that participants were asked to judge the truth value of a proposition expressed by an utterance in the context of an experimental scenario, but not all of the conditions inherent to a traditional TVJT were satisfied. As before, stimuli were presented via slides on a computer, and participants completed their responses using a paper and pen questionnaire. Each trial was composed of one slide on which the information was displayed incrementally. (The final display for two such trials appears in Fig. 3 below.) Initially, participants saw a chart presenting quantitative information about two same-gender characters. Participants were asked to review the chart, then click to reveal the target sentence underneath the chart. The visual sentence was accompanied by an auditory version of it repeated twice aurally. Participants were asked to judge the truth value of the sentence, given the information presented in the chart, and to also provide numerical justification for their answer. This justification confirmed that they were interpreting the comparative as intended. An example was provided in the training session.

Fig. 3. Slides for two target trials, one involving an object comparative (left) and a subject comparative (right) in Experiment 2. The truth values would be false under disjoint reference, and true under co-construal.

Slide 1



Slide 2



4.3. Results

Recall that in Experiment 1, participants opted out of selecting a referent that would indicate co-construal for object comparatives. However, their responses appeared to have been influenced by prosody, in that a deaccented pronoun allowed co-construal interpretations to seep in. With subject comparatives, responses were influenced by Principle C and argument structure. When Principle C was silent on the possibility of co-construal, participants occasionally allowed such an interpretation, but when Principle C ruled against it, participants' responses depended on the syntactic structure and the position of the pronoun. We were therefore curious to see whether in a judgment task, participants would also indicate acceptability of such grammatically barred interpretations of subject comparatives, and at a higher rate than exhibited in a forced-choice task, where a referent representing disjoint reference was an explicit option. Our results, presented below, confirm this intuition.

Object comparatives

As anticipated, participants found a co-construal relation to be largely unacceptable for object comparatives, where Principle C ruled against it. Consistent with the results of Experiment 1,

acceptance of co-construal relations when the pronoun was in subject position was near zero (2.2%). However, when the pronoun was in the indirect object position, acceptability of a co-construal relation depended on whether or not the pronoun was deaccented or received stress. When the pronoun was focused, acceptance was 10.3%, but when the pronoun was deaccented, acceptance was 41.9%, significantly higher than would be predicted by the grammar. Binomial logistic regression model with random intercepts for items revealed significant effect of pitch on responses indicating acceptability of co-construal in such constructions (β = -1.8405; SE = 0.6117; $p < 0.03$).

Subject comparatives

Equally striking was the pattern of results observed with subject comparatives. Recall that for half of these, Principle C ruled out co-construal, while for the other half, Principle C was silent about this possibility. However, there was no detectable difference between these two cases, regardless of Principle C. The percentage of responses reflecting co-construal ranged between 40%-58.1% and 43.6%-55.8%, respectively. Accordingly, binomial logistic regression model with random intercepts for subject and items revealed no significant effect of Principle C effect on responses indicating acceptability of co-construal (β = -1.0498; SE = 0.5777; $p = 0.07$). Table 1 presents the results for Experiment 1 and Experiment 2 in terms of responses indicating co-construal (dependent measures: Exp. 1 selection character, Exp. 2 *yes/no* response).

Table 1. Experiment 1 and Experiment 2: Responses indicating co-construal of pronoun and DP in target sentences, given structure

		Object comparatives (subj proN, obj proN)	**Subject comparatives (ECM, 3-place predicate, PP adj. to VP)**	
	pronoun	**Principle C violation**	**Princ. C violation**	**Princ. C observed**
Exp 1	deaccented	6.7%, 20.0%	11.6%, 31.8%, n/a	57.7%, 23,1%, 46.2%
	stressed	6.7%, 0.0%	15.8%, 26.3%, n/a	47.4%, 26.3%, 42.1%
Exp 2	deaccented	2.2%, 41.9%	40.0%, 58.1%, n/a	55.8%, 43.6%, 47.2%
	stressed	2.2%, 10.3%	---	---

4.4. Discussion

The results of this experiment bolster those of Experiment 1 to reveal that in these comparative constructions exhibiting backwards anaphora, in which a pronoun precedes an R-expression with which it may be co-construed, participants exhibit a consistent willingness to allow co-construal, even when Principle C bars it. The type of comparative (object v. subject), the placement of the pronoun in object comparatives (subject v. indirect object), and the prosodic manipulation of focus on the target pronoun (deaccented v. focused) all interact with Principle C to yield occasional judgments of acceptability or preference of co-construal, despite Principle C's categorical pronouncement. We now turn to Experiment 3 (a, b), which probed children's and adults understanding of subject and object comparatives, and their sensitivity to constraints imposed by Principle C.

5. Experiment 3a: Act-Out Task

5.1. Participants

26 children (8 boys, 18 girls; range: 4;6-6;5, M: 5;2) and 28 English-speaking adult controls participated. Children were recruited from area preschools and tested in a quiet room on the premises.

5.2. Materials and Procedure

As mentioned above, test items were constructed to resemble comparative constructions discussed by Bhatt and Takahashi (2011) (based on Lechner (2004)) and others appearing in the theoretical literature, which involved pronominal reference. They included two subject comparatives ((12)-(13) below) and three object comparatives ((14)-(16) below).

(12) More lambs walked from Belle to him$_{i/j}$ than from Harris$_i$'s brother.
LF: … than [d-many lambs walked] from **Harris**$_i$'s brother [to **him**$_{i/j}$].

(13) More blocks connected him$_{*i/j}$ to Minnie than to Flynn$_i$'s horse.
LF: … than [d-many blocks connected **him**$_{*i/j}$] to **Flynn**$_i$'s horse.

(14) King Triton gave more lizards to her$_{i/j}$ than Olivia$_i$'s mother.[1]
LF: … than **Olivia**$_i$'s mother [gave d-many lizards to **her**$_{i/j}$].

(15) Nemo delivered more presents from him$_{*i/j}$ to Flounder than to Eric$_i$'s dog.
LF: …than [Nemo delivered d-many presents from **him**$_{*i/j}$ to] to **Eric**$_i$'s dog

(16) She$_{*i/j}$ gave more cones to Winnie-the-Pooh than to Sleeping Beauty$_i$'s godmother.
LF: … than [**she**$_{*i/j}$ gave d-many cones] to **Sleeping Beauty**$_i$'s godmother

Each sentence featured a personal pronoun appearing before the standard clause (though in variable positions, as seen above) and an R-expression appearing in the standard clause. Based on the position of the elided material, and therefore the resulting c-command relation between

[1] This sentence is, of course, ambiguous, allowing for interpretations where Olivia's mother is either the subject or the object in the standard clause. The experimental scenario made very clear that the King and the Mother had the toy lizards and were the ones doing the distributing to the little girls. Each of the adults told the girls about their lizards (which were placed next to them), and wore special special bows around their necks, which corresponded to the color of their respective lizards (which they noted to the girls). Finally, in the scenario, the experimenter's lead-in sentence stated that both the King and Olivia's mother were giving out their lizards. The open question was who received them.

the pronoun and R-expression, we co-construal to be either allowed or disallowed. Two had no structural constraints in the standard clause dictating against co-construal, while three incurred a Principle C violation, as marked.

Control items were similar in structure, but did not involve pronominal reference in a comparative construction; rather, the controls teased these two elements apart. Two featured pronouns in syntactic configurations that barred co-construal because of the c-command relation between the pronoun and R-expression ((17)-(18)), while two others involved basic subject and object comparatives without pronouns (one subject, one object) ((19)-(20)).

(17) $\text{He}_{*\mathbf{i/j}}$ ate the cake, while the Smurf_{i} was dancing. (Crain & Thornton, 1998)

(18) Sebastian found a present from $\text{her}_{*i/j}$ to Ariel_{i}'s sister.

(19) More cars drove into the town than into the woods.

(20) Sheriff Woody fed more bear cubs than Jessie.

Each test or control trial began with a traditional TVJT (Crain & Thornton 1998) setup. One experimenter positioned a set of props for the story on the table in front of the participant (along with a puppet played by another experimenter for child participants). The first experimenter then proceeded to tell a story with the props. Towards the end of the story, when the target sentence was about to be delivered, participants were asked to act out the target sentence using the props for the test items and some of the control items, and to judge the truth value of the target sentence for the other controls. The prompt to act out the target sentence (delivered by the puppet for children, and the experimenter for adults) was always the target sentence as a lead-in followed by, "Could you show me that? Could you show me (that) [sentence]?" Experimenters were carefully trained to avoid placing a pitch accent on the pronoun or using contrastive focus, in order to avoid prosody that would favor non-default (i.e., disjoint)

pronominal reference, thus leaving open the possibility of co-construal between the pronoun and R-expression (apart from grammatical constraints).

Each test story featured two salient candidate referents, each of the same gender. In the scenario accompanying the target sentence in (16), Sleeping Beauty and Hello Kitty (two female characters) are on a playdate. They decide to play a game with some toy cones that are lying around. One set is pink (matching Hello Kitty's dress) and the other yellow (matching Sleeping Beauty's hair) (a correlation upon which these characters remark). Each girl receives the same number of cones (3). In the game, the cones are to be distributed somehow to two other characters, Winnie-the-Pooh and Sleeping Beauty's Godmother, who are nearby. The latter was referred to with the possessive construction and not by a name, to mirror the sentences from the theoretical literature and allow for the pronoun to be able to potentially refer to the character herself, and c-command an expression in which this character's name appears.

Conditions of falsification and plausible deniability were satisfied in each story, and in the TVJT trials, the props were positioned so as to provide participants with a record of events of the story. For Act-Out trials, participants were enlisted to create this themselves. Stimuli were presented in a pseudorandomized order. Participants engaged in a brief training session that consisted of one TVJT and one Act-Out Task, familiarizing them with the testing procedure. Following the training session, they proceeded to the test session proper. Each total experimental session lasted approximately 30-40 minutes.

Control TVJT items were analyzed for percentage of predicted *yes/no* responses. The dependent measure for the control Act-Out items was the percentage of time the quantity of items distributed reflected a grammatically-licensed interpretation of the comparative. For example, in (19), more cars had to drive into the town than into the woods, and in (20), Sherriff

Woody had to feed more bear cubs than Jessie did. Only those participants who responded as anticipated with half or more of the control items had their data included in analysis.

For the test items, the dependent measure was the percentage of times participants allowed for co-construal between the pronoun and R-expression and acted out the scenario accordingly. We predicted that if participants were guided primarily by Principle C, and also evaluated it at LF, they would not allow a co-construal interpretation in any sentence where the pronoun c-commanded the R-expression. Importantly, this c-command relation is determined by the presence of the pronoun in the elided material, not only by the surface position of the pronoun.

Thus, for (16), we hypothesized that Principle-C-abiding participants who set up a syntactic structure roughly equivalent to that of Fig. 4 would configure the props so that Hello Kitty, and not Sleeping Beauty was mapped to *she*, and distribute the cones to Winnie the Pooh and the godmother as in Fig. 5, or in a similar way that was faithful to the relation of quantities expressed by the comparative construction (e.g., 3-0, 2-1, 1-0). A participant who does not obey Principle C would be free to allow *she* to be interpreted as Hello Kitty or Sleeping Beauty, as shown in Fig. 6. However, *all* participants who interpret the comparative relation correctly should distribute the quantities so that Winnie the Pooh receives more cones than the godmother (and likewise for all other sentences).

Fig. 4. Syntactic representation of the comparative *She gave more cones to Winnie the Pooh than Sleeping Beauty's godmother*

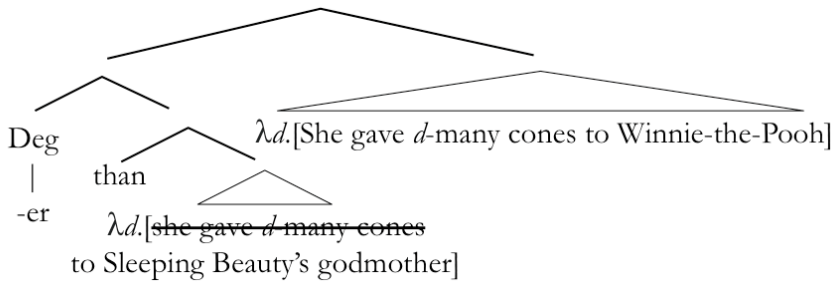


Fig. 5. One possible configuration representing a grammatical interpretation of the target comparative *She gave more cones to Winnie the Pooh than Sleeping Beauty's godmother* (image key: crown=Sleeping Beauty, face with whiskers=Hello Kitty, bear shape=Winnie the Pooh, wand=Fairy Godmother)

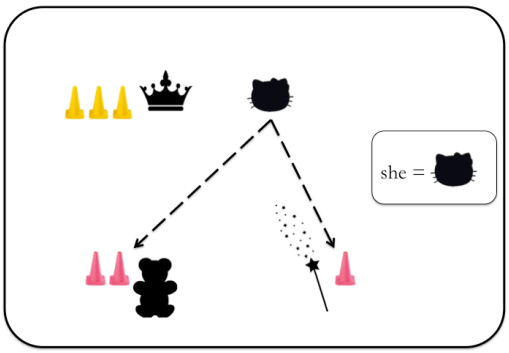
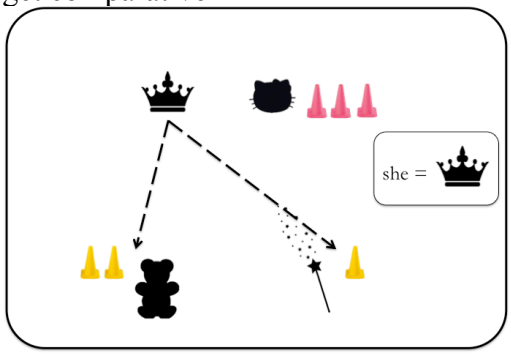


Fig. 6. One possible configuration representing an ungrammatical, Principle C-violating interpretation of the same target comparative



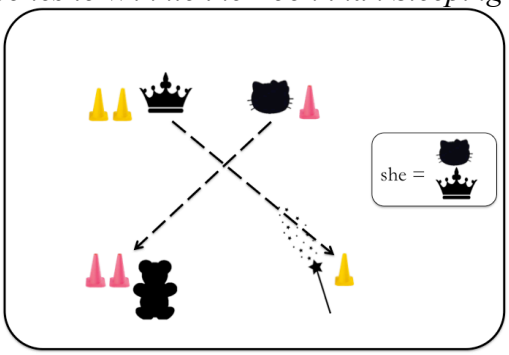
5.3. Results

We begin by discussing performance on control items. Neither children nor adults had any difficulty creating grammatically appropriate scenarios for the Act-out items or judging the truth value of TVJT items. Performance was at or near ceiling for all participants: the average percentage of correct responses on control comparatives was approximately 83% for children and 99% for adult controls.

The responses to the test items, however, were not as anticipated. To begin, both children and adults acted out interpretations that did not adhere to Principle C. Only 45% of all children's responses, and 57% of all adults' responses were as anticipating with respect to this binding principle. For both children and adults, binomial logistic regression model with random intercepts for subject and items revealed no significant effect of Principle C effect on responses

indicating acceptability of co-construal (children: β = 0.1708; SE = 0.4289; p = 0.69; adults: β = -0.1051; SE = 0.5648; p = 0.85). Even more unexpected yet was a pattern of responses observed in the child population that we had *not* anticipated. In 36% of the scenarios acted out across five test items and 26 child participants, children distributed the props from *both* possible antecedents. For example, after having been told the story and presented with the test sentence, children then proceeded to distribute cones from both Hello Kitty *and* Sleeping Beauty (each giving some number of cones to one of the other two characters), making one character give cones to Winnie the Pooh and the other give cones to the Godmother, in a quantity relation consistent with the interpretation with the comparative construction, as illustrated in Fig. 7. We therefore term this type of response a "two-giver" response. In all such responses, the female referent for the overt *she* was therefore different than the female referent for the covert *she*.

Fig. 7. One of the configurations provided by children reflecting an interpretation of the target comparative *She gave more cones to Winnie the Pooh than Sleeping Beauty's godmother*



This response type was not isolated or restricted to a handful of children. 19 of the 26 child participants displayed it at least once across test items, and 11 children for three or four of the test items, as shown in Table 2. There was no correlation with age of participant, although we did admittedly target a narrow age range on purpose. Adults, however, did not fall prey to such a response pattern, and only displayed the expected "one-giver" type of response, albeit often disobeying Principle C.

Table 2. Number of children across five test items displaying the unanticipated "two-giver response" in Experiment 3a

# test items displaying pattern	# children providing 2-giver response
0	7
1	4
2	4
3	9
4	2
5	0
Total	**26**

Thus, while all participants correctly interpreted the relation of quantities expressed in the comparative construction, both adults and children diverged from predictions generated by Principle C, and children produced an interpretation that we could not have anticipated – namely, one in which the surface pronoun and elided pronoun mapped on to two different individuals.

5.4. Discussion

In Experiment 3a, we found that, contrary to what would have been predicted by constraints on reference and co-construal determined by Principle C, participants consistently produced scenarios that diverged from these predictions. Moreover, children produced scenarios that corresponded to an underlying representation in which the surface and elided material were not interpreted identically. The question therefore arises: what can account for these unexpected responses, when participants otherwise interpreted the relation of quantities accurately? We address each divergent pattern in turn.

One possibility for the failure to adhere to Principle C is that in light of the pressure to resolve pronominal reference and arrive at an interpretation and configure the props accordingly, participants (in a way) flipped a coin and chose one of the two available candidates presented to them. Another possibility is that the scenarios favored a plausible co-construal interpretation, and as a result, participants momentarily relaxed the binding constraints, in favor of allowing for an

interpretation that was supported by the story acted out with the props by the experimenter. Evidence that one of these two explanations may be on the right track comes from performance on the two control items that involved a Principle C violation ((17) and (18)). While adults almost never permitted co-construal between the pronoun and R-expression when it was illicit (e.g., (17) and (18) above), children did approximately half of the time (51%). This pattern lies in contrast to the one reported by Crain & McKee (1985) and Crain & Thornton (1998), who showed that children typically obey Principle C. However, it is also possible that children simply re-interpreted (17) as (21), which is a construction that permits backwards anaphora.

(17) $\text{He}_{*\mathbf{i/j}}$ ate the cake, while the Smurf_{i} was dancing. (Crain & Thornton, 1998)

(21) While $\text{he}_{\mathbf{i/j}}$ ate the cake, the Smurf_{i} was dancing.

The responses to the second pronominal control item in (18), however, may be more telling. Co-construal is not allowed by Principle C with this item, and yet *both* child and adult participants allowed co-construal at a highly unexpected rate (93% and 64%, respectively). It is therefore possible that both age groups were more lenient than their grammars would normally allow in permitting co-construal relations, because they were presented with scenarios that made this relation plausible, while needing to resolve pronominal reference over and over again.

There is, however, the separate issue of children's unexpected "two-giver" responses. We present an explanation for this pattern that appeals to their syntax-semantics representations shortly. In the interim, however, we entertain one non-grammatical possibility for why children produced such responses, namely that children were influenced by the setup of the props and the scenario to assume that *both* characters were involved in the event, and e.g., that in (16), both characters had to participate in giving. If this is the case, then tweaking the scenario in order to make clear that one character is involved in the event should reduce this type of response

drastically. However, if children's abstract representations are responsible for this response type, the pattern should persist (but perhaps at a lower rate). We therefore decided to run a second version of the task, which we report in Experiment 3b.

6. Experiment 3b: Act-Out Task

6.1. Participants

18 children (8 boys, 10 girls; range: 4;3-6;1, M: 5;1) and 43 English-speaking adult controls participated. None of the participants in 1b had participated in 1a. Children were recruited from area preschools and tested in a quiet room on the premises. Adults were undergraduates at Rutgers University. All participants were native speakers of English. Data from five additional children were excluded due to inability to complete the task (n=3) and inability to understand the task (n=2). Data from three additional adults were excluded due to non-native speaker status (n=2) and inattentiveness (n=1).

6.2. Materials and Procedure

The materials and procedure were highly similar to Experiment 3a, with a few exceptions. First, we pared down the number of items so that the session lasted 20-25 minutes, removing the two pronominal control items and including only the two controls that allowed us to check that participants were distributing the quantities correctly, and removing one of the test items. We also hoped that excluding these items would allow for participants to not be overwhelmed by needing to resolve pronominal reference throughout the session. The test sentences were as follows.

(22) More lambs walked from Belle to $\text{him}_{i/j}$ than from Harris_i's brother.
LF: … than from **Harris**$_i$'s brother [to **him**$_{i/j}$].

(23) King Triton gave more lizards to $\text{her}_{i/j}$ than Olivia_i's mother.
LF: … than **Olivia**$_i$'s mother [… to **her**$_{i/j}$].

(24) Minnie delivered more presents from him$_{*i/j}$ to Flounder than to Eric$_i$'s dog.
LF: …than [from **him**$_{*i/j}$ to] to **Eric**$_i$'s dog

(25) She$_{*i/j}$ gave more cones to Winnie-the-Pooh than to Sleeping Beauty$_i$'s godmother.
LF: … than [**she**$_{*i/j}$ gave …] to **Sleeping Beauty**$_i$'s godmother

Second, we included additional wording in the scenarios that emphasized that only one character was involved in the target event. The scenario accompanying (25) thus read as in (26).

(26) Scenario leading in to (25)

Narrator: This is Sleeping Beauty. And this is her friend Hello Kitty! And one morning they decided to play a game with their cones.

Hello Kitty: Look, I have pink cones, because they match my pink bow!

S. Beauty: And I have these yellow ones, because I have beautiful golden hair. Hey, look-there's my fairy godmother. I bet she'll play with us!

Hello Kitty: I see Winnie-the-Pooh. I bet he'll play a game with us, too!

Narrator: And so Sleeping Beauty and Hello Kitty decided to invite Sleeping Beauty's godmother and Winnie-the-Pooh to play.

W.-the-Pooh: We'd love to play your cone game! But we don't have much time before the ball starts!

Godmother: Can <u>one</u> of you share your cones with us?

Narrator: Hello Kitty and Sleeping Beauty thought this was a great idea. And…she gave more cones to Winnie-the-Pooh than to Sleeping Beauty's godmother.

Puppet: Oh, yes, I see. Can you now show me that? Can you make it so that …
She gave more cones to Winnie-the-Pooh than to Sleeping Beauty's godmother.

Based on previous responses, we also substituted in a similar scenario for (13) with a simplified plot and featured a female subject in (15), although the syntactic construction remained the same.

6.3. Results

With the new manipulations, the percentage of participants adhering to Principle C's constraints when determining their configurations for the two target cases in which Principle C ruled out a referent increased to 63% for children and 74% for adults. However, this number is still lower

than would have been expected given a categorical grammatical constraint – an observation that may be relevant to the experiments that follow. Accordingly, binomial logistic regression model with random intercepts for subject and items revealed no significant effect of Principle C effect on both children's and adults' responses indicating acceptability of co-construal (children: $\beta = 0.3542$; SE = 0.5189; $p = 0.50$; adults: $\beta = 0.7513$; SE = 0.8368; $p = 0.37$). The second manipulation where we emphasized that only one participant participated in the event also appears to have been successful. In lieu of the 73% of children who provided at least one "two-giver" response in Experiment 3a, only 44% did this time, as shown in Table 3. However, the combination of the number of children providing such a response across the two experiments, the number of children persisting with this response type in spite of an explicit statement that only *one* character participated in Experiment 1b, and close inspection of videos of the children's experimental sessions leads us to entertain the possibility that such an interpretation is indeed licensed by children's abstract representations of these sentences – namely, how they interpret the elided material. We turn to this possibility in the discussion section.

Table 3. Number of children across four test items displaying the unanticipated "two-giver response" in Experiment 3b

# test items displaying response	**# children providing response**
0	10
1	2
2	4
3	1
4	1
Total	**18**

6.4. Discussion

In both Experiment 3a and 3b, participants demonstrated a willingness to retrieve interpretations that disobeyed Principle C. However, we saw that our manipulations seem to have decreased the processing load, thereby reducing the percentage of such illicit responses, albeit not at a rate that

one would predict from a categorical binding constraint. We return to this point in subsequent experiments. For now, we note that the manipulation had some degree of the desired effect, demonstrating that this binding constraint is indeed active for our participants. Perhaps more interesting though was the pattern of responses exhibited exclusively by children in which two characters participated in the target event, indicating that the surface and elided pronouns were not being interpreted identically, as they should in a comparative construction. We now turn to this result in particular and focus on a possible grammatical explanation here, appealing to the possibility of children's immature representation of the sentence (specifically the elided material).

We begin by observing that the children who produced such a "two-giver" response effectively allowed for multiple indexing simultaneously between the surface and elided pronoun, as illustrated in (27), whereby each pronoun is mapped onto a different female referent. As a result, in this example (and *mutatis mutandis* for the other examples), the 'she' that gives cones to Winnie-the-Pooh is therefore not the 'she' that gives ones to Sleeping Beauty's godmother, and the elided material does not stand in a strict identity relation with the surface material, contrary to what we observe in the adult grammar.

(27) **She**$_i$ gave more cones to Winnie-the-Pooh
than [~~λd. **she**$_j$ gave d-many cones~~] to Sleeping Beauty's godmother.

Importantly, such a "two-giver" response requires the participant to represent the abstract elided material; without this material, there would only be one individual mapping on to the pronoun in the surface material, and therefore only one giver. Thus, this kind of response is in and of itself evidence for children's ability to represent the elided material.

It is not unreasonable to allow for elided material to be interpreted in a way that is highly similar to, but not in exact identity with, the surface material. The phenomenon of 'sloppy

identity' (as opposed to 'strict identity') (Ross 1967) is by now highly familiar and well attested in cases of verb phrase ellipsis such as (28)-(30) below (Fiengo and May, 1994; Keshet, 2013; Reinhart, 1983; Sag, 1976; Tomioka, 1999). Moreover, there is robust evidence that children of the same age as those participating in this study are able to access both strict and sloppy identity relations in verb phrase ellipsis (Foley *et al*., 2003; Syrett 2015).

(28) Sherlock$_i$ saw his$_i$ hat, and Watson$_j$ did ⟨see his$_{\{i/j\}}$ hat⟩, too.

(29) The girl who gave John$_i$ an award congratulated him$_i$, and the one who gave Bill$_j$ an award did ⟨congratulate him$_{\{i/j\}}$⟩, too.

(30) Sherlock$_i$ enjoys putting his$_i$ life in danger more than Watson$_j$ does ⟨enjoy putting his$_{\{i/j\}}$ life in danger⟩.

A crucial difference between these examples and our target comparative sentences, though, is that with the sloppy identity examples discussed above, an R-expression binds or takes scope over the pronoun with which it is co-construed in each case, or the pronoun is anaphoric to this name. No such relation holds in the comparative constructions we are considering.[2] We are

[2] A reviewer suggests that when ellipsis is resolved, another pronoun would be copied in, allowing for different pronominal reference. We would like very much for this to be the case to parsimoniously explain the child data, but if this were a possibility, then adults should allow for disjoint reference between the surface and elided pronouns, but they do not. The reviewer suggests appealing to deletion of the pronoun as radical deaccenting and invoking a principle that says that for such cases in contexts of parallelism, one would need to place contrastive focus on the pronoun to license disjoint reference. If indeed this is an option, then additional research focusing on why adults do not typically allow for such interpretations is called for, and that is beyond the scope of this paper.

therefore left in search of an explanation that produces an output similar to that of sloppy identity, in which the giver and recipient co-vary, without relying on different indices on the surface and elided pronoun. We propose that one possible explanation is to appeal to functions.[3]

The idea of handling pronouns with functional interpretations is not a new one. Functional interpretations are the backbone of approaches to donkey anaphora sentences such as (31) and (32) (Evans, 1977, 1980; Elbourne, 2001, 2005), where the denotation of the pronoun varies with the assignment function. Heim (1990) and others that follow have thus referred to so-called E-type pronouns like these.

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

(32) If a farmer owns a donkey, he (always) feeds it.

With such examples, the pronoun is interpreted as the value of a contextually salient function *f*, where *f* maps each individual *x* in its domain to a unique individual in the range associated with *x* (Heim 1990). Functional interpretations have also been appealed to in VPE by Tomioka (1999).

How does this kind of functional pronominal interpretation explain children's "two-giver" responses in Experiments 3a and 3b? Let us consider the possibility that children are setting up a representation of the comparatives such as the one in (33) below.

(33) λd (**λx (*f*(x)** gave d-many cones to x) (Winnie-the-Pooh)) than
λd (**λx (*f*(x)** gave d-many cones to x) (Sleeping Beauty's Godmother))

In this representation, *f*(x) is a contextually salient function from individuals to individuals (here, givers and recipients of cones – a relationship that is highlighted in the linguistic and visual stimuli: the narrative and accompanying comparative construction establishes the relationship between a salient female and each of the two individuals named by R-expressions, and the visual

[3] Early ideas leading to this proposal were fleshed out in meetings with Roger Schwarzschild.

configuration on the table in front of the participants also highlights the potential mappings, thereby supporting contextually-salient functions.

Thus, children might arrive at an interpretation that closely resembles the kind of sloppy identity attested in VPE, but for different reasons: they treat the pronoun in the elided material as a functional E-type pronoun, allowing pairs of individuals to co-vary. Given previous findings suggesting that children correctly interpret donkey anaphora (Conway & Crain 1995), such a possibility does not seem far-fetched. What would be required, then, is that children learn that there is a strict identity relation in comparatives, such that the pronoun in the elided material *must* be co-indexed with the pronoun on the surface.

Experiments 3a and 3b revealed children's non-adult-like interpretation of comparatives stemming from their representation of the pronoun in the elided material. We also saw an inclination on the part of both age groups to overlook the constraints imposed by Principle C on co-construal.

7. General Discussion

We began this paper by underscoring the complexity of comparatives, and the unique challenges posed by comparatives involving pronominal reference in which the binding constraints (specifically Principle C) are thereby implicated. After briefly outlining a basic theoretical treatment of our target constructions, we generated two predictions. The first was that participants with grammatical knowledge of the binding constraints and an ability to represent the comparative and the elided material should disallow co-construal between a pronoun in the first part of the comparative (depending on structural position, of course) and an R-expression in the standard phrase, as predicted by the semantic theory. However, this is not what we found, in children or in adults. The second was that the structural position of the pronoun and comparative

material (i.e., *more*) should impact the processing of comparative sentences, and influence the interpretations participants assign to such sentences. This prediction was borne out.

Faced with the results of Experiment 3, one might wonder why children would arrive at an unexpected interpretation of comparative constructions that seems potentially much more complicated than the one that grammar actually licenses. We provided what we think is a reasonable and intriguing explanation of this pattern – namely, that while children can represent the comparative construction proper, the source of the interpretive problem lies in the representation of the elided material: whereas children should be representing an elided pronoun that stands in a strict identity relation with its surface counterpart, they instead generate a functional interpretation, which is recruited elsewhere in the grammar for the interpretation of other structures.

But the open question that remains is why children and adults should appear to overlook the binding constraints imposed by Principle C and allow interpretations that are associated with Principle C violations. Relatedly, why would we also observe a difference in licensing of co-construal relations between subject and object comparatives, with the former more likely to allow interpretations ruled out by Principle C? We think the answer lies in the complexity of processing comparatives, and the order in which the processor is engaged in parsing the material in the comparative construction.

Subject comparatives have been observed to induce so-called 'grammatical illusions' with nonsensical comparatives appearing at first glance to be acceptable, and their conceptual implausibility surfacing only upon further reflection (O'Connor, 2015; Townsend & Bever 2001; Wellwood *et al*. 2018, Phillips *et al*. 2011). This phenomenon is captured with the comparative in (34).

(34) More people have been to Russia than I have.

The subject comparatives in Experiments 1 and 2, like the ones repeated below in (35)-(36), were not entirely like the one above. The ungrammatical co-construal interpretation *was* conceptually plausible; it was just ruled out by Principle C.

(35) a. More people wanted her to go to Aspen than Mary's hometown.

b. More people wanted her to go to Aspen than [d-many people wanted **her** to go to **Mary**'s hometown.

(36) a. More cast members introduced her to the male lead than to Mary's understudy.

b. More cast members introduced her to the male lead than [d-many cast members introduced **her**] to **Mary**'s understudy.

But if Principle C is a hard, inviolable categorical grammatical constraint typically observed by speakers (Kazanina *et al*., 2007), why would experimental participants willingly allow an interpretation ruled out by Principle C here?

We propose that it is for a reason similar to the one for (34). Participants encounter the [*more*+plural] phrase in the subject position, and are immediately triggered to begin setting up a comparison. The focus on this comparison may detract from the resolution of the issue of whether the pronoun and the subsequent R-expression should be co-construed or not. This is more likely to happen when the pronoun is deaccented, and focus is placed elsewhere – namely, on another DP, cueing a different information structure. Thus, participants are lured into a false sense of security of the co-construal relation being possible with subject comparatives, because the first thing they encounter in processing the sentence is the comparative *more*, which engages the processor for other means.

The same thing does not happen with object comparatives where the pronoun is in subject position, as in one of our target object comparatives repeated below in (37). In such cases, the

need to resolve reference arises immediately, and participants must immediately answer the question, *Who is the salient female to which this pronoun refers*? At this point, the constraints imposed by Principle C kick in and exclude those albeit conceptually-plausible possibilities that the grammar simply does not allow.

(37) **She**$_{*i/j}$ is eating bigger breakfasts than **Jane$_i$** did last year.

When the pronoun is in the indirect object position, as in (38) below, attention is directed to the subject of the sentence and the events associated with that entity, and less so on the individual associated with the pronoun, especially when the pronoun is deaccented. In such cases, co-construal is occasionally permitted at a rate not predicted by the grammar,

(38) The travel agent offered **her**$_{*i/j}$ a better deal than he offered **Mary$_i$** last year.

In a way, this phenomenon is highly similar to the one observed by Grant *et al*. (2012) for sentences with Non-Actuality Implicatures (NAIs) such as (39) from Hardt (1993, pg. 131), containing the modal *could*, and (40) from Grant *et al*. (2012, pg. 331), containing the modal *need*. In both cases, there is a mismatch between the passive form of the main verb and the active form indicated for the ellipsis that follows, which is overlooked or found to be acceptable.

(39) This information could have been released by Gorbachev, but he chose not to.

(40) The cookies needed to be made, but the babysitter didn't.

Grant *et al*. (2012) argue that this apparent acceptability comes about because the modals implicate that a state of affairs that could or should hold does not hold in the actual world. The speaker who delivers such an utterance deliberately uses such words to indicate that a particular goal-state is desirable. The NAI thus highlights the information expressed in the antecedent clause and its relation to the information expressed in the following clause and a particular salient question, which the information contained in the ellipsis site helps to address. The listener

who picks up on these cues in the antecedent clause is thus able to draw inferences and use this information to anticipate how the discourse will unfold.

Our target comparative sentences in Experiments 1 and 2 did not include NAIs. However, they accomplished a similar function: the organization of the comparative (i.e., the sentence-initial comparative *more* in subject comparatives, and the appearance of the indirect object pronoun and comparative morpheme following the referential DP subject in object comparatives with prosodic manipulation of pitch accents) highlighted a particular state of affairs, directing participants attention away from violations of the binding constraint incurred by co-construal. As a result, participants deem permissible those interpretations of sentences disallowed by Principle C, because the syntactic structure of the target comparative construction and the prosodic delivery of the utterance conspire to place the focus elsewhere and override constraints on binding to result in a judgment of acceptability, despite ungrammaticality.

Our view is thus consistent with claims by Safir (2004, 2005), who argues that co-relations between nominals may be affected, and co-construal made possible in certain contexts, when what is normally taken to be unexpected (i.e., co-construal between nominal members of an otherwise obviative pair) is taken to be expected. Under this approach, co-construal (which is distinct from coreference and dependence relations) is not solely determined by syntactic structural constraints (in the form of binding principles) in the formal grammar, and may be influenced by other (e.g., conceptual, pragmatic) information in the context.

8. Conclusions

The research findings presented in this paper serve to highlight the perilous nature of interpreting comparatives, in particular, those with pronouns. Just as importantly, though, they also reveal that there is more to assigning an interpretation to a sentence with backwards anaphora than

merely performing a check about c-command relations in the structure and taking Principle C into consideration. Participants rather consistently arrive at judgments indicating acceptability of ungrammatical structures, given key factors that affect the processing of the target comparative constructions. This research therefore serves as a call for future research to investigate participants' interpretation of comparative constructions further, and to probe the factors that we have proposed lead to acceptability judgments that stand at odds with predictions generated by binding constraints the grammar. Comparative constructions will play a central role in this endeavor.

Appendix

Target sentences for Experiments 1, 2

Object comparatives

(41) **She**$_{*i/j}$ is eating bigger breakfasts than **Jane**$_{i}$ did last year.

(42) **She**$_{*i/j}$ is eating smaller dinners than **Mary**$_{i}$ did last year.

(43) The manager offered **her**$_{*i/j}$ a greater discount than he offered **Jane**$_{i}$ last year.

(44) The travel agent offered **her**$_{*i/j}$ a better deal than he offered **Mary**$_{i}$ last year.

(45) The Math teacher gave a higher grade to **her**$_{i/j}$ than she gave to **Jane**$_{i}$ last year.

(46) The Art teacher gave a higher grade to **her**$_{i/j}$ than he gave to **Mary**$_{i}$ last year.

Subject Comparatives

(47) More people wanted **her**$_{*i/j}$ to go to Aspen than to **Mary**$_{i}$'s hometown.

(48) More classmates wanted Alec to date **her**$_{i/j}$ than **Jane**$_{i}$'s next door neighbor.

(49) More cast members introduced **her**$_{*i/j}$ to the male lead than to **Mary**$_{i}$'s understudy.

(50) More photographers recommended their own pictures to **her**$_{i/j}$ than **Jane**$_{i}$'s pictures.

(51) More people talked to **her**$_{*i/j}$ about politics than about **Mary**$_{i}$'s new haircut

(52) More students talked to the department chair about **her**$_{i/j}$ than to **Jane**$_{i}$'s colleagues.

Target sentences for Experiment 3a

(53) **She**$_{*i/j}$ gave more cones to Winnie-the-Pooh than to **Sleeping Beauty**$_{i}$'s Godmother.

(54) Nemo/Minnie delivered more presents from **him**$_{*i/j}$ to Flounder than to **Eric**$_{i}$'s dog.

(55) King Triton gave more lizards to **her**$_{i/j}$ than **Olivia**$_{i}$'s mother.

(56) More blocks connected **him**$_{*i/j}$ to Minnie than to **Flynn**$_{i}$'s horse.

(57) More lambs walked from Belle to **him**$_{i/j}$ than from **Harris**$_{i}$'s brother.

Target sentences for Experiment 3b

(58) **She**$_{*i/j}$ gave more cones to Winnie-the-Pooh than to **Sleeping Beauty**$_i$'s Godmother.

(59) Nemo/Minnie delivered more presents from **him**$_{*i/j}$ to Flounder than to **Eric**$_i$'s dog.

(60) King Triton gave more lizards to **her**$_{i/j}$ than **Olivia**$_i$'s mother.

(61) More lambs walked from Belle to **him**$_{i/j}$ than from **Harris**$_i$'s brother.

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