


## Zero-Adjective contrast in much-less ellipsis: the advantage for parallel syntax

Katy Carlson <sup>a</sup> and Jesse A. Harris<sup>b</sup>

<sup>a</sup>Department of English, Morehead State University, Morehead, KY, USA; <sup>b</sup>Department of Linguistics, UCLA, Los Angeles, CA, USA

### ABSTRACT

This paper explores the processing of sentences with a *much less* coordinator (*I don't own a pink hat, much less a red one*). This understudied ellipsis sentence, one of several focus-sensitive coordination structures, imposes syntactic and semantic conditions on the relationship between the correlate (*a pink hat*) and the remnant (*a red one*). We present the case of zero-adjective contrast, in which an NP remnant introduces an adjective without an overt counterpart in the correlate (*I don't own a hat, much less a red one*). Although zero-adjective contrast could in principle ease comprehension by limiting the possible relationships between the remnant and correlate to entailment, we find that zero-adjective contrast is avoided in production and taxing in online processing. Results from several studies support a processing model in which syntactic parallelism is the primary guide for determining contrast in ellipsis structures, even when violating parallelism would assist in computing semantic relationships.

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### Introduction

Coordinate structures have played a pivotal role in uncovering preferences that are operative during sentence processing. Coordinators like *and*, *or*, and *but* allow a language to generate flexible and recursive structure. Yet, each coordinator imposes specific constraints on its use in ways that may extend beyond the realm of truth-conditional meaning. For instance, a speaker's use of *but* in Grice's (1975) example *Mary is pregnant, but she is pleased* suggests that Mary's being pleased is unexpected given her pregnancy, though no such inference arises with *and*. A sufficiently rich interpretation of the implied relationship between conjuncts requires balancing the specific constraints imposed by a coordinator against knowledge of the discourse, common ground, and the world at large. In order to specify how such information impacts processing decisions in real time comprehension, we first need to understand the relative importance of such constraints and their position within the sentence processing architecture. In this study, we exploit the properties of a lesser-studied connective that provides a window into how the processor resolves conflicting pressures from different kinds of information sources.

We present several experiments that address how the language processor prioritises discourse and pragmatic constraints associated with a highly constrained type of coordination, the *much less* construction, in comparison

to a more general preference for parallel structure in each conjunct. The *much less* ellipsis construction imposes a comparison between its conjuncts according to a context-sensitive scale (as proposed for *let alone*: Fillmore, Kay, & O'Connor, 1988; Harris, 2016; Hulsev, 2008; Toosarvandani, 2010). We exploit this requirement to distinguish general effects of syntactic parallelism from the coordinator specific requirement for a scalar relation between conjuncts.

Furthermore, this narrowly focused research question bears on more general questions regarding how the processor is organised to prioritise solving particular kinds of problems in ellipsis resolution. Our results support a broad, central tenet: not all kinds of information have equal importance in real-time processing, as the processor appears to rely more heavily on surface form and construction-general tactics, such as structural parallelism, in sentence interpretation. However, the processor must still be attuned to construction-specific requirements (e.g. Ong & Brasoveanu, 2014), which guide other processing decisions during ellipsis interpretation.

Before introducing the unique syntactic and pragmatic properties of *much less*, we first review the most relevant properties that studies on processing coordinate structures have revealed about the language processor, namely that it (i) is highly incremental, (ii) engages in some degree of top-down prediction, and (iii) favours conjuncts that are semantically and

structurally parallel. We treat those issues briefly in turn.

### **Processing coordinate structures**

The majority of studies on coordination have focused on the familiar coordinators *and* and *or*, both of which exhibit a great deal of syntactic flexibility. As mentioned, these coordinators can conjoin elements from just about any syntactic category, so long as the semantic representations (or types) match in kind (Partee & Rooth, 1983). Due to their flexibility, coordination structures are often temporarily ambiguous. Yet the human sentence processor does not wait to encounter disambiguating material to begin assigning structure to the input, exhibiting a clear preference for less complex structures, e.g. NP-level coordination structures over sentence-level coordination (Engelhardt & Ferreira, 2010; Frazier, 1987, among others). The preference for a simpler NP-coordination structure is sensitive, but not reducible, to thematic role assignment and general discourse structure (Hoeks, Hendriks, Vonk, Brown, & Hagoort, 2006; Hoeks, Vonk, & Schriefers, 2002), though seemingly not to overall frequency distributions (Engelhardt & Ferreira, 2010; Gibson & Schütze, 1999; Hoeks et al., 2006). Consequently, nearly all current processing accounts integrate default structural preferences and (non-syntactic) contextual information into the eventual interpretation, even if they differ vastly on when and how context impacts parsing routines.

Other coordination structures have been used to make the case that the processor utilises a considerable amount of top-down, predictive information. For example, Staub and Clifton (2006) examined the effect of the correlative/conjunctive adverb *either* to demarcate the size of the conjoined structures before the coordinator *or* in S(entence)-level (1a) and NP-level (1b) coordination.

- (1) a. (Either) [Linda bought the red car] or [her husband leased the green one].  
 b. The team took (either) [the train] or [the subway] to get to the game.

In addition to general facilitation on the initial NP of the second conjunct (*her husband* in 1a and *the subway* in 1b), Staub and Clifton (2006) found that *either* also eliminates the processing penalty for S-level coordination structures (for related findings, see also Frazier & Clifton, 2001; Yoshida, Dickey, & Sturt, 2014), although the position of *either* does not unambiguously determine the scope or size of the conjunct (Larson, 1985; Schwarz, 1999). A natural interpretation of these results is that the

processor predictively anticipates upcoming structure, which consequently facilitates incorporating the structure into a representation as it unfolds (e.g. Altmann, van Nice, Garnham, & Henstra, 1998; see also Staub, 2015, for a review).

Finally, processing coordinate structures is facilitated when the conjuncts are “parallel” in some fashion, a gradient property encompassing similarity in syntactic, semantic, or prosodic features between conjuncts (e.g. Frazier, Munn, & Clifton, 2000; Frazier, Taft, Roeper, Clifton, & Ehrlich, 1984; Henstra, 1996; Knoeferle, 2014; Knoeferle & Crocker, 2009; Poirier, Walenski, & Shapiro, 2012; Sturt, Keller, & Dubey, 2010). For instance, Frazier et al. (1984) found that the second clause of a coordinated structure was read faster in self-paced presentation when it matched the first clause on various factors, such as syntactic voice, thematic role, and animacy. Importantly for our purposes, the advantage for parallel conjuncts extends to cases of ellipsis under conjunction, as well (e.g. Carlson, 2001, 2002; Dickey & Bunker, 2011; Mauener, Tanenhaus, & Carlson, 1995).

In summary, the guiding hypotheses from research into processing coordinate structures are that the processor is highly incremental, predictive, and facilitated by parallelism between clauses, including cases of ellipsis. However, much of what is known derives from the most common forms of conjunction; it is conceivable that less-studied connectives that impose more fine-grained grammatical and extra-grammatical requirements on their conjuncts prioritise the satisfaction of those requirements over more general pressures, like parallelism. Such a result would indicate that what most sentence processing models have long considered core properties of the parser are in fact default processing routines that fail to be realised in construction-specific environments.

### **Focus-sensitive coordination structures**

In order to assess the generality of parallelism in coordination and ellipsis, we turn to sentences coordinated with *much less*, a kind of focus-sensitive coordination (FSC) structure. FSCs generally consist of a full clause followed by a phrase introduced by a coordinator (in English: *much less*, *let alone*, or *never mind*), and there are diverse constraints on their grammatical use (Fillmore et al., 1988; Harris, 2016; Hulse, 2008; Toosarvandani, 2010). The coordinator is typically licensed only in negative environments, questions, or in contexts implying pragmatic adversity, in a distribution similar to negative polarity items (Fillmore et al., 1988). The phrase following the coordinator, which we will call the remnant, stands in semantic and prosodic contrast with

an element in the previous clause (the correlate). In (2a), for example, the remnant NP *a job* contrasts with the correlate *an interview*. The contrastive elements in the correlate and remnant characteristically receive contrastive pitch accents, demarcated here by CAPS (Harris & Carlson, submitted).

- (2) a. He's unable to land [an INTERVIEW], much less [a JOB].  
 b. The man didn't [wear a WATCH], much less [carry a PHONE]. (COCA<sup>1</sup>)

Although it is not our intention to defend a particular analysis of focus-sensitive coordination structures in detail here, recent evidence supports the idea that focus-sensitive coordination shows ellipsis of a clause containing the second conjunct, with the remnant phrase (*a job* or *carry a phone* in the examples above) left over from ellipsis of the second clause (see Harris, 2016; Hulseley, 2008; Toosarvandani, 2010 for arguments that clause-final cases are always instances of ellipsis). In a move-and-delete approach, the remnant phrase is raised from its base position inside the full clause to a focus position immediately following the coordinator, after which the rest of the clause is elided or not pronounced, as in (3) for (2a), along the lines of stripping (Frazier, Potter, & Yoshida, 2012) or fragment ellipsis (Merchant, 2004).<sup>2</sup>

- (3) He's unable to land an interview, much less [[<sub>NP</sub> a job]<sub>1</sub> [<sub>VP</sub> t<sub>1</sub>]].

Support for an ellipsis analysis for FSC over a direct coordination approach comes from a variety of tests showing that the *much less* and *let alone* coordinators do not pattern with cross-categorical connectives like *and*. For example, the second constituent in a FSC construction cannot be a full clause (4), unlike ordinary coordination, regardless of the negative element in the host clause licensing the connective (5a-b).

- (4) Focus sensitive coordination  
 a. \* [John can't eat caviar], much less [John can't eat veal].  
 b. \* [John never eats caviar], much less [John eats veal].  
 c. John can't eat [caviar], much less [veal].  
 d. [John] can't eat [caviar], much less [Sue] [veal].
- (5) Ordinary coordination  
 a. John can't eat caviar, and John can't eat veal.  
 b. John never eats caviar, and / but John eats veal.  
 c. John can't eat caviar and veal.  
 d. John can't eat caviar and Sue veal.

As Hulseley (2008) noted for *let alone*, only the non-finite (uninflected) form of a verb is allowed after FSC, and such cases are often considered less acceptable than the elided version (6a). In the theoretical literature on ellipsis (e.g. Siegel, 1984), the non-finite variant of (6b) is understood as a form of verbal gapping (6c), coordinating a subclausal unit, such as a "voice phrase" (e.g. Kratzer, 1996).

- (6) a. John can't eat caviar, much less Sue ?eat / \* eats veal.  
 b. John can't eat caviar, and Sue eat / eats veal.  
 c. John can't eat caviar, and Sue veal.

Hulseley (2008) further observed that FSC structures permit "sprouting" (Chung, Ladusaw, & McCloskey, 1995) of an implicit argument or an adjunct (7a) that does not have a contrast within the first clause, whereas ordinary coordination structures do not (7b). Harris (2016) likened the effect to "stripping" ellipsis with examples like (7c), which are also analyzed as clausal ellipsis (e.g. Drubig, 1994). As sprouting is quite similar to the phenomenon of interest here, we will return to the topic in the discussion section.

- (7) a. John didn't talk, much less to Sue / quickly / with his mouth full.  
 b. \* John didn't talk, and to Sue / quickly / with his mouth full.  
 c. John talked, but not to Sue / quickly / with his mouth full.

In general, there is suggestive evidence that FSC structures are restricted to coordinating vP (and potentially CP) constituents. Apparent counterexamples in which a DP appears to be coordinated (e.g. *a job* in 2a) are understood as the remnant of ellipsis in the second conjunct.

In addition, FSC structures appear to pattern with coordination and not subordination. We present a few arguments here, though the comparison warrants further study. For example, Hulseley (2008; cf. example 6) shows that FSC structures allow gapping (8a) as in coordination (8b), while subordinated structures (8c) do not.

- (8) a. John won't eat peas, much less Mary carrots.  
 b. John will eat peas, and Mary carrots.  
 c. \*John eat peas before/because Mary carrots.

Furthermore, Hulseley (2008) points out that FSC structures, as in (9a), obey the Coordinate Structure Constraint (Ross, 1967), disallowing extraction from only one

conjunct (9b-c), but permit Across-the-Board movement out of both conjuncts (9d).

- (9) a. John didn't support Obama, much less Mary campaign for Clinton.  
 b. \*Which candidate didn't John support *t*, much less Mary campaign for Clinton?  
 c. \*Which candidate didn't John support Obama, much less Mary campaign for *t*?  
 d. Which candidate didn't John support *t*, much less Mary campaign for *t*?

Finally, the second clause cannot be fronted to sentence-initial position if headed by either an FSC connective (10a-b) or a standard coordinator (10c-d), though fronting is allowed in cases of subordination (10e-f).<sup>3</sup>

- (10) a. John won't come to the party, much less/let alone the after party.  
 b. \* Much less/ Let alone the after party, John won't come to the party.  
 c. John will come to the party and/but/or Mary will not.  
 d. \*And/But/Or Mary will not, John will come to the party.  
 e. John will come to the party, while/although/even if Mary will not.  
 f. While/Although/Even if Mary will not, John will come to the party.

We take this evidence to strongly suggest that FSC is indeed a kind of coordination, although it is restricted in unique ways, including the semantic and pragmatic relation between the two conjuncts.<sup>4</sup>

The semantics of FSC constructions implies a scalar contrast between the clauses containing correlate and remnant conjuncts (Fillmore et al., 1988). Sometimes the scale can be derived from a lexically-encoded ordering, such as *first-second* or *some-all*. But in the majority of cases, as in (11), the scales are formed on an *ad hoc* basis, and may only be recovered by consulting the context. In either case, the direction of the contrast is such that negating the correlate contextually entails negating the remnant: in (11a), if *injury* didn't happen, *death* didn't; similarly in (11b), if you can't *sew*, then you can't *alter blue jeans* (see Toosarvandani, 2010).<sup>5</sup>

- (11) a. Maybe one in a hundred bank robberies results in injury, much less death.  
 b. I don't know how to sew, much less alter blue jeans. (COCA)

Although FSCs have not received much attention in previous literature, the emerging research suggests a

coherent picture thus far. Harris (2016) builds on the ellipsis analyses of *let alone* coordination by Hulsey (2008) and Toosarvandani (2009, 2010), which were in turn supported by several experimental findings. In several completion studies, he found that larger remnants, VPs, were preferred to smaller ones, NPs, after the coordinator. He argued that there was no preference for structurally simpler remnants, as predicted if an entire clause is built to host the ellipsis. In a reading experiment, there was a tradeoff between VP and NP remnants, but no categorical difference in processing difficulty. Indicating the position of expected contrast using the particle *even* facilitated processing of either size of remnant and had small effects on remnant choice, as below.

Harris and Carlson (2016) conducted a corpus study of *let alone* constructions in the British National Corpus and the Corpus of Contemporary American English. The results showed that both VP and NP remnants were common, together making up over 80% of the examples, though NP remnants were more frequent in both corpora. Also, *let alone* remnants preferentially contrast with the nearest phrase of the same type, usually the last phrase before the coordinator (Locality), and generally occur at the end of a clause (Finality), rather than adjacent to the correlate, as in *The man didn't wear, much less carry, a watch*. The Locality bias was further tested in a sentence rating and two self-paced reading studies, and were shown to guide online sentence processing preferences. That is, *let alone* sentences with non-local contrasts were rated as less natural and read slower than those with local contrasts. In sentence rating, non-final contrasts were also dispreferred.

Harris and Carlson (submitted) continued to explore the Locality effect in *let alone* structures, showing how it interacts with the placement of contrastive accents on the correlate and remnant: accenting a non-local correlate significantly increases ratings of unambiguous sentences, while a local correlate is acceptable whether accented or not. A small corpus study of auditory *let alone* sentences from NPR recordings found that parallel accent placement on the correlate and remnant is quite frequent, often with contrastive accents, though additional accents on other content words were common.

We assume that *much less* and *let alone* are fundamentally the same kind of connective, extending a suggestion in Fillmore et al. (1988). Based on the processing of *let alone*, we propose that *much less* sentences always involve the projection of clausal structure to host the ellipsis at the point that the focus-sensitive coordinator is encountered. Specifically, a full clause is posited after the coordinator along with raising of the

remnant to a clause-adjoined position and ellipsis of the following material. As a consequence, all remnant types (e.g. NP, VP, PP, etc.) should require a complete, albeit covert, host clause to be generated after the coordinator. Thus, we follow Harris (2016) in proposing that, all else being equal, larger remnants should not incur greater processing costs than smaller ones, provided the scalar contrast is directly supported by context or equally easy to compute from the lexical elements supplied.

But we do predict processing costs when the scalar contrast is hard to accommodate. As the scalar contrast between the remnant and its correlate is necessary to fully interpret FSC constructions, the ease of locating the appropriate correlate to place on a contextually salient scale with the remnant should be central in how such sentences are processed. Furthermore, we expect that readers might anticipate some properties of the remnant upon encountering the FSC coordinator, as an attempt to more rapidly integrate an upcoming representation with the previously parsed structure. As such, they may experience processing difficulty when presented with a misleading contrast, e.g. one that would force comparison along odd or seemingly-incomparable dimensions as in *I don't own a Panama hat, much less a red one*, though these relations could eventually be accommodated given the appropriate context (Fillmore et al., 1988; fn. 6).

In general, we propose that the language processing system must complete four major steps in order to fully interpret FSC structures, illustrated in (12). First, it must construct a remnant of the appropriate syntactic type, e.g. an NP, VP, or PP (12.i). Second, it must locate the contrasting correlate phrase in the matrix clause, and determine the intended contrast within the remnant, whether it is a subpart or the entirety of the remnant structure (12.ii). Third, it must construct or infer the remaining unpronounced material at the ellipsis site (12.iii). In addition, it must infer the contextually appropriate scalar relationship that holds between the remnant and its correlate (12.iv).

- (12) He's unable to land an interview, much less a job.
- i. *Parse the remnant*: Assign the appropriate phrase structure for a *job*.  
He's unable to land an interview, much less  
[<sub>DP = Remnant</sub> a job]
  - ii. *Locate the correlate*: Retrieve an appropriate correlate that provides a suitable contrast to the remnant *a job*.  
He's unable to land [<sub>DP = Correlate</sub> an interview],  
much less [<sub>DP = Remnant</sub> a job]
  - iii. *Construct the elided phrase*: Build the ellipsis structure after the remnant.

He's unable to land [<sub>DP = Correlate</sub> an interview],  
much less [<sub>DP = Remnant</sub> a job] <sub>1</sub> <he land *t*<sub>1</sub> >  
iv. *Establish a contextually salient scale*: Consult sentence and context to establish the scalar relation between *an interview* and *a job*, such that not landing an interview contextually entails not landing a job.

The ease with which this final process is executed may prove to be dependent upon numerous factors, including whether the lexical items are associated with a lexically determined scale, or if an *ad hoc* or situation-specific relation must be posited. Any one of these tasks may impose a processing burden on the processor, especially if they conflict with one another. The first two steps are plausibly ordered in processing, in that parsing the remnant (12.i) logically precedes finding a correlate for it (12.ii). Still, we are not committed to the relative ordering of the final two stages, which ultimately depends on what precisely is being compared by the semantics: correlate-remnant pairs <*a job*, *an interview*> or pairs of propositions associated with the matrix and the ellipsis clause <*he lands an interview*, *he lands a job*>.

We now turn to the case of zero-adjective contrast, in which the form of the remnant is not syntactically parallel to the correlate, and thus the remnant cannot be predicted on the basis of previously appearing material. These cases are important as they potentially distinguish the role of general parallelism effects in coordination and ellipsis from the unique properties imposed by specialised coordinators. In the next section, we introduce the phenomenon of zero-adjective contrast in focus-sensitive coordination. We articulate two basic hypotheses regarding non-parallel contrast whose predictions are tested in the corpus and experimental studies below.

For present purposes, we limit our attention to the most common case of zero-adjective contrast in FSCs, as in (13a).

- (13) a. I'm not sure I own [a hat], much less [a red one].  
(COCA)  
b. I don't own [a pink hat], much less [a red one].

In (13a-b), the remnant is a complete NP, but only the adjective (*red*) is contrastive. The difference is that in the modified example (13b), an adjective (*pink*) is present in the previous clause to contrast with the adjective in the remnant, but in (13a), it is not.

We consider two different hypotheses about the processing of this type of sentence, both of which centre on how the processor locates a correlate for the remnant, and establishes the intended scalar relation between

them. The first hypothesis (14) concentrates on the surface form of the clause hosting the FSC ellipsis, stating that the processor should prefer correlates that are parallel in form to the remnant phrase. The idea is that the completely parallel syntax of the NPs *a pink hat* and *a red one* in (13b) facilitates computation of the contrastive element within the remnant. If this hypothesis is correct, we would expect zero-adjective contrast to be rare in naturally-occurring speech, and more difficult to process online than more parallel examples. Results supporting this hypothesis would also put *much less* constructions on a par with other coordinate structures in displaying a strong parallelism preference.

- (14) **Parallel correlate hypothesis:** Prefer correlates that are parallel in form to the remnant.

The second hypothesis (15) focuses on the importance of establishing a meaningful scalar relationship between the correlate and the remnant. According to this view, the processor should prefer correlates in which the scalar relationship is determined directly by the lexical content of the elements put in opposition. In zero-adjective contrast, the negation of the proposition associated with the host (*I don't own a hat*) logically entails the negation of the remnant in combination with the elided clause (*I don't own a red hat*). Therefore, the cost of computing the scalar relationship in non-parallel examples could be comparatively reduced, as no other relationship besides what is present in the sentence needs to be inferred, and in particular, no *ad hoc* scale needs to be accommodated in order to interpret the relationship between the clause containing the correlate and the clause containing the remnant. If the Scale-first hypothesis is correct, we would expect zero-adjective contrast to be relatively frequent in natural speech and easier to process than more parallel alternatives.

- (15) **Scale-first hypothesis:** Prefer correlates that already satisfy a scalar relation with the remnant.

The intuitions behind our two hypotheses are neither arbitrary nor mutually exclusive: the former highlights the need to locate a correlate for the remnant given the host clause (12.ii), while the latter highlights the need to put the correlate and the remnant on a contextually-salient scale (12.iv). We imagine that both pressures are ultimately relevant to the interpretation of FSC structures, but that one might be conceptually more important or prioritised over the other in production, offline comprehension, and online sentence processing.

That is the question we explore below, starting with a corpus study of American English.

### Corpus analysis in COCA

In order to investigate the syntactic and semantic preferences of *much less* ellipsis in natural text and speech, we conducted a corpus study using COCA (Davies, 2008). Search results returned 1724 sentences containing the string “much less”, from which 1644 instances of *much less* ellipsis were identified. We annotated the syntactic category of the remnant and the syntactic category of the contrasting portion of the remnant (Table 1).

The most common remnant category was NPs, at 45% of the total, followed by VPs at 31%, PPs at 14%, and a variety of different categories making up the remainder. The results are highly similar to the distribution of syntactic categories in *let alone* ellipsis in both the British (BNC) and American (COCA) English, in which NPs were preferred and VPs a reasonably close second (Harris & Carlson, 2016).

Usually, every element in the remnant contrasted with the entire correlate, e.g. a VP remnant contrasted in its entirety with a VP correlate (16). In a minority of cases, the correlate contrasted with only part of the remnant.<sup>6</sup> Some illustrative examples of partial contrast from COCA are provided in (17).

- (16) a. Some had never [heard of lacrosse], much less [seen the game played]. (VP remnant, VP contrast)  
 b. I wouldn't trust him with [a Weed Eater], much less [an assault rifle]. (NP remnant, NP contrast)
- (17) a. ... never played [a team sport], much less [a contact sport]. (NP remnant, Adj contrast)  
 b. That's not helpful to [your soul], much less [your pocketbook]. (NP remnant, N contrast)  
 c. I find it remarkable that two grown men even [played Monopoly], much less [fought over it]. (VP remnant, V contrast)  
 d. There was no incentive to invest [in the land], much less [in the people who tilled it]. (PP remnant, NP contrast)

**Table 1.** Total corpus counts from COCA by syntactic category of the remnant; percentages are in parentheses.

	Remnant category	Contrast
Adj	33 (2%)	99 (6%)
Adv	20 (1%)	15 (1%)
Det	1 (0%)	6 (<1%)
N	NA	51 (3%)
NP	736 (45%)	740 (45%)
P	NA	1 (<1%)
PP	233 (14%)	123 (7%)
SC	42 (3%)	48 (3%)
V	60 (4%)	132 (8%)
VP	519 (31%)	429 (26%)

In total, there were 29 instances of non-parallel contrast of any syntactic type in the corpus (less than 2% of the entire data set), and of those, only 13 cases were zero-adjective contrast, as in (18) from COCA.

(18) She will not argue with [a fool], much less [a money-hungry one].

For an additional 12 items containing contrastive adjectives in the remnant, the domain widener *any* appeared in the correlate instead of a more specific adjective (19). This may be a way to maintain some parallelism in form between the remnant and correlate even without matching adjectives. A complete list of the zero-adjective contrast and *any* examples may be found in Appendix A.

(19) There isn't a degree which guarantees you [any income], much less [a big one].

Of the 13 zero-adjective contrast examples, five used *one* following the adjective and the other eight repeated the noun. In the additional 12 examples with *any*, seven contained *one* and five repeated the noun. Both forms are clearly grammatical for NP remnants which do not contrast the noun, but it appears that using *one* is a common way to make the focus structure clear (since *one* is unlikely to be stressed and thus provides a cue to the prosodic pattern of the utterances). Similarly, in the 71 *much less* examples with VP remnants where only the verb itself was contrastive, over 60 used a pronoun for any NPs which would otherwise have been repeated. Both of these patterns also hold for the *let alone* corpus data, suggesting that it is common to pronominalise already given material which is to remain non-contrastive.

Overall, then, zero-adjective contrast – non-parallel contrast of any category, for that matter – is relatively rare in the corpus compared to more parallel alternatives. This supports the Parallel-correlate hypothesis, according to which parallel syntax between the correlate and the remnant is preferred, over the Scale-first hypothesis. The general question now is whether the preferences observed in corpora carry over to controlled experiments. The more specific question is whether evidence for the the Scale-first hypothesis will emerge when participants are tasked with interpreting the relation between the remnant and correlate in an experimental setting.

## Experiment 1

Our first set of studies explored the syntactic preferences of *much less* ellipsis in written forced-choice completion,

as well as the availability of zero-adjective contrast when it is presented as a possible continuation. We first varied the presence of *any* to encourage non-parallel contrast, and varied the focus particle *even* to signal an upcoming scalar contrast in a written completion task. Both of these factors appeared relatively frequently in the corpus results presented above. We then followed up in an auditory version, to control for implicit prosodic realizations that might have impacted the results.

### Experiment 1A: written forced-choice completion

#### Method

**Items.** The 20 experimental fragments appeared in 4 conditions in a crossed  $2 \times 2$  factorial design. The choice of determiner of the object noun was crossed between items that contained a domain widener *any* (20b,d) and those that contained another determiner or bare noun (20a,c). We also manipulated the presence or absence of the focus-sensitive particle *even* in preverbal position.

(20) Sentence fragments

- a. The police didn't arrest a suspect, much less ...
- b. The police didn't arrest any suspect, much less ...
- c. The police didn't even arrest a suspect, much less ...
- d. The police didn't even arrest any suspect, much less ...

The fragments were followed by two forced-choice continuations to choose from: a VP remnant that contrasted with the verb of the matrix clause (20a), and an NP remnant with an Adjectival contrast (20b). Both remnant choices contained a pronoun from the set of *them*, *one*, or *ones*, whichever was deemed natural by the authors. Continuation choices were presented one above the other in individually randomised order. Syntactic labels are added to (21) here for clarity.

(21) Forced choice alternatives

- a. charge one. (VP remnant)
- b. dangerous one. (NP remnant)

The word *any* was included in the manipulation in part because we observed a number of examples from COCA with NP remnants with apparent adjective contrasts following *any*, and in part because its domain-widening function was predicted to interact with our processing hypotheses in (14) and (15). A now-familiar analysis of *any* is that it creates a stronger statement by widening the domain of the NP it combines with

(i.e. *suspect*), with the effect that the NP domain lacks exceptions (Kadmon & Landman, 1993). In a simplified version of standard semantic theory, an indefinite like *a suspect* is semantically identified with a set of individuals that satisfy the property of being a suspect in a particular context. Thus, the dominant interpretation of *the police didn't arrest a suspect* can be paraphrased as the statement that "there was no contextually relevant suspect or suspects who the police arrested." The addition of *any* indicates that the domain of quantification extends to include all suspects, even those that the speaker or hearer might not think are contextually relevant or important. As the meaning of *any suspects* entails any possible subset of *suspects*, including *dangerous suspects*, the scalar contrast is given directly by the semantic relationship afforded by the meaning of the correlate and the remnant.

If the Scale-first hypothesis in (15) is correct, then adding *any* ought to strongly facilitate zero-adjective contrast, because the entailment relationship between the correlate and remnant is so readily apparent. In contrast, if the Parallel-correlate hypothesis (14) is correct, then non-parallel contrast might be only moderately facilitated in conditions (20b,d) over (20a,c), depending on how well the determiner *any* contrasts with the scalar adjective.

In Harris (2016), the focus-sensitive additive particle *even* did not affect the choice of contrast, but instead reduced reading times globally, presumably by facilitating a scalar relationship (e.g. Beaver & Clark, 2008; Horn, 1969) between correlate and remnant. The particle *even* was added in conditions (c-d), as its scalar meaning might encourage the processor to satisfy the scalar relation, and therefore lead to more cases of non-parallel contrast.

**Participants.** Twenty-four individuals were recruited and paid through Amazon Mechanical Turk (AMT). They identified themselves as native English speakers and answered four unambiguous catch trials correctly, and were paid \$4 for completing the experiment.

**Procedure.** The experiment was conducted on-line through the Ixex Farm platform (Drummond, 2012). Each participant read through instructions and a brief guided practice before completing the experiment itself. Participants saw only one version of each item and read equal numbers of stimuli in each condition over the course of the experiment. Along with the 20 experimental items, there were 56 sentences from unrelated experiments, 4 sentences designed as catch trials with unambiguously correct answers, and 12 fillers for a total of 92 stimuli per experimental session. During

the experiment, participants read each item and then chose between two given continuations. The experiment lasted around 25 min on average.

## Results

The results are expressed in Table 2 as the percentage of responses where the VP answer was selected by the participant, which were coded as a success (1) for statistical analysis. The data were analyzed as a generalised logistic linear mixed effects regression model with the sum-coded conditions of Particle, Determiner, and their interaction as fixed effect factors, and with by-subject and by-item random slopes and intercepts.

In all conditions, VP responses were at or above 80%. This could suggest a VP preference, a bias against zero-adjective contrast (since the NP answers demanded that non-parallel structure), or both. Prior research on *let alone* showed a bias toward VP remnants in off-line tasks (Harris, 2016; Harris & Carlson, 2016), although the absolute size of the VP bias is more dramatic here.

Regarding the main manipulation of Determiner, there was a significantly higher rate of NP choices with zero-adjective contrast when *any* was present,  $z = 2.69$ ,  $p < 0.01$ , though at 6% the absolute difference remains quite small. In keeping with Harris (2016), we did not detect a significant effect or interaction based on the presence of *even* in the sentences (Table 3).

In addition, items in the No domain widener condition varied with respect to the determiner on the object noun: the indefinite *a* (8 items), definite *the* or possessive *his/her* (5 items), or no determiner (7 items). A planned post-hoc comparison revealed that subjects were very unlikely to choose a remnant that required zero-adjective contrast when the determiner was definite or

**Table 2.** VP continuations for Experiment 1A-B by condition. Standard errors are in parentheses.

		Determiner	
		No domain widener	Domain widener
Experiment 1A	No focus particle	85% (3)	80% (4)
	Focus particle <i>even</i>	88% (3)	80% (4)
Experiment 1B	Object accent	86% (2)	74% (3)
	Verb accent	92% (2)	91% (2)

**Table 3.** Generalised logistic linear mixed effects regression model for VP responses provided in Experiment 1A.

Fixed effects	Estimate	Std. Error	Wald Z	p-estimate
(Intercept)	3.098	0.541	5.725	<0.001
Focus particle	-0.555	0.245	-2.27	<0.05
Domain widener	-0.711	0.265	-2.69	<0.01
Particle × Domain widener	0.002	0.206	0.011	0.991



possessive (95% VP bias), or the noun was a bare plural (82% VP bias). However, remnants that required a non-parallel adjective contrast were significantly more attractive when the matrix noun was an indefinite (77% VP bias) in a model with object noun type included as an additive factor ( $\hat{\beta} = -0.90$ ,  $SE = 0.378$ ,  $z = -2.40$ ,  $p < 0.05$ ). This pattern is consistent with the corpus results, in that the majority (10 of 12) of attested zero-adjective contrast cases were preceded by an indefinite object noun in the matrix clause.

### Discussion

In this experiment, participants were forced to choose between NP remnants with zero-adjective contrast and VP remnants. Given those options, they showed a very strong preference for VP continuations. The results do not suggest that zero-adjective contrast is preferred, since it was not chosen frequently, despite being made explicitly available as one of only two alternatives. These findings lend initial support to the Parallel-correlate hypothesis over the Scale-first hypothesis, in that subjects typically avoided NP remnants with zero-adjective contrast in favour of VP remnants.

However, the study did not control the implicit intonational contours that subjects could assign to the text in silent reading. Our intuitions were that the choice of remnant and the contrast therein are sharply affected by focus placement, among other factors. Therefore, we conducted a follow up study that elicited forced-choice completion of auditory fragments while controlling for the prosodic rendering of the items.

### Experiment 1B: auditory forced-choice completion

#### Method

**Items.** The materials were identical to those presented in the written forced-choice completion study above without the particle *even*. The sentence fragments were produced and recorded with a contrastive pitch accent placed on the verb (22a-b), the noun (22c), or the determiner *any* (22d). Subjects were given two written completions (*charge one* and *a dangerous one*) to select as before.

- (22) Sentence fragments
- a. The police didn't ARREST a suspect, much less ...
  - b. The police didn't ARREST any suspect, much less ...
  - c. The police didn't arrest a SUSPECT, much less ...
  - d. The police didn't arrest ANY suspect, much less ...

All sentences were recorded and then analyzed in Praat for adherence to the intended prosodic contours; any anomalous sentences were re-recorded. The acoustic measurements of F0 averages and duration averages in Table 5 show that accented words were longer and had higher pitch maxima than their unaccented counterparts.

**Participants.** Fifty-six participants were recruited through Amazon Mechanical Turk to complete a survey on the Qualtrics platform for a payment of \$4. The data from eight subjects was removed due to less than 90% accuracy on the questions following unambiguous filler sentences, leaving forty-eight subjects in the analysis. All participants reported being native English speakers.

**Procedure.** Along with the 20 experimental items, there were 68 sentences from three different unrelated sub-experiments and 22 filler sentences, for a total of 110 stimuli. The other items were unambiguous or ambiguous complete sentences followed by comprehension questions, either yes/no questions about causal relationships or two-choice questions about some aspect of the sentence's meaning. A short set of demographic questions followed the stimuli.

### Results

The statistical analysis was the same as in the previous experiment. As before there was a strong overall preference for VP completions (86%), regardless of the condition. We observed two main effects. First, items with contrastive pitch accent on the Object elicited fewer VP remnant responses ( $M = 80\%$ ,  $SE = 2$ ) than those with contrastive pitch accent on the Verb ( $M = 92\%$ ,  $SE = 1$ ),  $z = -5.55$ ,  $p < 0.001$ . In addition, the Domain widener condition (82%) was associated with fewer VP remnant responses compared to the No domain widener condition (89%),  $z = -3.01$ ,  $p < 0.01$ . More importantly, there was an interaction, such that the effect of the domain-widener *any* was greater when the object was accented ( $d = 12\%$ ) than when the verb was accented ( $d = 1\%$ ),  $z = -2.05$ ,  $p < 0.05$  (Table 4).

As before, the No domain widener condition contained various types of object noun. Although indefinite object nouns led to numerically more zero-adjective

**Table 4.** Generalised logistic linear mixed-effect regression model for Experiment 1B.

Fixed effects	Estimate	Std. Error	Wald Z	p-estimate
(Intercept)	3.313	0.506	6.547	<0.001
Object accent	-0.806	0.139	-5.817	<0.001
Domain widener	-0.397	0.132	-3.006	<0.01
Accent × Domain widener	-0.267	0.130	-2.053	<0.05

contrast completions (81% VP bias) compared to definite / possessive (94% VP bias) and bare plural (86% VP bias) object nouns, no significant differences were observed between noun types.

### Discussion

This auditory experiment replicated the results of Experiment 1A, showing that participants continued to strongly prefer VP continuations over NP continuations with non-parallel adjectives. The novel finding was that accented *any* best ameliorated the bias against zero-adjective contrast, perhaps because it provided something like a contrast for the non-parallel adjective in the NP remnants. Both experiments show that unaccented *any* does not affect the overall choice of remnants.

However, the forced-choice methodology utilised in the two experiments above raises several concerns. First, the choice of adjectives in the remnants may have introduced bias by forcing an inappropriate contrast. That is, if *any* provided a poor contrast for the scalar adjective in the remnant, especially without pitch accent, subjects may not have avoided zero-adjective contrast for syntactic reasons as much as for semantic or pragmatic reasons. A second, more general, concern is that we cannot tell whether the high rate of VP remnants reflects a desire to avoid NP remnants in general, or a desire to avoid NP remnants with non-parallel adjectives. In the next experiment, we presented subjects with auditory fragments and allowed for unconstrained replies, so that we might better investigate preferences guiding remnant choice independently of non-parallel contrast, without imposing a particular adjective onto the subjects. And in order to test whether use of the pronominal *one* had influenced the results of the first two studies, we conducted another auditory forced-choice study with fully written-out remnant choices.

## Experiment 2

This set of studies broadens our understanding of the contrast preferences in *much less* sentences and follows up on the results of Experiments 1A-B by varying the presence of an adjective within the matrix clause object. This allowed us to compare zero-adjective contrast NP responses with NP responses that contained overt adjective contrasts. The first experiment solicited open response completions, allowing us to study both the syntactic structures participants produced and the semantic contrasts they provided. The second used the same recordings but forced-choice answers to explore whether the pronominal *one* used in Experiments 1A-B accounted for the processing results.

## Experiment 2A: auditory completion

In this experiment, we varied the presence of an adjective in the correlate in the first clause and allowed participants to write their own completions of sentence fragments ending at *much less*. The open completion paradigm allowed us to establish a baseline preference for VP or NP remnants in *much less* ellipsis as well as to observe how often adjective contrasts appeared, either as zero-adjective contrast or when a prior adjective was present.

### Method

**Items.** The 20 experimental fragment pairs appeared in 2 conditions varying in the presence of an adjective, as shown in (23).

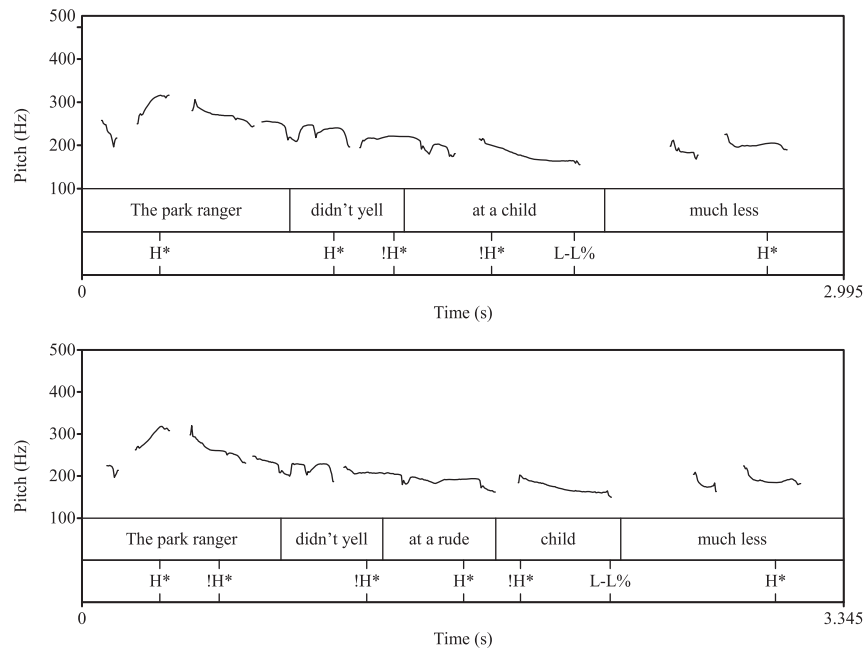
- (23) a. The park ranger didn't yell at a child, much less ...  
 b. The park ranger didn't yell at a rude child, much less ...

The conditions of each item were recorded with relatively neutral prosody that did not contrastively accent either the verb or any part of the object NP. Instead, the highest pitch in each sentence was the accent on the subject NP and the F0 contour showed normal declination over the remainder of the sentence. Downstepped H\* accents occurred on most major content words. A major prosodic boundary occurred at the end of the first clause, followed by minor pitch reset for the *much less* portion. These properties can be visually identified in the example sentence in Figure 1 and are supported by the acoustic averages shown in Table 5.

All sentences were examined in Praat (Boersma & Weenink, 2017) for fluency and adherence to the intended prosodic contours, and any non-standard stimuli were re-recorded and analyzed. In the majority of sentences, the first clause ended in a L-L% boundary; a few examples in each condition had a L-H% instead, a continuation rise ending at an average F0 of 167 Hz. A complete list of the experimental items is in Appendix C.

### Participants

Thirty-four participants were recruited and paid \$3.50 for participation through Amazon Mechanical Turk (AMT). They identified themselves as native English speakers and produced grammatical completions throughout the experiment. The question about native language appeared after all of the experimental items and participants were assured that they would still be compensated even if they were not English speakers; data from such participants were excluded from the final data set. Data from two subjects was excluded because they failed to



**Figure 1.** Pitch tracks for an example sentence in Experiment 2A, conditions (a-b).

**Table 5.** Average F0 (Hz) and duration (ms) measurements in Experiment 1B and Experiment 2A-B.

Experiment 1B						
	Subject	Verb	Adjective	Object N	Boundary L-H%	
F0 averages						
V Accent, No any	–	286	–	155	144, 160	–
V Accent, any	–	274	169	158	148, 155	–
Obj Accent, No any	–	217	–	275	150, 158	–
Obj Accent, any	–	211	282	153	145, 182	–
Durations		Verb		Object N		
V Accent, No any	–	414	–	581	–	–
V Accent, any	–	409	–	775	–	–
Obj Accent, No any	–	319	–	672	–	–
Obj Accent, any	–	321	–	785	–	–
Experiment 2A-B						
	Subject	Verb	Adjective	Object N	Boundary	Much less
F0 Average						
No Adjective	312	223	–	203	158	189
With Adjective	309	226	205	195	157	186
Durations		Verb	Adjective	Object N	Pause	
No Adjective	–	316	–	608	155	–
With Adjective	–	316	378	595	179	–

complete 10 or more items, leaving the data from the remaining thirty-two people to be analyzed.

### Procedure

The experiment was conducted on-line through a Qualtrics survey linked to AMT. Each participant was presented with instructions asking them to provide either a grammatical completion to incomplete sentences or the most natural following sentence after complete clauses. Participants heard only one version of each item and heard equal numbers of stimuli in each condition over the course of the experiment. Along with the 20 experimental items, there were 40 sentences from unrelated experiments and 27 fillers with different structures for a total of 87 stimuli. During the experiment,

participants clicked on an audio player to listen to each item and then typed a completion or follow-up in an open response box. The experiment lasted around 25 min on average.

### Results

The 640 responses were annotated according to syntactic category. Three nonsensical responses were removed. The most common syntactic categories presented as completions were VPs and NPs, as expected given the corpus distributions, accounting for approximately 98% of completions across conditions. The other responses were PPs ( $N=2$ ) and clauses ( $N=6$ ), which were removed from the data before analysis. The VP and NP results are shown in Table 6.

**Table 6.** Syntactic categories of responses in Experiment 2A. Standard errors in parentheses.

	VPs	NPs	Difference
No Adjective	53% (3)	45% (3)	8% VP bias
With Adjective	41% (3)	58% (3)	17% NP bias
Mean	48%	53%	

Data were modelled as a logistic linear mixed effects regression with fixed effects as the sole condition of Adjective and random effects as random slopes and intercepts. The Adjective condition was sum-coded, so that conditions without an adjective formed the statistical baseline [Intercept:  $\hat{\beta} = -0.13$ ,  $SE = 0.53$ ; Wald  $Z = -0.25$ ,  $p = 0.80$ ; Adjective:  $\hat{\beta} = -0.43$ ,  $SE = 0.20$ ; Wald  $Z = -2.18$ ,  $p < 0.05$ .]

The syntactic category of the continuation that subjects provided was clearly affected by the presence of the adjective in the earlier clause. Without an adjective contrast in the matrix clause, there was a mild bias towards VP answers, consistent with off-line results for *let alone* ellipsis (Harris, 2016; Harris & Carlson, 2016), as well as the previous experiment. When the matrix clause provided an adjective contrast, however, NP responses accounted for a greater proportion of the completion responses, suggesting that NP remnants were available as possible responses.

The responses were also examined to see what portion of the remnant provided the contrast. The four most common contrasts, accounting for over 99% of the response data, are shown by condition in Table 7.

The most common contrasts were with NPs, VPs, verbs alone, or with the adjective in NP remnants. Without an adjective present in the initial clause, contrasts with the NP were most frequent, followed by VP and V contrasts at similar proportions. With an adjective present, adjective contrasts rose from 2% of responses to over 30%, and all other contrasts became less frequent ( $\chi^2 = 82$ ,  $p < .01$ ).

Turning to the form of the completions, we analyzed how often completions contained the pronoun *one* or other pronouns. Within VP remnants, completions where the entire VP contrasted with the correlate had pronouns for predicate NPs 30% of the time, compared to 85% of the time when only the V contrasted (e.g. V

contrast: *The park ranger didn't yell at a child, much less hit him*). The presence of the adjective in the initial clause did not affect these percentages. Within NP remnants, the results clearly varied by condition. Without the adjective present, there was only one instance of pronominal *one* among the 138 examples of NP contrast, though all seven examples with an adjective contrast used *one*. With the adjective present, three of the 94 NP contrasts used *one* and 87 out of the 101 adjective contrasts did too (e.g. Adjective contrast: *The park ranger didn't yell at a rude child, much less a well-behaved one*). Overall, use of pronouns seems to follow the contrastive focus structure of these constructions, with repeated non-contrastive elements inside remnants often replaced by pronouns. This is especially true for what would be repeated nouns within NP remnants, as in zero-adjective contrast examples.

### Discussion

The results show a slight preference for VP remnants for *much less* ellipsis when there is no adjective in the matrix clause for the remnant to contrast with, as with *let alone* ellipsis (Harris, 2016). However, this bias was readily overturned by the presence of an adjective within the object NP of the first clause; the adjectives were not contrastively accented but still led to an NP remnant bias. Further, the presence of an adjective in the potential NP correlate led to a sharp rise in the number of contrasting adjectives presented in remnants, showing that we cannot attribute the VP bias in earlier experiments to an attempt to avoid remnants containing an adjective. Although there were a few cases of grammatical zero-adjective contrast, it is clearly avoided when possible.

Insofar as our tasks represent a valid test of production preferences, the patterns observed in the experiments so far closely match those in the corpus: the small proportion of zero-adjective contrast in the corpus is reflected in completion preferences (both forced-choice and open completions). These results similarly support the Parallel-correlate hypothesis, which predicts that parallelism between the correlate and remnant eases retrieval of the correlate. Apparently, an entailment relationship between the remnant and the correlate is not sufficient to entice the processor toward contrasting with a non-parallel adjective in the remnant.

**Table 7.** Contrasting elements in continuation responses, Experiment 2A. Adj = Adjective; N = Noun; V = Verb; VP = Verb Phrase.

Condition	Contrast category			VP(%)
	Adj(%)	N(%)	V(%)	
No Adjective	2	44	25	29
Adjective	32	30	16	22
Difference	30	-14	-9	-7

### Experiment 2B: auditory forced-choice completion without one

#### Method

**Items.** The auditory materials were identical to those presented in Experiment 2A, the auditory completion study

above. They appeared in 2 conditions varying in the presence of an adjective in the correlate, repeated in (24).

- (24) Sentence fragments
- a. The park ranger didn't yell at a child, much less ...
  - b. The park ranger didn't yell at a rude child, much less ...

The conditions of each item were recorded with relatively neutral prosody that did not contrastively accent either the verb or any part of the object NP. These were the same recordings used in Experiment 2A; see Table 5 for their average acoustic properties.

The difference between this experiment and Experiment 2A was in the response type and choices. We returned to the forced-choice methodology, and we presented answer choices based on those in Experiments 1A-B but without the pronominal *one*. Examples are shown in (25).

- (25) Forced choice alternatives
- a. No-Adjective answers
    - i. nice child (NP) ii. strike a child (VP)
  - b. Adjective answers:
    - i. a nice child (NP) ii. strike a rude child (VP)

As shown in (25), the VP answers had to vary between conditions in order to match the full content of the correlate, i.e. containing the same adjective in (25b) but no adjective in (25a). The NP answers could remain the same across conditions, but differed in their relationship to the prior clause. Without a matrix adjective (24–25a), NP answers represented a choice of zero-adjective contrast; otherwise, NP answers simply showed overt adjective contrast between correlate and remnant.

**Participants.** One hundred and eighteen participants were recruited through Amazon Mechanical Turk to complete a survey on the Qualtrics platform for a payment of \$3.60. The data from 7 participants were removed due to less than 90% accuracy on the questions following unambiguous filler sentences or several missing responses, and data from an additional 7 participants were removed in order to counterbalance the number of participants per list, leaving one hundred and four participants in the analysis. All participants reported being native English speakers.

**Procedure.** Along with the 20 experimental items, there were 59 sentences from three different unrelated sub-experiments and 35 filler sentences with a variety of structures, for a total of 99 stimuli. Most of the other items were unambiguous or ambiguous complete

sentences followed by comprehension questions, either yes/no questions about causal relationships or two-choice questions about some aspect of the sentence's meaning. One set of 15 fillers contained forced-choice completions relating to pronoun reference. A short set of demographic questions followed the stimuli.

### Results

As before, the data were subjected to a logistic linear mixed effects regression model with Adjective as the only fixed effect. Random slopes and intercepts were included as the random effects of the model. The Adjective condition was sum-coded, so that conditions without an adjective was treated as the statistical baseline [Intercept:  $\hat{\beta} = 0.48$ ,  $SE = 0.27$ ; Wald  $Z = -1.77$ ,  $p = 0.08$ ; Adjective:  $\hat{\beta} = -1.139$ ,  $SE = 0.19$ ; Wald  $Z = -6.42$ ,  $p < 0.001$ .] Without the adjective in the correlate (24a), there was a strong preference for VP continuations ( $M = 75\%$  VP completions,  $SE = 1$ ). With the adjective present (24b), the preference shifted to NP continuations ( $M = 37\%$  VP completions,  $SE = 1$ ). These results replicate those in Experiment 2A with a larger effect size, showing that the presence of *one* in the earlier answer choices did not account for the pattern of results. Instead, NP continuations with zero-adjective contrast were strongly dispreferred. The preference for NP continuations with an adjective present might also show a dispreference for VP answers with excess given material: recall that the VP answers in the adjective condition had to repeat that adjective as part of an entirely given, non-contrastive object NP. These findings support our use of *one* in earlier studies.

### Discussion

This auditory experiment replicated the results of Experiment 2A in a forced-choice paradigm, showing that processors continued to strongly prefer VP continuations over NP continuations with non-parallel adjectives. When the NP continuations did not contain zero-adjective contrast, they became much more attractive remnants and were even preferred. As expected given the corpus results and the form of the open completions in Experiment 2A, the presence or absence of pronominal *one* did not turn out to account for the effects observed in the previous experiments. Instead, the use of *one* minimises non-contrastive lexical content in the remnant.

### Experiment 3: auditory forced-choice completion

In the previous experiments, we controlled for prosody, allowed for open responses, and tested the influence of pronominal forms in the remnant. We again found a

strong bias against NP remnants with zero-adjective contrast unless there was a suitable contrast in the previous clause. In this experiment, we return to the forced-choice completion method, pitting a VP remnant against an NP remnant with an adjective, while also manipulating the placement of contrastive pitch accents. The design allows us to test the strength of the bias against zero-adjective contrast and explore the effects of accents which mark a potential correlate as contrastively focused.

## Method

### Items

Twenty fragment quartets like (26) were constructed, crossing Accent placement (Verb accent, N accent) and the presence of a prenominal Adjective (Adjective, No Adjective).

- (26) Sentence fragments
- The police didn't ARREST a suspect, much less ... (V accent, No Adj)
  - The police didn't ARREST a harmless suspect, much less ... (V accent, Adj)
  - The police didn't arrest a SUSPECT, much less ... (N accent, No Adj)
  - The police didn't arrest a HARMLESS SUSPECT, much less ... (N accent, Adj)

Each fragment was followed by two possible forced-choice written completions (27), similarly to Experiment 1.

- (27) Forced choice alternatives
- charge one. (VP remnant)
  - a dangerous one. (NP remnant with a non-parallel Adjective)

In the Adjective conditions (26b,d), neither the VP nor the NP remnant involves non-parallel contrast, which allows us to explore which contrast is preferred when zero-adjective contrast is not a factor in response selection. As there is no corresponding adjective in the correlate for No Adjective conditions (26a,c), an NP answer indicates that the subject chose zero-adjective contrast.

The experimental items were produced with two different prosodic patterns, namely with the verb accented or the object accented, as shown by capital letters in (26), in addition to the lexical manipulation of the presence or absence of an adjective. The subject NP was always accented, and then contrastive (L + H\*) accents appeared on either the verb in V accent conditions (26a-b) or the object noun in N accent conditions (26c-d). The adjectives in condition (d) bore H\* accents but the main accent was on the noun. The ends of the

first clauses were marked by a continuation rise with L-H% boundary tones. Acoustic measurements which support this analysis are shown in Table 8. The verbs were both higher and longer on average in conditions (26a-b) than in (26c-d); the object nouns were higher and longer on average in conditions (26c-d) than in (26a-b). Any recorded sentence which did not fit the intended prosodic contour was re-recorded and re-measured.

We considered two possible ways that accents could affect the choice of continuations. First, if comprehenders take pitch accent as a narrow indicator of focus scope, then the pitch accent should determine the remnant type: cases of object NP accent should elicit more NP remnants, even with zero-adjective contrast, and cases of V accent should elicit more VP remnants, regardless of the presence of a contrastive adjective. Second, if NP accent is consistent with both narrow (NP) and broad (VP) focus, as suggested by intonational theories of focus projection (e.g. Selkirk, 1984, 1995) and the rating results of Birch and Clifton (1995, 2002), subjects should interpret V accent as broad VP focus and choose VP remnants in NP accent conditions (26c), unless an adjective in the object NP indicates a more specific contrast (26d). In essence, the (c-d) manipulation addressed whether contrastive focus on a correlate NP is sufficient to warrant zero-adjective contrast compared against more parallel cases in which an adjective contrast is licensed by an overt adjective with pitch accent in the preceding clause.

### Participants

Fifty-four participants were recruited and paid \$3 through AMT to complete a survey on the Qualtrics platform. Two of them reported being non-native speakers of English and so their data were subsequently removed. The data from four additional participants were removed in order to counter-balance participants across the twelve lists of items, leaving a total of forty-eight participants whose data were analyzed.

**Table 8.** Average F0 measurements in Hz and duration measurements in ms for words in Experiment 3 sentences.

	Verb	Adjective	Object N	Boundary L-H%
F0 averages				
a. V Accent, No Adj	258	–	155	143, 182
b. V Accent, Adj	255	162	155	145, 174
c. N Accent, No Adj	208	–	247	142, 177
d. N Accent, Adj	211	209	238	143, 167
Durations				
	Verb	Adjective	Object N	Pause
a. V Accent, No Adj	404	–	590	147
b. V Accent, Adj	375	342	574	179
c. N Accent, No Adj	293	–	700	160
d. N Accent, Adj	301	360	655	156

## Procedure

The procedure was identical to the procedure in Experiment 1B. Along with the 20 experimental items, there were 64 sentences from unrelated experiments and 20 fillers with different structures for a total of 104 stimuli. The experiment lasted around 25 min on average.

## Results

Means and standard errors are reported for each condition in Table 9.

The data were analyzed as generalised logistic linear mixed effects regression models with the sum-coded conditions of Adjective, Accent, and their interaction as fixed effects predictor variables, and by-subject and by-item slopes and intercepts for the random effects structure. The model is presented in Table 10.

There are several main effects to report. First, there was again a general bias towards VP remnants, though at a rate of 68%, the strength of the bias was numerically lower than in Experiments 1 and 2. Second, we found a main effect of Adjective, in which fewer VP remnants were elicited when an adjective was present in the correlate ( $M = 52\%$ ,  $SE = 2$ ) than when it was not ( $M = 83\%$ ,  $SE = 2$ ),  $z = -10.74$ ,  $p < 0.001$ . Third, there was a main effect of Focus placement, in which subjects selected VP remnants less often in cases of Noun focus ( $M = 62\%$ ,  $SE = 2$ ) than Verb focus ( $M = 73\%$ ,  $SE = 2$ ),  $z = -3.88$ ,  $p < 0.001$ . Finally, we observed that subjects increased their preference for VP responses as the experiment progressed,  $z = 2.57$ ,  $p < 0.05$ .

Additionally, we observed the predicted interaction, in which Noun accent in the matrix clause elicited more NP remnant choices than Verb accent did, but only when there was a contrastive adjective in the matrix object ( $d = 20\%$ ),  $z = -2.60$ ,  $p < 0.01$ . Noun accent appeared not to affect the remnant preferences when there was no contrastive adjective ( $d = 3\%$ ). We

**Table 9.** Mean percentage of VP remnants supplied by subjects and standard errors for all conditions in Experiment 3.

% VPs	No Adjective	With Adjective	Difference
Verb Focus	85% (2)	62% (3)	23%
Noun Focus	82% (3)	42% (2)	40%

**Table 10.** The generalised logistic linear mixed effects regression model for Experiment 3.

Fixed effects	Estimate	Std. Error	Wald Z	p-estimate
(Intercept)	0.726	0.331	2.195	<0.05
Adjective	-1.034	0.096	-10.739	<0.001
Noun accent	-0.346	0.089	-3.881	<0.001
Trial order	0.008	0.003	2.567	<0.05
Adjective × Noun accent	-0.231	0.089	-2.596	<0.01

interpret this result as evidence for the interactive role of prosodic marking in locating the appropriate scalar dimension against which the correlate and remnant will be compared. While the mere presence of a scalar adjective in the matrix was enough to increase the number of NP remnants with adjectives in the responses, it was not until the adjective received pitch accent that the bias for VP remnants was overturned.

## Discussion

The results provide additional support for the previously observed VP bias in offline completion tasks involving FSC structures. Furthermore, we have confirmed that the remnant choice is sensitive not only to accent placement in the correlate, but also to the salience of scalar contrast, as indicated by pitch accent placement (Harris & Carlson, submitted). The general findings thus far are that zero-adjective contrast is rare in text and avoided in completion paradigms, but that comprehenders are not simply averse to adjective contrast in general, especially when the adjective in the correlate bears a pitch accent. The results from the experiments above support the Parallel-correlate hypothesis over the Scale-first hypothesis in production and offline sentence comprehension. Despite the ease of constructing a scalar relationship between an NP remnant with zero-adjective contrast and its correlate, such remnants are not preferred. Instead, the presence of an adjective in an NP remnant is much more acceptable when the correlate also contains an adjective.

The experiments thus far have all provided offline evidence that language users prefer parallel correlates. However, we also predict that the preference is active during real-time sentence processing, reflecting an online strategy for recovering the correlate by accessing the surface form of the antecedent clause. We now test this prediction in a self-paced reading experiment in order to investigate the effects of zero-adjective contrast in real-time sentence processing.

## Experiment 4: self-paced reading

In this experiment, complete sentences with *much less* ellipsis were presented in a moving window self-paced paradigm. The aim was to study the on-line processing of this ellipsis type with and without zero-adjective contrast.

## Method

### Items

The 20 items appeared in 4 conditions, crossing two factors. The first factor manipulated the presence of a

contrastive adjective like *complex* in object position (28c, d) with the absence of any such adjectives (28a,b). The second factor manipulated the syntactic type of the remnant: NP remnants with adjectives were presented in conditions (28a,c), whereas VP remnants were presented in conditions (28b,d). Only in condition (28a) does the lack of an adjective result in zero-adjective contrast. The materials were designed to include a spillover region and a final region for sentence-final wrap up (regions 6 and 7, respectively) after the ellipsis remnant (*an easy one* or *burn one*) in region 5. These regions were presented as short, prosodically-natural phrases.

- (28) a. |<sub>1</sub> The chef |<sub>2</sub> didn't overcook |<sub>3</sub> a meal, |<sub>4</sub> much less |<sub>5</sub> an easy one, |<sub>6</sub> since he was trained |<sub>7</sub> by the very best. (No Adjective, NP Remnant)  
 b. |<sub>1</sub> The chef |<sub>2</sub> didn't overcook |<sub>3</sub> a meal, |<sub>4</sub> much less |<sub>5</sub> burn one, |<sub>6</sub> since he was trained |<sub>7</sub> by the very best. (No Adjective, NP Remnant)  
 c. |<sub>1</sub> The chef |<sub>2</sub> didn't overcook |<sub>3</sub> a complex meal, |<sub>4</sub> much less |<sub>5</sub> an easy one, |<sub>6</sub> since he was trained |<sub>7</sub> by the very best. (Adjective, NP Remnant)  
 d. |<sub>1</sub> The chef |<sub>2</sub> didn't overcook |<sub>3</sub> a complex meal, |<sub>4</sub> much less |<sub>5</sub> burn one, |<sub>6</sub> since he was trained |<sub>7</sub> by the very best. (Adjective, VP Remnant)

Along with the 20 experimental items, there were 36 sentences from two unrelated experiments and 43 fillers for a total of 99 stimuli.

### Participants

Sixty participants were recruited from the Morehead State University campus, and were compensated with \$10. All participants identified themselves as native English speakers. Data from one subject was corrupted. Another subject was removed for scoring less than 80% on the comprehension questions.

### Procedure

The experiment was run using the E-Prime program on a PC in a sound-proof booth. Participants pressed buttons to read each successive phrase in the sentences, in a visual moving windows design. Comprehension questions followed half of the items in order to ensure that

participants were reading for comprehension. Half of the comprehension questions were yes-no questions (such as *Was the chef competent?*) and half of them were simple *wh*-questions (such as *Where do students get their textbooks? the bookstore or online*).

Each participant read through a set of instructions and completed a 6-item practice session before starting the experiment. Participants read only one version of each item and saw equal numbers of stimuli in each condition over the course of the experiment. Most participants completed the experiment within 30 min.

### Results

The reading times of primary interest are those for the region immediately after the remnant phrase, when people were processing the contrast they had just encountered. After reading times over 2000 ms were eliminated from each region of interest, outliers over 3 standard deviations were removed from the data. Reading times for regions after the *much less* coordinator are shown in Table 11.

The data were then analyzed as a linear mixed effects regression model with the sum-coded predictor variables of Matrix contrast, Remnant type, and their interaction, along with the interactive predictor of presentation Order, i.e. how far along the subject was into the experiment. Model parameters were selected on the basis of previous results from Harris and Carlson (2016), which showed that presentation order affected the speed with which subjects read the remnant and the region following it, so that the size of the effect grew less robust over time. As above, random effect structures included all planned effects for by-subjects and by-items random slopes and intercepts. The final region failed to show any effects of interest and so is omitted from discussion. All significant effects are reported (Table 12).

For the region containing the remnant, there are several effects to report. First, there was a main effect of Remnant type, in that NP remnants ( $M = 853$  ms,  $SE = 17$ ) elicited longer reading times than VP remnants ( $M = 789$  ms,  $SE = 15$ ),  $t = 3.64$ . This penalty reduced as the experiment progressed,  $t = -2.07$ . We also found a

**Table 11.** Means and standard deviations (in parentheses) for reading times after the *much less* coordinator.

Matrix contrast	Remnant type					
	Remnant (Region 5)		Spill over (Region 6)		Final (Region 7)	
	NP	VP	NP	VP	NP	VP
Adjective	855 (25)	813 (22)	981 (24)	953 (24)	1048 (29)	1034 (29)
No Adjective	852 (23)	765 (19)	1012 (25)	943 (23)	1043 (28)	985 (24)
Sprouting cost	-3 ms	NA	31 ms	NA	-5 ms	NA
Misleading contrast cost	NA	48 ms	NA	10 ms	NA	49 ms



**Table 12.** Linear mixed effects for Region 5 (the remnant) and Region 6 (the spillover).

Fixed effects	Remnant (Region 5)			Spill over (Region 6)		
	Estimate	Std. Error	t-value	Estimate	Std. Error	t-value
(Intercept)	1051.620	36.790	28.584	1112.562	48.475	22.951
Remnant	80.313	22.069	3.639*	-8.978	22.330	-0.402
Adjective	-31.719	22.280	-1.424	0.252	22.740	0.011
Order	-4.388	0.382	-11.488*	-2.727	0.389	-7.006*
Remnant × Adjective	39.984	20.518	1.949+	47.301	22.725	2.081*
Remnant × Order	-0.795	0.383	-2.073*	0.725	0.393	1.845+
Adjective × Order	0.654	0.375	1.743	0.255	0.406	0.628
Remnant × Adjective × Order	-0.441	0.381	-1.158	-0.779	0.405	-1.922+

The "\*" marks a significant effect on the  $|t| > 2$  criterion; the "+" indicates a trend for  $|t| > 1.8$ .

general effect of presentation order: subjects read faster in later trials. In addition, there was a marginal interaction of Remnant type and Adjective: when there was an Adjective contrast in the matrix clause, there was a greater cost for VP remnants ( $d = 50$  ms) than NP remnants ( $d = 10$  ms),  $t = 1.95$  compared to conditions without the earlier adjective. This pattern suggests that after encountering an adjective in the first clause, subjects may have come to expect a corresponding contrasting adjective in the remnant, which would lead them to anticipate an NP remnant.

Several effects were observed in the spill over region. Of primary interest to zero-adjective contrast is the interaction between Remnant type and Adjective. As expected, there was a cost for NP remnants ( $d = 31$  ms) that did not follow an adjective in the matrix clause, but no observable cost for VP remnants ( $d = -10$  ms),  $t = 2.05$ , an effect which also attenuated over the course of the experiment,  $t = -1.92$ . Planned *post-hoc* comparisons found no differences in by-subjects or by-items *t*-tests between NP and VP remnants when either remnant followed an adjective,  $t's < 1$ , but NP remnants were penalised when a non-parallel adjective contrast existed, as evidenced by a significant by-subjects *t*-test comparison,  $t_1(57) = 2.22$ ,  $p < 0.05$ , and by a trend in a by-items *t*-test comparison,  $t_2(19) = 1.79$ ,  $p = 0.09$ . As in the remnant region, subjects sped up on the spill over region as the experiment progressed,  $t = -7.01$ .

## Discussion

The central findings of the self-paced reading experiment can be summarised in two main points. First, VP remnants, which did not make use of the adjective contrast, were penalised in the remnant region when they followed a matrix clause containing an adjective. We propose that readers may have predicted an upcoming adjective contrast on the basis of the presence of an adjective in the matrix clause, revising this expectation when it turned out to be incorrect. Although we cannot claim to have evidence that readers actively

anticipated adjectival contrasts upon reading the *much less* coordinator, their preferences for sentence continuations are certainly affected by the presence of an adjective in the matrix clause, as seen in Experiments 2 and 3. Second, zero-adjective contrast in NP remnants elicited a reading time cost in the region immediately following the remnant. This suggests that zero-adjective contrast is not just avoided in text, or when given a choice in off-line tasks, but that it also reduces the reading time in online sentence processing. Thus, the results of Experiment 4 dovetail with those of Experiments 1–3 to support the Parallel-correlates hypothesis. Zero-adjective contrast appears to be difficult to process, despite the clear entailment relationship between an unmodified correlate NP and a modified remnant NP.

## Conclusions

Our findings in four experiments and a corpus study argue against the Scale-first hypothesis. In corpora, zero-adjective contrast was rarely observed. In a host of offline and online experimental methods, it was disfavoured. Apparently, zero-adjective contrast in the remnant of a focus-sensitive coordination (FSC) construction demands additional processing resources over more parallel counterparts. Our results instead support the Parallel-correlate hypothesis, according to which parallel form between the correlate and remnant is preferred and easier to process. Although we suspect that correlate-remnant pairs that can be more easily placed along a scale should be easier to process, we found no evidence that a ready-made entailment relationship via zero-adjective contrast facilitates processing. The results indicate that the promise of a ready-made entailment relation is insufficient to offset whatever cost is incurred in violating parallelism between clauses.

Overall, *much less* ellipsis showed very similar remnant preferences to *let alone* ellipsis, another type of focus-sensitive coordination construction (Harris, 2016; Harris & Carlson, 2016). Corpus results for both types of coordinators yielded a moderate bias towards NP remnants,

with VP remnants a close second. Offline results from completion and forced-choice tasks showed a preference for VP remnants for both types of coordinator. Further, the pattern observed during the on-line processing of VP and NP remnants in *much less* ellipsis was overall very similar to the patterns observed for *let alone* (Harris, 2016).<sup>7</sup> We therefore expect that zero-adjective contrast would be dispreferred in *let alone* constructions also, and that sprouting or non-parallel contrast of other categories, e.g. sprouting of an NP argument or an adjunct, would be dispreferred in both kinds of FSC structures.

The present results shed some light on a particular corner of sentence processing which we believe has much wider implications for the parsing of ellipsis, and perhaps language processing more generally. Regarding ellipsis, we speculate that the preference for parallelism (operationalised here as the matching presence of an adjective in a pair of contrasting NPs) could indicate a general processing strategy of prioritising overt surface cues when locating a correlate for the remnant. This is consistent with the range of features that contribute to parallelism between NPs in other ellipsis structures, including definiteness, gender, number, and lexical form (Carlson, 2001, 2002). We hypothesise that, once the remnant has been parsed, the processor preferentially utilises the available syntactic content from the antecedent clause, in hopes of pairing the remnant and correlate via cues directly available from the syntax. This strategy of attending to surface form persists even when the meanings of the correlate and the remnant delimit any possible relations to that of an entailment. The FSC construction is useful for studying this tradeoff because it demands that a specific relationship between the correlate and the remnant be formed, rather than opting out or leaving the relationship vague or otherwise partially specified. In general, it points to a conceptual priority of processes in the recovery of elliptical forms: the processor must locate a suitable correlate within the matrix clause for a remnant before it can postulate the necessary relations between them.

As mentioned earlier, an analogous structure was identified by Chung et al. (1995), who wrote about puzzling cases of sluicing ellipsis (clausal ellipsis under a constituent question) in which the antecedent and elided clause apparently present different argument structures, as in (29b). In (29a), an overt indefinite correlate in the first clause (*something*) corresponds to the *wh*-remnant (*what*) in the sluiced clause, but in (29b), there is no overt correlate for the remnant. In order to interpret (29b), a variable corresponding to the implied correlate has to be added into the representation of the ellipsis

to contrast with the *wh*-word (29c), a process they dub “sprouting”.

- (29) a. Bill sang something, but I don't know what<sub>i</sub> <he sang x<sub>i</sub> >  
 b. Bill sang, but I don't know what <he sang >  
 c. Bill sang, but I don't know what<sub>i</sub> <he sang x<sub>i</sub> >

Frazier and Clifton (1998) and Dickey and Bunker (2011) have shown that sprouted sluicing sentences (29b) elicit processing costs compared to non-sprouted ones (29a). Dickey and Bunker (2011) also found that non-elided sentences with sprouting elicited longer processing times than sentences with a clear correlate overtly present in the matrix clause. Their findings lead to the possibility that the processing penalty for sprouting is not specific to sluicing ellipsis, or indeed ellipsis in general, but reflects a more general preference for contrastive elements to be as readily identifiable from the surface structure as possible. This sprouting and parallelism work thus harmonises with the conclusions from our *much less* studies, even though our constructions did not differ in argument structure.

Regarding the implications for language processing as a whole, we return to studies on other types of coordination. We found that *much less* does not elicit a radically different processing profile than more prosaic forms of coordination, thereby confirming the centrality of the three core properties discussed in the introduction: incrementality, top-down prediction, and parallelism. Although we have focused on a construction that might have overruled the general preference for parallel syntax in favour of ease of semantic processing, we found evidence that violating parallelism between contrasting phrases (even when they are not directly coordinated) was strongly dispreferred in production and potentially taxing in comprehension. Less directly, results from the self-paced reading experiment are compatible with the pervasiveness of top-down information in generating expectations about the input, in that reading times were inflated whenever an adjective in the matrix clause failed to correspond to a contrastive adjective in the remnant NP. Conceptually, this effect might be viewed as the opposite of the cost for sprouting contrasts, but we believe that it might instead be rooted within the same mechanism: when encountering a connective, the processor plausibly generates hypotheses about what the following material will contrast with in the preceding clause. The cost for zero-adjective contrast is a case in which the relevant contrast failed to be indicated in the previous clause; there may well be a similar cost for hypothesising likely contrasts given material in the preceding clause that go unrealised.

Indeed, several previous experiments have found that the processor makes fairly fine-grained predictions regarding various properties of an upcoming word, whether they be syntactic (e.g. Staub & Clifton, 2006; van Berkum, Brown, Zwitserlood, Kooijman, & Hagoort, 2005; Wicha, Bates, Moreno, & Kutas, 2003), semantic (e.g. Kutas & Federmeier, 2000), or orthographic (e.g. DeLong, Urbach, & Kutas, 2005; Laszlo & Federmeier, 2009), as well as more general event-thematic relations (e.g. Altmann & Kamide, 1999; Altmann & Mirković, 2009). We propose that contrastive relations may be added to this list, in that the processor forms expectations about the remnant of FSC ellipsis on the basis of potentially contrastive elements within the antecedent clause. While we do not yet have enough information to confirm which factors drive anticipatory processing of a FSC remnant, we suspect that prosodic and lexical factors may play a particularly important role, in that prosodic marking serves to highlight the intended correlate-remnant pair, and different lexical items (e.g. scalar adjectives, determiners with conventionalised scales) may provide readily accessible scalar relationships. Of course, these factors may turn out to be exacerbated or muted, depending on the context.

Future studies on contrast in FSC constructions may wish to pay particular attention to the effect of context. Although all of the experiments above were conducted without the benefit of explicit context, we suspect that the effectiveness and use of FSC constructions is most likely influenced by the information structure of the discourse around a sentence. Additional research could explore whether specific contexts change the processing preferences of *much less* ellipsis or FSC ellipsis in general, and whether supporting context could reduce, or eliminate altogether, the cost of zero-adjective contrast in focus-sensitive coordination.

## Notes

1. Where possible, we give examples of *much less* ellipsis found in the Corpus of Contemporary American English (COCA; Davies, 2008). This source is indicated parenthetically.
2. For reasons of space, we have omitted syntactic tests that indicate clausal ellipsis; see Hulsey (2008) for arguments that FSCs always involve some kind of ellipsis, and Harris (2016) for arguments that the type of ellipsis involved is of the clausal variety.
3. As noted by a reviewer, this comparison is weakened by the fact that FSCs often appear in the scope of explicit negation, even though a fair number of examples observed in corpora are licensed by implicit negation, negative adjective and adverbs, questions, and pragmatic adversity. Even when the FSC structure appears beneath clausal negation, fronting is still prohibited for

FSC structures (a-b), and not subordination (c-d).

- (i) a. It's not the case that John would go to the party, much less the after party.
  - b. \* It's not the case that, much less the after party, John would go to the party.
  - c. It's not the case that John will go to the party, even if Mary came.
  - d. It's not the case that, even if Mary came, John will go to the party.
4. We are following previous literature in assuming that these structures coordinate constituents (e.g. Hulsey, 2008; Toosarvandani 2009, 2010), though a reviewer questions whether the proper relation might be that of subordination. We continue to use the term *coordination* because parallelism effects are also observed for subordinate clauses (e.g., Sturt et al., 2010), and would not therefore confound our findings, even if the mechanisms for parallelism are not necessarily the same between coordination and subordination.
  5. Important exceptions include dialects that allow so-called "positive" *let alone*, in which the scalar relation between remnant and correlate are reversed (Fillmore et al., 1988; see also Mark Liberman's commentary on *Language Log*, November 21, 2007, accessible as <http://itre.cis.upenn.edu/~myl/language-log/archives/005142.html>), and the afterthought use, which appears to be devoid of a scalar component and can be paraphrased along the lines of *not to mention* (Cappelle, Dugas, & Tobin, 2015).
  6. This strength of this generalization depends on the syntactic category of the remnant. NP and VP remnants, the most common categories, displayed total contrasts (with NP or VP correlates) in approximately 80% of cases, whereas Adverb remnants showed a near even split between Adverb (55%) and PP (45%) correlates. Nevertheless, the majority of remnant classes showed total or near total matching between remnant category and contrast.
  7. Also, the lack of a strong processing cost for VP over NP remnants in both types of FSC structure further supports the idea that the processor projects an ellipsis structure at the coordinator, obviating structural economy preferences. It would otherwise be a puzzle why a larger and more structurally complex VP remnant would fail to elicit processing costs compared to an NP remnant.

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## ORCID

Katy Carlson  <http://orcid.org/0000-0001-6372-4389>

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