A Note on the Voice Mismatch Asymmetry in Ellipsis

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Abstract

Theories of ellipsis differ in the identity condition claimed to hold between an antecedent and an elided constituent. A syntactic identity condition leads to the prediction that syntactic mismatches between an antecedent and elided constituent should give rise to a penalty, and that penalty should be greater than in corresponding examples without ellipsis. Further, if syntactic mismatches are ungrammatical, violating the syntactic identity condition, then in effect they are speech errors and would be expected to be rated higher when a passive clause antecedes an active elided VP than vice versa because people misremember passives as actives more often the reverse. A written acceptability judgment study crossed the voice of the antecedent clause (active/passive), the voice of the ellipsis clause (active/passive) and ellipsis/non-ellipsis in the final clause. Results indicate a syntactic mismatch lowers acceptability in examples with elided VPs but not examples with overt VPs, as predicted by theories with a syntactic identity condition. Passive-active mismatches were rated better than active–passive ones, especially with ellipsis, as predicted by a speech error/repair approach to mismatches. This result eliminates any concern that the appearance of a voice asymmetry might only be due to some incompatibility between VP ellipsis and passive voice.

Introduction

In this note, we address two aspects of a long-standing question in linguistics and psycholinguistics: what are the grammatical requirements of verb phrase ellipsis (VPE), and how are sentences that violate them understood? Consider (1):

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1.   a. Bill read the documents and Joe did too.

          b. The documents were read by Bill and Joe did too.

Example (1a) is clearly more acceptable than (1b). Two main classes of analyses of VPE exist and can account for this difference (see Johnson 2001, for a thorough overview, considering a variety of different kinds of ellipsis). One class claims that the grammar requires a syntactic match at some level of representation in all sentences involving ellipsis (Sag 1976; Williams 1977).[1] The other class denies the need for a syntactic match. Some instances of this class claim that the elided VP is a pro-form, which merely requires an antecedent of the appropriate semantic type (Hardt 1992, 1993, 1999).

Proponents of a semantic or discourse approach to VPE typically emphasize that VPE shares properties with other discourse referential devices, namely, it allows antecedents in a prior sentence (Hardt 1990), as well as cataphoric antecedents (Kehler 2015), split antecedents (Webber 1978) and non-linguistic antecedents (Poppels and Kehler 2017).[2] Proponents of a syntactic theory emphasize the greater restrictiveness of their theory, and the distinct characteristics of examples with a syntactically matching antecedent and those with nonlinguistic antecedents or split antecedents (Frazier and Duff to appear).

In terms of accounting for mismatch antecedent examples, a syntactic approach must account for the observation that certain cases of mismatch may be accepted to some extent, e.g., by assuming that a syntactically mismatching antecedent can be repaired at some cost (Arregui et al. 2006) or accommodated (Thoms 2015). A discourse approach must account for the unacceptability of some instances of antecedent-mismatch ellipsis, perhaps by appealing to some discourse requirements (Kehler 2002; Poppels and Kehler 2017, 2018, Miller et al. 2019).

We will focus here on the voice (mis)match phenomenon under VPE, in which antecedent and ellipsis can match or mismatch in voice (active vs. passive). In earlier work (Arregui et al. 2006) we claimed not only that ellipsis with voice mismatches are ungrammatical but that there is an asymmetry: a passive antecedent clause followed by an active ellipsis clause was found to be more acceptable than an active–passive mismatch. This asymmetry was attributed to the fact that a passive is more likely to be misremembered as an active than vice versa (Mehler 1963). Arregui et al. argued that this effect provides experimental support both for the representational identity requirement for VPE and for an account in which a mismatching antecedent is repaired. We will discuss more about the implications later in this note. But our immediate purpose is to more systematically examine the scope of the mismatch penalty effect and the voice asymmetry effect. This is needed because some recent studies have questioned whether the voice mismatch penalty is specific to VPE and whether the asymmetry in the mismatch penalty truly exists (Poppels and Kehler 2017, 2018).

In support of the asymmetry prediction, Arregui et al. (2006) presented acceptability judgment data for sentences like (2).

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[1] In the particular context of VPE voice (mis)match, Merchant (2008, 2013) proposes that, although VPE requires a syntactically matching antecedent, sentences in which an antecedent and an elided verb phrase mismatch in voice can still be acceptable. This is because the identity requirement is satisfied at a level in the syntactic tree where the value of the voice feature has not yet been specified. The data to be presented here demonstrate that mismatching VPE sentences are not in fact fully acceptable.

[2] Evidence also suggests that VPE differs from VP Anaphora (VPA) by showing stronger matching effects (e.g., Tanenhaus and Carlson 1990). However, recent work by Miller suggests the different discourse properties of VPE and VPE undermine the validity of this contrast (Miller 2011; Miller et al. 2019).

2.   a. The dessert was praised by the customer after the critic did already.

      b. The customer praised the dessert after the appetizer was already.

Sentences with a passive antecedent clause and active ellipsis clause (2a) were rated more acceptable than sentences with an active antecedent clause and passive ellipsis clause (2b).

Poppels and Kehler (2017, 2018) correctly pointed out that the design used in the passive study in Arregui et al. tested only voice mismatch sentences but not sentences where the voice was the same in the antecedent clause and the ellipsis clause. Consequently, the difficulty attributed to active–passive mismatches might really be due simply to some incompatibility between ellipsis and the passive voice. The partial design used in that study (Experiment 5 of Arregui et al.) couldn't distinguish between this incompatibility hypothesis and the original memory hypothesis for the apparent mismatch asymmetry, because it did not compare VPE sentences with mismatching antecedents to such sentences with matching antecedents.

Recently, Kim and Runner (2018, Experiment 1) reported a more complete study. They measured the acceptability of VPE sentences whose antecedents either match or mismatch the ellipsis in voice, and found a highly significant cost to the mismatch. They also compared the acceptability of sentences where the elliptical verb phrase was replaced by a fully spelled-out verb phrase, and found that the voice mismatch cost disappeared. However, since their experiment was designed primarily to examine the effect of discourse relations on acceptability (Kehler 2002), they did not provide clear evidence about the existence of a mismatch asymmetry (a greater cost in the active–passive than the passive-active VPE condition). While they did claim that their results confirm the asymmetry reported by Arregui et al., they did not report the relevant data, and the critical statistical effect (an interaction of ellipsis, match/mismatch, and voice) was not fully significant.

To clarify the issue of whether the penalty for a passive ellipsis is limited to cases with an active antecedent (the mismatch cases), we report an experiment with the full design crossing the voice of the antecedent clause and the voice of the final/ellipsis clause, together with one additional factor, whether the final clause contains ellipsis or not. If the relative unacceptability of passive ellipsis with an active antecedent reflects only processes involved in the interpretation of ellipsis, it should disappear when the antecedent is a passive, as well as when the ellipsis is replaced by a fully specified verb phrase. However, if it remains under these conditions, then some version of Poppels and Kehler's proposal could provide an adequate account of the apparent asymmetry that Arregui et al. observed.

Methods

Participants

Sixty-nine participants were recruited using Amazon's Mechanical Turk (https://requester. mturk.com/).All had U.S. web addresses, and all indicated that they were over 18 years of age and native speakers of English, and all consented to participating in the experiment following procedures approved by the University of Massachusetts Institutional Review Board. Each was paid $1.20 for participating in the experiment, which typically lasted

8–10 min. The data for ten participants were discarded because of indications (discussed below) that they were not reading the sentences carefully.

Materials

Twenty-four sentences were constructed in eight forms each, as illustrated in (3). All items appear in the "Appendix".

3. a. The little girl was taken aside by the janitor, and later the beekeeper did too.
   b. The little girl was taken aside by the janitor, and later the beekeeper took the little girl aside too.
   c. The little girl was taken aside by the janitor, and later the beekeeper was too.
   d. The little girl was taken aside by the janitor, and later the beekeeper was taken aside by the janitor too.
   e. The janitor took the little girl aside, and later the beekeeper did too.
   f. The janitor took the little girl aside, and later the beekeeper took the little girl aside too.
   g. The janitor took the little girl aside, and later the beekeeper was too.
   h. The janitor took the little girl aside, and later the beekeeper was taken aside by the janitor too.

The eight versions of each item, as illustrated in (3), were the factorial combination of active versus passive initial clauses (3a–d vs. 3d–h), active versus passive second clauses (3a, b, e, f vs.3c, d, g, h) and elliptical versus non-elliptical second clauses (3a, c, e, g vs. 3b, d, f, h). This resulted in half the forms having second clauses that were not parallel to the initial clause (the 'mismatch' items), and half having parallel clauses ('match' items). All items contained two clauses, joined by a connective such as *apparently* or *later*, because this was the form used by Arregui et al. (2006) and by Poppels and Kehler (2018) in their experiments that showed the absence of a mismatch asymmetry effect. The experimental items appear in the "Appendix".

These 24 experimental items were combined with 28 filler sentences. Six were grammatical sluicing sentences, six were grammatically nonparallel elliptical sentences not involving voice mismatches taken from Arregui et al. (2006), 12 were grammatical and generally plausible sentences of various forms, and four were sentences with clear violations of syntax and plausibility. These last four were intended as 'catch' items to identify participants who were not reading sentences carefully.

Procedures

Participants were tested using IbexFarm software (http://spellout.net/ibexfarm/). After indicating their consent to participate in the experiment and completing a short demographic questionnaire, participants were instructed that on each trial of the experiment, they were to read a single sentence and press the space bar on their computer when they understood the sentence. The sentence then disappeared and a 7-point naturalness rating scale appeared. Participants were asked to indicate the extent to which the sentence sounded like a 'good sentence of English, something a native speaker might say in some context or other.' After four practice sentences, the 52 experimental and filler sentences were presented in individually randomized order. Participants' naturalness judgments as well as their reading and decision times were recorded.

Results

The data for ten participants were rejected because the mean of their responses to the four "catch" items exceeded 3.6 (grand mean plus 1 SD for these items) on the 7 point naturalness scale. In statistically analyzing naturalness ratings from the remaining participants, it is inappropriate to treat them as existing on a metric scale (e.g., the values may not be equally spaced and cannot extend beyond the limits of the scale), but they can legitimately be treated as ordinal values (e.g., Christensen and Brockhoff 2013; see Liddell and Kruschke 2018, for extended discussion of problems created by treating ordinal data as if they are metric). Therefore, the numerical naturalness ratings were analyzed as an ordinal mixed regression model (cumulative link mixed model) using the clmm function in R 3.4.3 and the package ordinal 2015.6-28 (R Development Core Team 2017) (see Christensen 2018, for detailed description of the analysis). Since the data were treated as ordinal categories, rather than being on an interval scale, they are best described by presenting their distributions (Fig. 1) and their median values (Table 1). However, some understanding of these data may be conveyed by their mean ratings and standard errors, which also appear in Table 1.

The cumulative link mixed models used sum coding of the three fixed effect factors, voice (active vs. passive) of the ellipsis clause, parallelness of the two clauses (match vs. mismatch), and ellipsis (elliptical vs. non-elliptical second clause). Noninteracting random slopes of subjects and participants were used in the analysis (analyses with interacting random slopes did not converge). The model results appear in Table 2. The results are straightforward: all main effects and all interactions were significant at or beyond $p < 0.03$. Matching sentences were rated as more natural than nonmatching sentences; sentences with active ellipses were rated as higher than ones with passive ellipses; and the non-elliptical items were rated higher than the elliptical items. The highly significant interaction of match/mismatch and ellipsis/non-ellipsis provided strong evidence that the voice mismatch effect was limited to elliptical sentences. Finally, the significant 3-way interaction indicated the existence of a mismatch asymmetry, limited to non-elliptical items. It can be seen as the larger mismatch effect for passive than for active ellipses, and the absence of any mismatch effect for non-elliptical items. The interaction can also be seen in Fig. 1 as the substantial leftward shift of the distributions for the mismatching elliptical sentences, especially in the case of the active–passive mismatch, and the absence of any such shift for the non-elliptical items.

The critical 3-way interaction was followed up by two separate 2-way ordinal mixed analyses, one on items where the ellipsis mismatched the antecedent and one where it matched the antecedent in voice. These analyses provided clear evidence for a mismatch asymmetry effect for elliptical sentences. The interaction of passive/active second clause and ellipsis/non-ellipsis was highly significant for the mismatching sentences ($\beta = 0.95$, SE = 0.29, z = 3.21, $p = 0.001$) but nonsignificant when voice of the two clauses was the same ($\beta = -0.01$, SE = 0.29, z = −0.032, $p = 0.974$). Additional follow-up analyses conducted on sentences with matching voice indicated that sentences with passive voice might be penalized compared to ones with active voice. Acceptability ratings for matching passive voice elliptical sentences were significantly lower than those for such sentences with an active voice (4.97 vs. 5.29, $\beta = -0.46$, SE = 0.23, z = −2.01, $p = 0.044$), and the same comparison for non-elliptical sentences approached significance (4.93 vs .5.29, $\beta = -0.53$, SE = 0.30, z = −1.78, $p = 0.075$). This apparent cost might be attributable to the voice of the second clause: non-elliptical active–passive (mismatching) sentences were rated lower
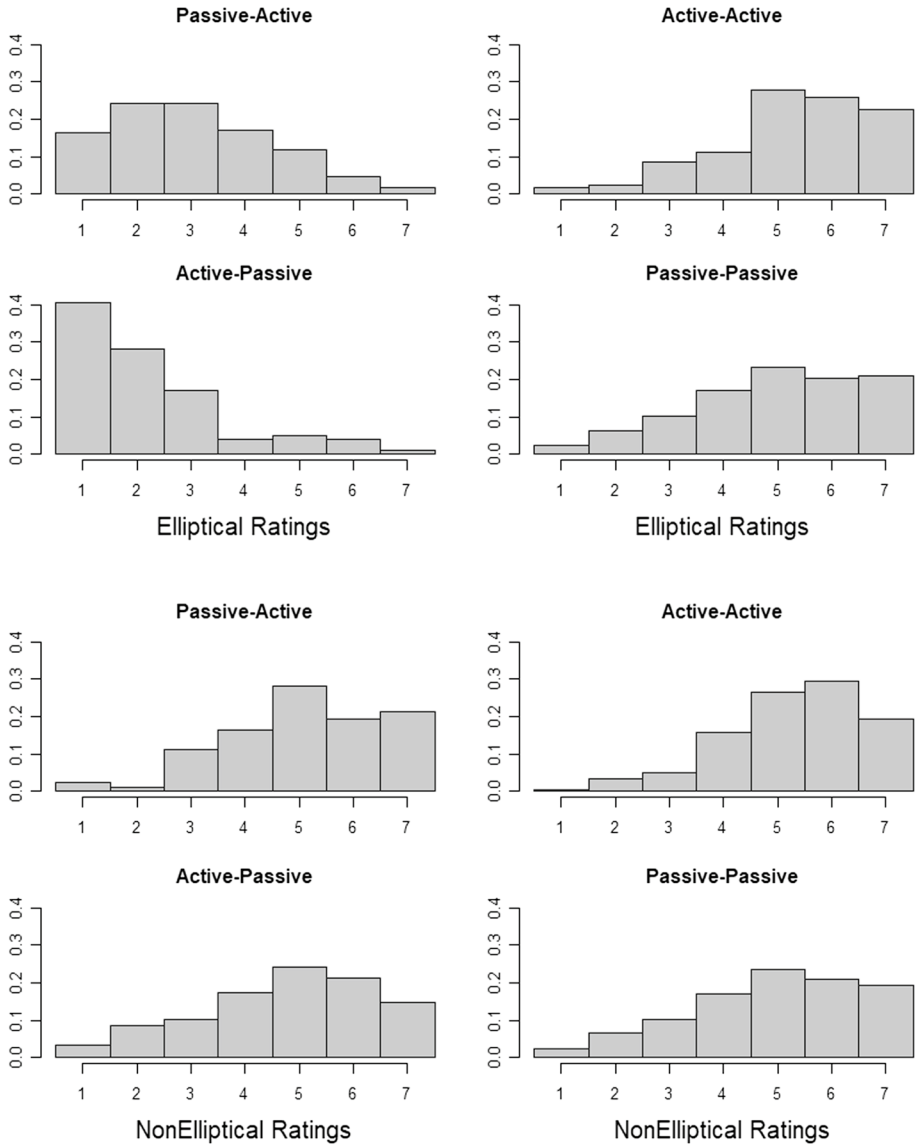
Fig. 1 Histograms of ratings

than their passive–active counterparts, 4.74 versus 5.22 ($\beta = -0.56$, SE $= 0.22$, z $= -2.57$, $p = 0.010$).

Table 1 Median naturalness ratings (means and their SEs in parentheses)

Second clause form	Match	Mismatch	Match-mismatch
Elliptical			
Active	5 (5.29, 0.11)	3 (3.04, 0.11)	2 (2.25)
Passive	5 (4.97, 0.12)	2 (2.21, 0.11)	3 (2.76)
Means	5 (5.13)	2.5 (2.63)	
Non-elliptical			
Active	5 (5.29, 0.10)	5 (5.11, 0.11)	0 (0.18)
Passive	5 (4.93, 0.12)	5 (4.74, 0.12))	0 (0.19)
Means	5 (5.11)	5 (4.93)	

Table 2 Results of cumulative link mixed model analysis

Effect	Estimate β	SE	Wald z	p
Second clause form	0.36	0.08	4.56	$<7e-06$
Match-mismatch	1.11	0.11	11.23	$<2e-16$
Elliptical-non-elliptical	-0.93	0.11	-8.82	$<2e-16$
Form X match-mismatch	-0.12	0.05	-2.45	0.014
Form X ellip/non-ellip	0.11	0.05	2.21	0.027
Match X ellip	0.88	0.06	15.70	$<2e-16$
Form X match X ellip	-0.11	0.05	-2.26	0.024

General Discussion

The first clear conclusion from our study confirms Kim and Runner's (2018) report that the cost of a voice mismatch between clauses is essentially limited to cases where the second clause is elliptical. The second clear conclusion is that, in addition to a possible overall cost of having a passive second clause, the cost of a voice mismatch is substantially larger in the active–passive than the passive-active order.

These findings (the VPE mismatch effect and the voice asymmetry effect) pose a challenge for theories that claim VPE involves a pro-form or some other mechanism by which a semantically appropriate antecedent is sufficient. They also provide a challenge for Merchant's (2013) theory, in which VPE voice mismatch was considered grammatical, derivable through more fine-grained syntactic representations of active and passive structures. They are consistent with the position taken by Arregui et al. (2006) that VPE sentences in which the antecedent differs in form from the ellipsis are ungrammatical, but can be somewhat acceptable if the antecedent can be repaired (a possibility advanced by Kim and Runner 2018, in discussing their results, although they emphasize the possible role of inferential and pragmatic factors in interpreting ungrammatical utterances; cf. Grant et al. 2012). It is, of course, possible that the effects we have observed could be accounted for by a theory that assumes mismatching elliptical sentences are grammatical but are costly because of some discourse condition (e.g., Kehler 2002). But the current results indicate that the following four points must be explained:

1. why the basic voice mismatch penalty holds

2. why the basic voice mismatch penalty holds only for ellipsis
3. why passive-active is more acceptable than active–passive
4. why the mismatch asymmetry (3) holds only for ellipsis, not for unelided sentences

Attributing point 3 to currently suggested discourse constraints does not suffice given that the effect holds only of ellipsis sentences. Candidate discourse principles involving both clauses addressing the same QUD (Question under Discussion) (Kehler 2015), or needing a Contrastive Topic analysis (along the lines of Hendriks 2004 or Kertz 2008, 2013), would seem to apply equally to ellipsis sentences and to their unelided counterparts. Our present understanding of the principles governing discourse and their interplay with syntactic structure is far from complete. So we certainly would not argue that a discourse-based theory is impossible, but we do argue that the present results pose a serious challenge for discourse oriented theories.

The single experiment reported here addresses some criticisms that have been leveled at syntactic matching accounts of ellipsis, but clearly does not answer all remaining questions about the processing of ellipses. One next step would be to extend and test accounts of the passive-active symmetry and its limitation to mismatch ellipsis. Arregui et al. (2006) appealed to Mehler's (1963) observation of an asymmetry in an explicit memory experiment and suggested that the asymmetry in acceptability might reflect changes in a reader's memory for the antecedent. Another possibility is that sentences that producers are more likely to erroneously produce are rated more acceptable than counterparts speakers are less likely to produce (as shown by Frazier and Clifton 2011, 2015). If a mismatch ellipsis is treated as some kind of speech error, something that must be repaired, the greater frequency of active than passive voice would favor a mismatching active ellipsis over a mismatching passive one. A third possibility is that when the surface syntax of an antecedent clause cannot be remembered or must be repaired, it is regenerated using the lexical items in the antecedent clause and the principles of production. Some recent findings by Xiang and Klafka (2018) provided preliminary evidence for this account. Clearly, further research is needed to expand upon and evaluate these and other possible accounts of how ellipsis that mismatches its antecedent is processed. And, of course, extensions of research to cases of ellipsis that mismatch in grammatical features other than voicing would be valuable.

Appendix

Materials used in the experiment. All 8 versions of the first item appear, but only the non-elliptical passive–passive versions of the remaining items (from which all 8 versions can be constructed) are presented.

1. The little girl was taken aside by the janitor, and later the beekeeper did too.
    The little girl was taken aside by the janitor, and later the beekeeper took the little girl aside too.
    The little girl was taken aside by the janitor, and later the beekeeper was too.
    The little girl was taken aside by the janitor, and later the beekeeper was taken aside by the janitor too.
    The janitor took the little girl aside, and later the beekeeper did too.

The janitor took the little girl aside, and later the beekeeper took the little girl aside too.

The janitor took the little girl aside, and later the beekeeper was too.

The janitor took the little girl aside, and later the beekeeper was taken aside by the janitor too.

2. The unruly students were contacted by the judge, and eventually the party-givers were contacted by the judge too.

3. The guitarist was given flowers by the music director, and just today the singer was given flowers by the music director too.

4. The buyer was seen by the seller, and predictably the middleman was seen by the seller too.

5. Some of the accountant's e-mails were taken by the IRS, and later some notes were taken by the IRS too.

6. The chocolate dessert was chosen by the guest, and apparently the oyster appetizer was chosen by the guest too.

7. The Red Sox were beaten by the Yankees, and surprisingly the Dodgers were beaten by the Yankees too.

8. Rabbit stew was eaten by the campers, and apparently ginger ice cream was eaten by the campers too.

9. Mary was spoken to by the lawyer, and today the social worker was spoken to by the lawyer too.

10. The fireman was given an award by the mayor, and today the policeman was given an award by the mayor too.

11. Mary was given a prize by the school, and eventually Mary's sister was given a prize by the school too.

12. The little child was seen by the stranger, and unsurprisingly her mother was seen by the stranger too.

13. The report was seen by the judge, and then the evidence was seen by the judge too.

14. Part of the math test was written by the old teacher, and apparently the history test was written by the old teacher too.

15. The new electric car was driven by the local businessman, and later the diesel truck was driven by the local businessman too.

16. The evidence was suppressed by the police, and then the photograph was suppressed by the police too.

17. The schoolchild was taken to the zoo by the babysitter, and later the child's friend was taken to the zoo by the babysitter too.

18. The singer was given an ovation by the audience, and just now the band was given an ovation by the audience too.

19. The job applicant was seen by the interviewer, and later the other applicant was seen by the interviewer too.

20. The watery soup was eaten by the prisoners, and eventually the stale bread was eaten by the prisoners too.

21. Fred was given a comic book by a neighbor, and later Billy was given a comic book by a neighbor too.

22. The missing dog was seen by the jogger, and soon afterwards the stray cat was seen by the sunbather too.

23. The new music video was chosen by the young student, and apparently the movie DVD was chosen by the young student too.

24. The fancy sports car was driven by the attractive young woman, and later the big SUV was driven by the young woman too.

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