



## Focus Structure and Voice Mismatch in Pseudogapping

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### ABSTRACT

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This paper explores the identity, or mismatch, of voice in a particular type of ellipsis called pseudogapping (e.g., *John called Sarah, and Mary will Jane*). Although voice is *ipso facto* a grammatical category, it is known to interact with information structure to affect speakers' perception of it. In three acceptability judgment tasks, we tested how native speakers evaluate voice mismatches in pseudogapping, in comparison to verb phrase ellipsis, and also whether their judgments are affected by the locus of the main contrast or focus—i.e., contrastive topics or auxiliary focus. Unlike previous findings which showed that information structure can modulate how speakers perceive mismatches in verb phrase ellipsis (Kertz 2013), we found no reliable effect of information structure on pseudogapping. This suggests that the impact of focus structure may not be the same across all ellipsis types. We discuss the broader implications of the results from both theoretical and experimental perspectives.

### KEYWORDS

pseudogapping, ellipsis, voice mismatch, information structure, acceptability judgment

## 1. Introduction

Pseudogapping, illustrated in (1a), is an elliptical construction in which a main verb is elided, leaving behind a tensed auxiliary verb and a dependent of the main verb. It is often compared to other types of ellipsis such as verb phrase ellipsis (VPE) as in (1b) and gapping as in (1c) (Ross 1967, Levin 1980, Jayaseelan 1990, Lasnik 1999, Hoeksema 2006, Gengel 2007, 2013, Miller 2014, Kubota and Levine 2017, Kim and Park 2022, Kim and Runner 2022):

- |     |    |  |                      |
|-----|----|--|----------------------|
| (1) | a. | John called Sarah, and Mary will Jane. | <i>Pseudogapping</i> |
|     | b. | John called Sarah, but Mary didn't.    | <i>VPE</i>           |
|     | c. | John called Sarah, and Mary Jane.      | <i>Gapping</i>       |

While these constructions look superficially similar, they target different ellipsis sites: VPE elides the entire VP after an auxiliary verb, but gapping targets the highest finite verb, optionally along with other material, leaving behind a dependent of a verb. The presence of a finite auxiliary and a post-elliptical material warrants a direct comparison between pseudogapping and these ellipsis types. To somewhat simplify, in all these constructions the missing material in the ellipsis site is interpreted based on the corresponding material in the respective antecedent clause (e.g., *John called Sarah* in (1)). However, it should be noted that such a linguistic antecedent is not necessarily required in VPE (Hankamer and Sag 1976).

Interestingly, it has been noted that in so-called larger elliptical constructions such as sluicing, fragment answers, gapping, and stripping the elided material and the antecedent must match in voice whereas in smaller elliptical constructions like VPE and VP-anaphora voice mismatches are possible in certain environments (Stump 1977, Tanenhaus and Carlson 1990, Dalrymple et al. 1991, Hardt 1993, Fiengo and May 1994, Johnson 1996, 2001, 2009, Kehler and Ward 1999, Merchant 2001, 2013, Kehler 2002, Arregui et al. 2006, Chung 2006, 2013, Frazier and Clifton 2006, Houser 2010, Kertz 2010, Tanaka 2011a,b).

- |     |    |   |
|-----|----|---|
| (2) | a. | *Someone murdered Joe, but we don't know who by. (Sluicing; Merchant 2013: 81, (5b))  |
|     | b. | Q: Who is sending you to Iraq? A: *By Bush. (Fragment answers; Merchant 2013: 81, (8))  |
|     | c. | *Some bring roses and lilies by others. (Gapping; Merchant 2013: 83, (10a))   |
|     | d. | *MAX brought the roses, not by AMY! (Stripping; Merchant 2013: 83, (11a))   |
| (3) | a. | The janitor must remove the trash whenever it is apparent that it should be. (VPE; Merchant 2008: 169, (2b))  |
|     | b. | Since regardless of which bit is initially assigned, it will be flipped if more information is gained by doing so. (VP-anaphora; Kehler and Ward 1999: 246, (34)) |

Intuitively, this simple dichotomy seems plausible, because in the former a verbal expression goes missing on the surface but in the latter at least an auxiliary verb is present. Then, the question is whether pseudogapping, known for showing mixed properties of VPE and gapping at the same time, allows for voice mismatches or not.

Most previous research on pseudogapping has mainly focused on theorizing the mapping between its incomplete form and the full, propositional meaning. Accordingly, different formal analyses have been proposed: movement-cum-deletion (Kuno 1981, Jayaseelan 1990, Lasnik 1995, 1999, Johnson 1996, Takahashi 2004, Merchant 2008, Gengel 2013, Thoms 2016); sideward movement (Agbayani and Zoerner 2004); base-generation and deletion (Lee 2018); purely interpretive (Miller 1990); type-logical (Kubota and Levine 2017); construction-based (Kim and Runner 2022). However, only a few studies have explored the construction empirically (Levin 1980, Hoeksema 2006, Miller 2014, Kim and Park 2022). They have attempted to identify what linguistic factors affect the frequency and acceptability of pseudogapping examples, with a particular focus on the connective types and

subject types in the PG-clause. Concerning frequency, they have shown that pronominal PG-subjects and comparative structures are frequently found in naturally-occurring pseudogapping examples (Levin 1980, Hoeksema 2006, Miller 2014). Regarding acceptability, Hoeksema (2006) showed that comparative pseudogapping is more favorably judged than coordinate pseudogapping by native speakers, and more recently, Kim and Park (2022) replicated this result in a controlled experiment. Kim and Park further showed that the pronominality of the PG-clause subject can modulate the acceptability of pseudogapping, but only in coordinate structures. Regardless of the condition, however, pseudogapping generally elicited mid- to high ratings on a scale of 7, suggesting that the issue is likely extra-grammatical in nature.

Despite much work on the formal aspects of pseudogapping, issues regarding the construction's sensitivity to syntactic properties such as voice parallelism are not yet settled. Theorists have relied on introspective judgments: some judge voice-mismatched pseudogapping examples as ungrammatical (Merchant 2008, 2013) while others as acceptable (Tanaka 2011a,b, Miller 2014, Kubota and Levine 2017, Kim and Runner 2022). In addition, although experimental studies on the voice mismatches in other elliptical constructions like VPE and gapping are prevalent and thus a few hypotheses have been tested for the voice mismatch effects (Kehler 2002, Arregui et al. 2006, Frazier and Clifton 2006, Kertz 2008, 2010, 2013, Kim and Runner 2011, 2018, Runner and Dozat 2011, Clifton et al. 2019, Poppels and Kehler 2019), little attempt has been made to systematically examine the voice mismatch effects on pseudogapping from an experimental perspective. In this context, the present study aims to provide a first set of empirical data that can help resolve previous disagreements among theorists regarding voice mismatches in pseudogapping. We intend to do so by examining how voice mismatches in pseudogapping are received by native speakers of English, and furthermore by comparing the results with judgments on parallel VPE examples. We also aim to explore the potential influence of information structure on pseudogapping as previous studies showed that it can modulate the acceptability of VPE (Kertz 2013).

We organize the paper as follows. In Section 2, we first review the discussion of voice-mismatched pseudogapping examples noted in previous literature and introduce a hypothesis regarding the role of information structure in VPE by Kertz (2013). In Section 3, we present the results of the experiments designed to test Kertz's information structure hypothesis for the voice mismatch effects on pseudogapping as compared to those on VPE. In Section 4, we then discuss the main findings of our experiments and their implications in theoretical and experimental research. Lastly, in Section 5, we summarize our main findings and conclude the paper.

## 2. Previous Studies on Voice Mismatches in Pseudogapping

### 2.1 A Survey of Previous Data

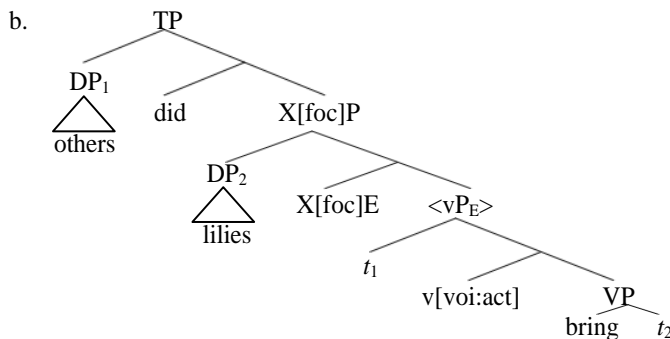
As mentioned above, there have been disputes regarding the acceptability of pseudogapping examples with voice mismatches. For instance, Merchant (2008) claims that voice mismatches are not allowed in pseudogapping, and presents the following judgments:

- (4) Passive antecedent, active ellipsis (Merchant 2008: 170, (3))
  - a. \*Roses were brought by some, and others did lilies.
  - b. \*Klimt is admired by Abby more than anyone does Klee.
  - c. \*Hunderwasser's ideas are respected by architects more than most people do his work.
  - d. \*More people were invited to Beth's reception by her mother than Beth herself did to her wedding.
- (5) Active antecedent, passive ellipsis (Merchant 2008: 170, (4))
  - a. \*Some brought roses, and lilies were by others.

- b. \*Abby admires Klimt more than he is by anyone else.
- c. \*Laypeople respect Hundertwasser’s work more than his idea are by architects.
- d. \*Beth’s mother invited more people to her wedding than were by Beth herself!

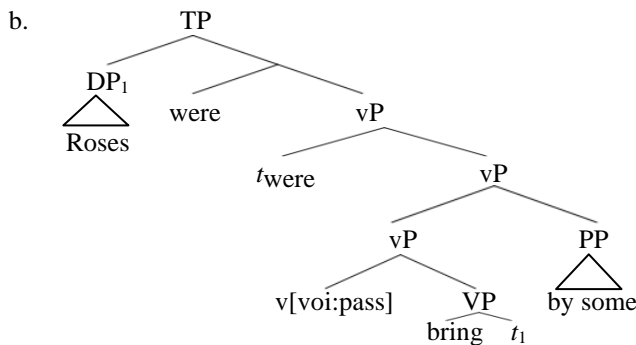
As demonstrated in these examples, Merchant (2008) argued that voice mismatches are not tolerated irrespective of whether the antecedent clause is in the active or passive voice. He attributed the ungrammaticality of these voice-mismatched pseudogapping examples to the size, or category, of the elided expression in that pseudogapping involves deletion of the vP sister to X[foc]<sup>0</sup>, not of the VP sister to v as in VPE. For instance, according to Merchant (2008), a typical voice-matched pseudogapping example in (6a) will have the structure in (6b) for the PG-clause, where the ellipsis site <vP<sub>E</sub>> contains information that is identical to the vP in the antecedent:

- (6) a. Some brought roses, and others did lilies.



On the other hand, in voice-mismatched pseudogapping, the antecedent vP and the elided vP are not identical in that one has v[voi:act] and the other has [voi:pass]. The example in (4a), repeated in (7a) below, illustrates such a case. (7b) represents the structure of the antecedent, and (6b) above the structure of the PG-clause:

- (7) a. \*Roses were brought by some, and others did lilies.



In this tree representation, the v node specifies [voi:pass], which is not identical to the [voi:act] specification in the PG-clause (as in (6b)). Merchant claims, this is why voice mismatches are impossible in pseudogapping since the [voi] head resides within the ellipsis site, giving rise to an identity failure.

However, as Tanaka (2011b: 473-476) pointed out, Merchant’s (2008) ungrammatical pseudogapping examples with voice mismatches in (4) and (5) have their ungrammatical VPE counterparts as in the following:

- (8) a. \*Roses were brought by some, and others did, too.  
 b. \*Klimt is admired by Abby more than anyone does.  
 c. \*Hunderwasser's ideas are respected by architects more than most people do.  
 d. \*More people were invited to Beth's reception by her mother than Beth herself did.
- (9) a. \*Some brought roses, and lilies were, too.  
 b. \*Abby admires Klimt more than he is.  
 c. \*Laypeople respect Hundertwasser's work more than his ideas are.  
 d. \*Beth's mother invited more people to her wedding than were.

Since ungrammatical pseudogapping examples remain ungrammatical even in their VPE counterparts, Tanaka (2011b) claimed that there is no asymmetry between the two elliptical constructions. Tanaka (2011b: 476) also noted that when VPE examples allow for voice mismatches, their pseudogapping counterparts do, too (see also Park and Choi 2015).

- (10) a. This problem was to have been looked into, but obviously nobody did.  
 b. ?My problem will be looked into by Tom, but he won't yours.
- (11) a. The system can be used by anyone who wants to.  
 b. ?The new system can be used by anyone who could the older versions.
- (12) a. Actually, I have implemented a computer system with a manager, but it doesn't have to be.  
 b. ?Actually, I have implemented a computer system with a manager, but it should have been by a computer technician.

Tanaka (2011b) admitted that the judgments for the pseudogapping examples here are subtle, as is the case for pseudogapping examples in general. He then assumed that the two elliptical constructions can be grouped together, leaving open how to explain the marginal status of these pseudogapping examples.

Furthermore, some other previous studies argued that voice-mismatched pseudogapping examples are acceptable in certain environments on the basis of the authors' own judgments or naturally-occurring corpus data, as given in (13) (Miller 1990, 2014, Coppock 2001, Kubota and Levine 2017, Kim and Runner 2022):

- (13) a. ?That should be explained to individual students by the TA, but the professor will to the class in general. (Coppock 2001: 135, (4c))  
 b. The arms were hidden by the rebels as a woman would (do) her most precious jewels. (Miller 1990: 94, (55))  
 c. A whole poached wild striped bass should be taken to the table as you would a Thanksgiving turkey or a crown roast pork, with a twinkle of extravagance. (Miller 2014: 87, (20a))  
 d. I mean for her to be dressed—and addressed—as we would Becky Sharp, or Ophelia, or Elizabeth Bennet, or Mrs. Ramsay, or Mrs. Wilcox, or even Hester Prynne. (Miller 2014: 87, (20b))  
 e. These savory waffles are ideal for brunch, served with a salad as you would a quiche. (Miller 2014: 87, (20c))

As noted above, pseudogapping in general favors comparative structures over coordination structures in frequency and acceptability (Levin 1980, Hoeksema 2006, Miller 2014, Kim and Park 2022) and this seems to account for why attested voice-mismatched examples tend to involve comparative structures as in (13c) - (13e) as well, as observed by Miller (2014) and Kim and Runner (2022).

As we have discussed thus far, no consensus has been established regarding the acceptability of voice-mismatched pseudogapping examples. While the existence of naturalistic data suggests that voice mismatches are

not entirely banned in pseudogapping, the question of precisely what factors contribute to their acceptability still remains to be explored.

## 2.2 Can Information Structure Modulate Mismatch Effects?

Kertz (2008, 2010, 2013) argued that voice mismatch in VPE is best accounted for by information structure, as opposed to syntactic or discourse-coherence parallelism (e.g., Kehler 2002, Arregui et al. 2006, Kim and Runner 2018, Clifton et al. 2019). That is, unacceptable mismatches tend to focus the subject argument of the elliptical clause, whereas acceptable mismatches instead focus the auxiliary verb. For example, in unacceptable mismatches in (14), the subjects of the elliptical clauses (*the TA's* and *the chair*) are contrasted with their focal counterparts in antecedent clauses in different syntactic positions (*the instructors* and *the committee*, respectively), thus failing to establish contrastive topics. In contrast, the subjects of the elliptical clauses in (15) do not have focal counterparts in their respective antecedent clauses, due to the lack of agent *by*-PPs; instead, the main focus is on the contrastive auxiliaries.

- (14) a. #The material was skipped by the instructors and the TA's did too.  
 b. #The problem was looked into by the committee, just like the chair did.  
 (Kertz 2008: 285, (8)-(9))

- (15) a. A lot of this material can be skipped, and often I do.  
 b. This problem was to have been looked into, but obviously nobody did.  
 (Kertz 2008: 285, (10)-(11))

In a series of experiments, Kertz examined the influence of information structure on voice mismatch in VPE, focusing on contrastive topics and auxiliary focus. As an illustration, a set of example stimuli from Kertz (2013) is presented below, where two factors are crossed (INFORMATION STRUCTURE x VOICE) with the addition of a third factor to serve as a control (ELLIPSIS):

- (16) a. The technicians didn't install the line as quickly as the engineers did.  
 (contrastive topic; match; ellipsis)  
 b. The line wasn't installed by the technicians as quickly as it could have been.  
 (auxiliary focus; match; ellipsis)  
 c. The line wasn't installed by the technicians as quickly as the engineers did.  
 (contrastive topic; mismatch; ellipsis)  
 d. The technicians didn't install the line as quickly as it could have been.  
 (auxiliary focus; mismatch; ellipsis)  
 e. The line wasn't installed by the technicians as quickly as the engineers installed it.  
 (contrastive topic; mismatch; no ellipsis)  
 f. The technicians didn't install the line as quickly as it could have been installed.  
 (auxiliary focus; mismatch; no ellipsis)  
 (Kertz 2013: 411, Table 7)

The results revealed main effects of Voice and Ellipsis, as well as an interaction effect between Voice and Information Structure. They showed that both Voice and Ellipsis reliably lower the acceptability ratings of pseudogapping, but the effect of Voice can be modulated by Information Structure: auxiliary focus significantly enhanced ratings on the voice mismatch condition. Interestingly, this modulating effect of Information Structure was consistently observed in both ellipsis and no ellipsis conditions. This can suggest, as Kertz claims, mismatch

penalties due to ill-formed contrastive topics reflect a general information-structural constraint that is not specific to ellipsis.

### 3. An Acceptability Judgment Study

The effect of information structure on speakers' acceptance of VPE revealed by Kertz's studies (2008, 2010, 2013) naturally leads us to the question of whether a similar effect would be found for pseudogapping. In order to investigate this question, we conducted three acceptability judgment experiments with native speakers of English. In Experiment 1, we tested the influence of two information-structural manipulations (contrastive topic and auxiliary focus) on speakers' judgments of voice-matched and voice-mismatched pseudogapping examples. To confirm whether the results from Experiment 1 were construction-specific or general, in Experiment 2, we had speakers judge VPE sentences constructed from the pseudogapping stimuli from Experiment 1, keeping the experimental design constant. In Experiment 3, we further included ellipsis as a predictor of the acceptability of pseudogapping and VPE to examine how it interacts with information structure.

#### 3.1 Experiment 1: Information Structure and Voice Mismatch in Pseudogapping

Experiment 1 is designed to examine the influence of information structure on pseudogapping with a contrast in voice, using a 2 x 2 factorial design: VOICE (Match and Mismatch) x INFORMATION STRUCTURE (Contrastive topic and Auxiliary focus).

##### 3.1.1 Participants

Forty-two self-reported native speakers of English participated in Experiment 1 via the for-research survey distribution platform Prolific (<https://www.prolific.com>). Eligible participants were required to be US residents aged between 18 and 60, with a minimum approval rate of 95% and a history of completing over 500 tasks on the platform. Two participants were removed from the dataset due to failing comprehension check questions or providing random answers (e.g., selecting 5, 6, and 7 for all items in that order).<sup>1</sup> This process left data from 40 participants. The participants were compensated 1.6 GBP upon successful completion.

##### 3.1.2 Materials

The test items were all pseudogapping sentences, constructed by crossing two variables: VOICE (Match and Mismatch) and INFORMATION STRUCTURE (Contrastive topic and Auxiliary focus). To illustrate, an example set of items is provided in (17) below:

- (17) a. Adam didn't alert the engineers as quickly as Eric did the inspectors. (Match, ConTop)  
 b. The engineers weren't alerted by Adam as quickly as they could have been by Eric. (Match, AuxFoc)

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<sup>1</sup> Ten comprehension check questions were made and included in the experiment to measure the participants' attentiveness. Each of them immediately followed a filler item. For instance, immediately after the participants rated the filler item *Leslie spoke German and Robin spoke French*, the question *Leslie spoke Korean* appeared and they were required to click on *Yes* or *No* to continue to the next item. The required accuracy rate was 80% or higher in order for one's data to be used in the analysis (i.e., answering more than eight out of ten comprehension check questions correctly).

- c. The engineers weren't alerted by Adam as quickly as Eric did the inspectors. (Mismatch, ConTop)
- d. Adam didn't alert the engineers as quickly as they could have been by Eric. (Mismatch, AuxFoc)

The antecedent clauses appeared in either active or passive voice. Pairing an active voice antecedent clause with an active voice PG-clause formed a voice-match condition as in (17a) as did pairing a passive voice antecedent clause with a passive voice PG-clause as in (17b). In contrast, pairing a passive voice antecedent clause with an active voice PG-clause formed a voice-mismatch condition as in (17c) as did pairing an active voice antecedent clause with a passive voice PG-clause as in (17d). In the contrastive topic conditions, a contrastive subject argument was introduced in the PG-clause in relation to the subject in the antecedent clause as in (17a) or the agent *by*-PP in the antecedent clause as in (17c). On the other hand, in the auxiliary focus conditions, the subject in the PG-clause is coreferential with the patient argument in the antecedent clause while the main focus falls on the contrasting auxiliaries as in (17b) and (17d).

Following the patterns in (17), 16 sets of test items were made (see Appendix A for a complete list of test items). The resulting 64 test items were distributed to four experimental lists in a Latin-square design. In addition, 48 filler items were created with varying degrees of acceptability and added to the experiment.

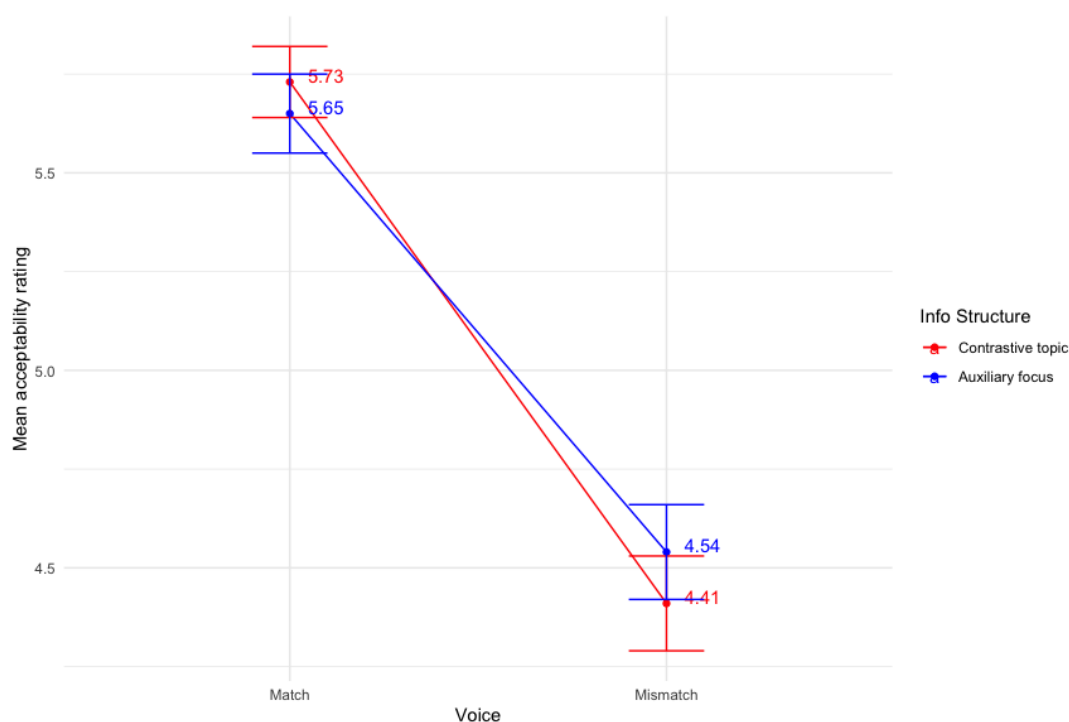
### 3.1.3 Procedure

Experiment 1 was run online via PCIbex Farm (Zehr and Schwarz 2018). Participants were presented with English sentences on a computer screen. Their task was to rate the acceptability of each given sentence by clicking on a number between 1 and 7 (1: fully unacceptable, 7: fully acceptable). Participants were first instructed to take a training session to familiarize themselves with the experiment procedure. The initial training session consisted of three practice trials with guiding information, including one fully acceptable sentence, one fully unacceptable sentence, and one intermediate sentence. This was followed by seven more practice trials without guiding information, two of which each were followed by a comprehension check question (see footnote 1). Upon a successful completion of the training session, participants moved onto the main part of the experiment, where the test items and fillers were presented in a uniquely generated random order. Among the fillers, ten items were followed by a comprehension check question.

### 3.1.4 Results

Figure 1 shows the mean acceptability ratings of the four conditions of pseudogapping sentences in Experiment 1 along with standard error bars:





**Figure 1. Mean Acceptability Ratings of the Four Conditions of Pseudogapping Sentences in Experiment1 along with Standard Error Bars**

The results indicate that, overall, the mean acceptability rating of voice-matched pseudogapping sentences was higher than that of voice-mismatched ones for each information structure: 5.73 ( $SE = 0.09$ ) for the voice-matched PG-condition with the contrastive topic structure as in (17a) > 4.41 ( $SE = 0.12$ ) for the voice-mismatched PG-condition with the contrastive topic structure as in (17c); 5.65 ( $SE = 0.10$ ) for the voice-matched PG-condition with the auxiliary focus structure as in (17b) > 4.54 ( $SE = 0.12$ ) for the voice-mismatched PG-condition with the auxiliary focus structure as in (17d). On the other hand, the mean acceptability ratings of the stimuli remained fairly constant within each VOICE condition, showing little effect of information structure: 5.73 ( $SE = 0.09$ ) for the voice-matched PG-condition with the contrastive topic structure as in (17a) and 5.65 ( $SE = 0.10$ ) for the voice-matched PG-condition with the auxiliary focus structure as in (17b); 4.41 ( $SE = 0.12$ ) for the voice-mismatched PG-condition with the contrastive topic structure as in (17c) and 4.54 ( $SE = 0.12$ ) for the voice-mismatched PG-condition with the auxiliary focus structure as in (17d).

We analyzed the data with a linear mixed-effects model in R (R Core Team 2022), using the *lme4* package (version 1.1.31, Bates et al. 2015) and *lmerTest* (version 3.1.3, Kuznetsova et al. 2017). VOICE and INFORMATION STRUCTURE were added as fixed effects and PARTICIPANT and ITEM as random effects. To obtain  $p$ -values, we used the likelihood ratio test of the full model with the effect in question against the reduced model without it (Winter 2013).

The analysis showed that the voice-mismatch effect was significant ( $\chi^2(1) = 53.29$ ,  $p < 0.0001$ ; Estimate = -1.2125,  $SE = 0.1331$ ,  $t = -9.109$ ), indicating that the acceptability of voice-mismatched pseudogapping sentences was significantly lower than that of voice-matched pseudogapping sentences, irrespective of information structural manipulations. The analysis, however, showed no information structure effect ( $\chi^2(1) = 0.036$ ,  $p = 0.8495$ ; Estimate = 0.0250,  $SE = 0.2052$ ,  $t = 0.122$ ). This indicates that the acceptability of pseudogapping sentences with the contrastive topic structure was not significantly different from that of pseudogapping sentences with the auxiliary

focus structure. In addition, no interaction effect was found between voice match/mismatch and information structure ( $\chi^2(1) = 0.6541, p = 0.4186$ ; Estimate = 0.2125,  $SE = 0.2693, t = 0.789$ ), showing that the acceptability of pseudogapping sentences with voice matches and mismatches did not significantly differ depending on the two information structure types.

Then, the results here are not in line with Kertz's information structure hypothesis. While it predicts a significant reduction of mismatch penalty when auxiliary focus is used as opposed to contrastive topic, no such effect of information structure was found in this experiment.

### 3.2 Experiment 2: Information Structure and Voice Mismatch in VPE

The results from Experiment 1 suggest that information structure does not reliably affect the acceptability of voice mismatch in pseudogapping. However, these findings do not conclusively establish whether this lack of effect is specific to this construction. In Experiment 2, we therefore turned to VPE and explored its acceptability, using the same predictors and parallel stimuli from Experiment 1. Experiment 2 also aimed to reaffirm that the information structural manipulations in Experiment 1 had the desired effect, by examining VPE examples manipulated consistently as the pseudogapping items in Experiment 1.

#### 3.2.1 Participants

Forty-four participants completed Experiment 2 through Prolific. None of them had taken part in Experiment 1. The participant criteria and compensation remained consistent with those of Experiment 1. Four participants were excluded from the analysis due to failing comprehension check questions or providing random answers. The results and analysis reported below are thus based on data collected from 40 participants.

#### 3.2.2 Materials

The test items in Experiment 2 were all VPE sentences constructed from the pseudogapping test items used in Experiment 1, manipulated for two variables: VOICE (Match and Mismatch) and INFORMATION STRUCTURE (Contrastive topic and Auxiliary focus). A sample set of test items is given in (18):

- (18) a. Adam didn't alert the engineers as quickly as Eric did. (Match, ConTop)  
 b. The engineers weren't alerted by Adam as quickly as they could have been. (Match, AuxFoc)  
 c. The engineers weren't alerted by Adam as quickly as Eric did. (Mismatch, ConTop)  
 d. Adam didn't alert the engineers as quickly as they could have been. (Mismatch, AuxFoc)

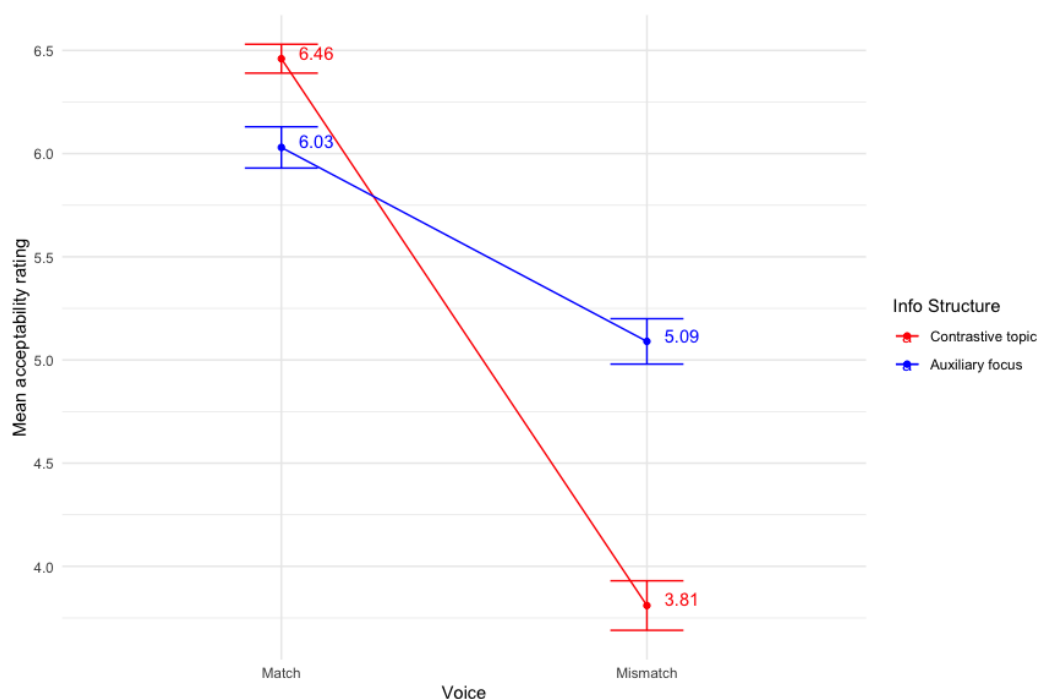
As in Experiment 1, 16 sets of quadruples like those in (18) were constructed and included in the experiment (see Appendix B for a complete list of test items). The resulting 64 test items were distributed to four experimental lists in a Latin-square design. The 48 filler items from Experiment 1 were reused and kept constant across the experimental lists.

#### 3.2.3 Procedure

The same procedure in Experiment 1, described in Section 3.1.3, was used in Experiment 2.

#### 3.2.4 Results

Figure 2, given with standard error bars, represents the mean acceptability ratings of the four conditions of VPE sentences in Experiment 2:



**Figure 2. Mean Acceptability Ratings of the Four Conditions of VPE Sentences in Experiment 2 along with Standard Error Bars**

As can be seen here, the mean acceptability rating of voice-matched VPE sentences was higher than that of voice-mismatched ones for each information structure: 6.46 ( $SE = 0.07$ ) for the voice-matched VPE-condition with the contrastive topic structure as in (18a) > 3.81 ( $SE = 0.12$ ) for the voice-mismatched VPE-condition with the contrastive topic structure as in (18c); 6.03 ( $SE = 0.10$ ) for the voice-matched VPE-condition with the auxiliary focus structure as in (18b) > 5.09 ( $SE = 0.11$ ) for the voice-mismatched VPE-condition with the auxiliary focus structure as in (18d). More importantly, in the voice-matched conditions the mean acceptability rating of VPE sentences was higher with the contrastive topic structure than with the auxiliary focus structure: 6.46 ( $SE = 0.07$ ) for the voice-matched VPE-condition with the contrastive topic structure as in (18a) > 6.03 ( $SE = 0.10$ ) for the voice-matched VPE-condition with the auxiliary focus structure as in (18b). Conversely, in the voice-mismatched conditions the mean acceptability rating of VPE sentences was higher with the auxiliary focus structure than with the contrastive topic structure: 5.09 ( $SE = 0.11$ ) for the voice-mismatched VPE-condition with the auxiliary focus structure as in (18d) > 3.81 ( $SE = 0.12$ ) for the voice-mismatched VPE-condition with the contrastive topic structure as in (18c).

Using a linear mixed-effects model as in Experiment 1, we found a significant effect of VOICE ( $\chi^2(1) = 61.985$ ,  $p < 0.0001$ ; Estimate = -1.7969,  $SE = 0.1844$ ,  $t = -9.746$ ). This suggests that mismatches in voice significantly lower the acceptability of VPE sentences, irrespective of the information structures involved. In addition, the analysis showed the information structure effect ( $\chi^2(1) = 5.6156$ ,  $p < 0.05$ ; Estimate = 0.4219,  $SE = 0.2907$ ,  $t = 1.451$ ). It means that auxiliary focus elicits reliably higher ratings than contrastive topics, regardless of (mis)matches in voice. Furthermore, an interaction effect was found between VOICE and INFORMATION STRUCTURE ( $\chi^2(1) = 30.603$ ,  $p < 0.0001$ ; Estimate = 1.7063,  $SE = 0.2782$ ,  $t = 6.133$ ).

To examine the interaction effect more precisely, we performed post-hoc pairwise comparisons using the R package *emmeans* (version 1.8.2, Lenth 2022) with the Kenward-Roger approximation method for degrees of freedom and the Tukey method for *p*-value adjustments. The results are given in Table 1 below:

**Table 1. Post-hoc Pairwise Comparisons between Conditions in Experiment 2**

Contrast	Estimate	SE	df	t.ratio	p.value
MatchConTop - MatchAuxFoc	0.431	0.197	64.2	2.192	0.1363
MismatchConTop - MismatchAuxFoc	-1.275	0.197	64.2	-6.482	< 0.0001
MatchConTop - MismatchConTop	2.650	0.197	64.2	13.472	< 0.0001
MatchAuxFoc - MismatchAuxFoc	0.944	0.197	64.2	4.798	0.0001

The analysis first confirmed the voice mismatch penalty when VPE sentences had the same information structure. The analysis also revealed that the information structure effect was only significant in the voice-mismatched VPE conditions, but not in the voice-matched ones. The results here replicated Kertz's findings in that only in the voice-mismatched conditions VPE sentences were rated lower with the contrastive topic structure than with the auxiliary focus structure. The results then indicate that the pseudogapping test items used in Experiment 1 were not problematic and that indeed her information structure hypothesis was not extended to pseudogapping as it was found in VPE.

### 3.3 Experiment 3: Controlling for the Ellipsis Effect

The previous experiments revealed that information structure can modulate mismatch effects in VPE but not in pseudogapping, a finding that is puzzling under Kertz's hypothesis. In Experiment 3, we tested one further aspect of Kertz's hypothesis: namely, mismatch penalties due to ill-formed contrastive topics are not specific to ellipsis.

#### 3.3.1 Participants

Fifty-one participants took Experiment 3 using Prolific. None of them had participated in Experiments 1 or 2. All the other requirements as eligible participants and compensation were the same as those in the earlier experiments. Three participants were removed from the dataset, since two of them did not pass the requirement for comprehension check questions and one of them provided random answers. Thus, responses from 48 participants were included in the analysis.

#### 3.3.2 Materials

The test items in Experiment 3 involved six different conditions from crossing two predictors: CONSTRUCTION (Full, PG, and VPE) and INFORMATION STRUCTURE (Contrastive topic and Auxiliary focus). As example set of test items is shown in (19):

- (19) a. The engineers weren't alerted by Adam as quickly as Eric alerted the inspectors. (Full, ConTop)  
 b. Adam didn't alert the engineers as quickly as they could have been alerted by Eric. (Full, AuxFoc)  
 c. The engineers weren't alerted by Adam as quickly as Eric did the inspectors. (PG, ConTop)  
 d. Adam didn't alert the engineers as quickly as they could have been by Eric. (PG, AuxFoc)  
 e. The engineers weren't alerted by Adam as quickly as Eric did. (VPE, ConTop)  
 f. Adam didn't alert the engineers as quickly as they could have been. (VPE, AuxFoc)

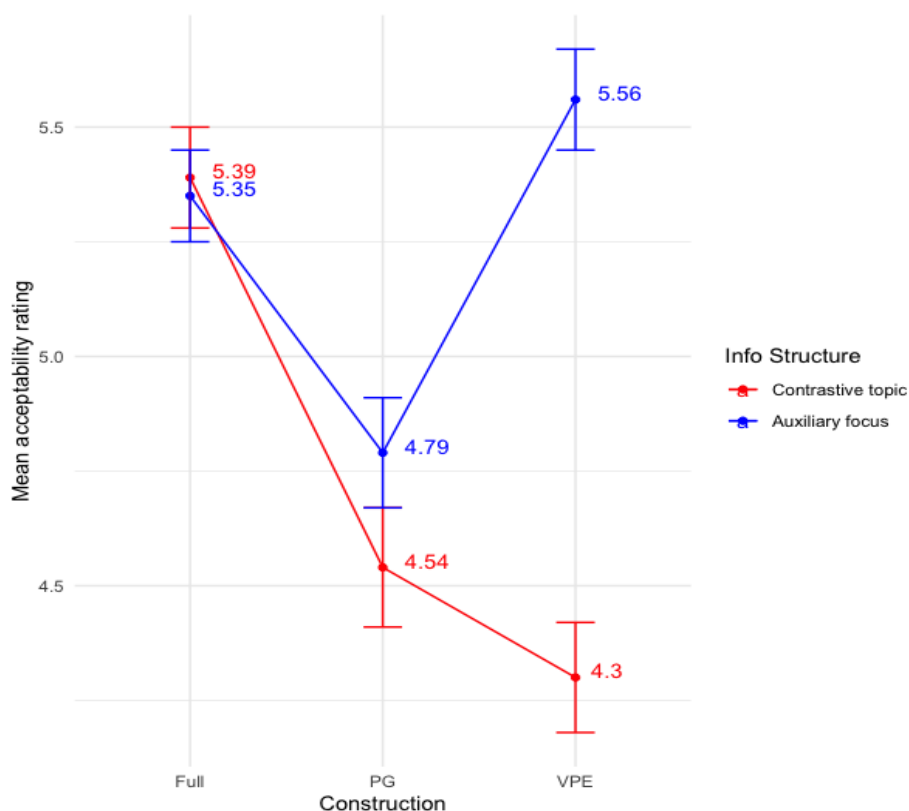
In total, 24 sets of test items such as those in (19) were created, among which 16 sets were constructed based on the test items in prior experiments. All test items are given in Appendix C. The resulting 144 items were distributed to six experimental lists in a Latin-square design. The same 48 fillers from Experiments 1 and 2 were added to each experimental list.

### 3.3.3 Procedure

The same procedure in Experiments 1 and 2, described in Section 3.1.3 in detail, was used in Experiment 3.

### 3.3.4 Results

The mean acceptability ratings of the six conditions along with standard error bars in Experiment 3 are shown in Figure 3:



**Figure 3. Mean Acceptability Ratings of the Six Conditions of Voice-Mismatched Sentences in Experiment 3 along with standard error bars**

As demonstrated in this figure, information structure had varying effects on different constructions. As for full, non-elliptical sentences, there was little difference in mean acceptability ratings: 5.39 ( $SE = 0.11$ ) for contrastive topics vs. 5.35 ( $SE = 0.10$ ) for auxiliary focus. Acceptability decreased for both information structures as the construction shifted from full to pseudogapping: 4.79 ( $SE = 0.12$ ) for auxiliary focus vs. 4.54 ( $SE = 0.13$ ) for contrastive topics. Contrastive topics lowered the mean acceptability ratings even further for VPE, whereas auxiliary focus elicited a dramatic increase in acceptability ratings for the same construction: 4.30 ( $SE = 0.12$ ) for

contrastive topics vs. 5.56 ( $SE = 0.11$ ) for auxiliary focus. Notably, mean acceptability ratings were higher with VPE than with full, non-elliptical sentences in the context of auxiliary focus.

For the statistical analysis, a linear mixed-effects model was used as in Experiments 1 and 2. The analysis showed the construction effect ( $\chi^2(2) = 30.467$ ,  $p < 0.0001$ ; Estimate = -0.7057,  $SE = 0.1335$ ,  $t = -5.287$  for PG; Estimate = -0.4427,  $SE = 0.1335$ ,  $t = -3.317$  for VPE), indicating that the acceptability of voice-mismatched pseudogapping and VPE sentences was significantly lower than that of their non-elliptical counterparts, regardless of the information structures. The analysis also showed the information structure effect ( $\chi^2(1) = 22.345$ ,  $p < 0.0001$ ; Estimate = 0.4913,  $SE = 0.1118$ ,  $t = 4.394$ ), meaning that the acceptability of sentences with the auxiliary focus structure was higher than that of sentences with the contrastive topic structure, irrespective of the construction types involved. Furthermore, an interaction effect was found between construction type and information structure ( $\chi^2(2) = 35.058$ ,  $p < 0.0001$ ).

In order to precisely identify where the differences arose, we carried out post-hoc pairwise comparisons using the R package *emmeans* (Lenth 2022) with the Kenward-Roger approximation for degrees of freedom and the Tukey  $p$ -value correction. The results are provided in Table 2:

**Table 2. Post-hoc Pairwise Comparisons between Conditions in Experiment 3**

Contrast	Estimate	SE	df	t.ratio	p.value
FullConTop - FullAuxFoc	0.0312	0.155	143	0.201	1.0000
PGConTop - PGAuxFoc	-0.2448	0.155	143	-1.577	0.6148
VPEConTop - VPEAuxFoc	-1.2604	0.155	143	-8.121	< 0.0001
FullConTop - PGConTop	0.8438	0.155	143	5.437	< 0.0001
FullConTop - VPEConTop	1.0885	0.155	143	7.014	< 0.0001
PGConTop - VPEConTop	0.2448	0.155	143	1.577	0.6148
FullAuxFoc - PGAuxFoc	0.5677	0.155	143	3.658	0.0047
FullAuxFoc - VPEAuxFoc	-0.2031	0.155	143	-1.309	0.7798
PGAuxFoc - VPEAuxFoc	-0.7708	0.155	143	-4.967	< 0.0001

The analysis first confirmed the information structure effect on voice-mismatched VPE sentences in that the acceptability of voice-mismatched VPE sentences was significantly higher with the auxiliary focus structure than with the contrastive topic structure: 5.56 ( $SE = 0.11$ ) > 4.30 ( $SE = 0.12$ ). However, information structure effects were not found on their non-elliptical and pseudogapping counterparts: 5.39 ( $SE = 0.11$ )  $\approx$  5.35 ( $SE = 0.10$ ) and 4.79 ( $SE = 0.12$ )  $\approx$  4.54 ( $SE = 0.13$ ). In addition, the analysis revealed that with the contrastive topic structure, the acceptability of voice-mismatched non-elliptical sentences was significantly higher than those of their pseudogapping and VPE counterparts but the latter two did not significantly differ: 5.39 ( $SE = 0.11$ ) > 4.54 ( $SE = 0.13$ )  $\approx$  4.30 ( $SE = 0.12$ ); in contrast, with the auxiliary focus structure, the acceptability of voice-mismatched pseudogapping sentences was significantly lower than those of their non-elliptical and VPE counterparts while the latter two were not significantly different: 5.56 ( $SE = 0.11$ )  $\approx$  5.35 ( $SE = 0.10$ ) > 4.79 ( $SE = 0.12$ ).

This experiment replicated a major finding of Experiments 1 and 2, namely that construction type plays a role in predicting the effect of information structure on voice mismatches in ellipsis: judgments on VPE, but not those on pseudogapping, varied significantly by the type of information structure in the context of voice mismatch. Furthermore, this experiment also demonstrated that non-elliptical sentences are not sensitive to information structures. These results contradict Kertz's assumption that ill-formed contrastive topics, as those involved in voice mismatches, result in decrease of acceptability irrespective of the presence of ellipsis or construction type. They suggest that the influence of information structure on voice mismatch is not general but confined to certain structural types (i.e., VPE).

## 4. Discussion

While speakers' perception of ellipsis constructions is known to be influenced by multiple factors, the precise impact of these factors on acceptability judgments can differ among constructions. The present study has focused on the perception of voice mismatch in pseudogapping with two different information structures. Our specific aim was to investigate Kertz's (2013) hypothesis, which suggests that decreases in acceptability ratings due to voice mismatch may result from a violation of a constraint on contrastive topics, specifically that they must also align in syntactic structure, i.e., realize as subjects. Our findings support this hypothesis for VPE but not for pseudogapping, where information structural manipulations did not result in reliable differences in acceptability ratings. These results cast doubt on the generality of Kertz's hypothesis, especially as non-elliptical sentences with voice mismatch also showed no effect of information structure.

In the remainder of this section, we explore some implications of our findings and discuss open questions.

### Voice-mismatch penalties and the level of representation

Some existing accounts of pseudogapping require only a semantic identity between the ellipsis site and its corresponding material in the antecedent (Miller 1990, Kubota and Levine 2017). They therefore do not predict reduction of acceptability ratings related to voice mismatch. Our findings raise questions about these accounts, but they do not necessarily support accounts that adopt a structural identity condition.

It is possible that what have been observed as voice-mismatch penalties so far are in fact effects at the discourse level rather than strictly structural effects (Hardt and Romero 2004). Voice alteration in English accompanies structural changes, but it also has corresponding effects at discourses. The acceptability reductions seen in voice mismatch in pseudogapping may be linked to discourse effects and only indirectly connect to syntactic structure (a possibility previously pointed out by Kim and Runner 2018 for VPE). We leave open the exploration of how such a possibility can be fleshed out in ellipsis theories.

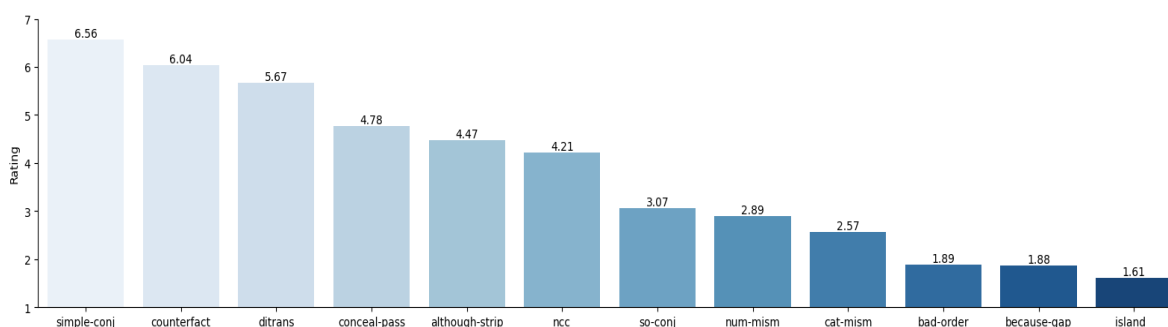
Relatedly, the question whether syntactic identity is involved in the interpretation of pseudogapping can be explored using the Recycling Hypothesis (Arregui et al. 2006). According to this hypothesis, mismatches are more easily processed when the antecedent is passive compared to when it is active, as passive constructions are more complex and prone to misremembering. In our experiments, the contrastive topic stimuli had a passive antecedent and an active elided clause, whereas the simple auxiliary focus stimuli had an active antecedent and a passive elided clause. The degrading effect of the contrastive topic condition may have been mitigated by an uncontrolled factor, i.e., order of mismatches.

### Acceptability ratings and grammaticality

While our findings clearly demonstrated a reliable negative impact of voice mismatch on pseudogapping, it is noteworthy that voice-mismatched sentences received higher ratings than anticipated. On average, they scored above 4.4 on a scale of 7 in both Experiments 1 and 3. This mean rating is comparable to those of our fillers with intermediate-to-high acceptability levels, such as non-constituent coordination and *although*-stripping illustrated in (20) and (21), respectively (see also the mean acceptability ratings of the filler types in Figure 4 below). Notably, these are generally accepted as grammatical constructs in English (Merchant 2003, Beavers and Sag 2004, Kubota and Levine 2015, Wurmbrand 2017, Yatabe and Tam 2021).

- (20) Non-constituent coordination (average rating 4.21 in Experiment 1)  
 a. Keith gave Emma a book and to Robin a record.

- b. Erin sold Sarah a bicycle and to Joseph a car.  
 (21) *Although*-stripping (average rating 4.47 in Experiment 1)  
 a. Susan studied math hard *although* not biology.  
 b. Parker bought some shirts last Sunday *although* not shoes.



**Figure 4. Mean Acceptability Ratings of Fillers by Construction Type**

The relatively high acceptability ratings for voice mismatches in pseudogapping might suggest that participants in our experiments were able to achieve a reasonably clear interpretation. However, it is important to note that interpretability does not necessarily equate to grammaticality. Psycholinguistic research has shown that comprehenders can often derive an interpretation for ill-formed sentences through covert repairs into well-formed ones (Frazier and Clifton 2011) and that they can even learn to comprehend novel ungrammatical constructions (Kaschak and Glenberg 2004). Furthermore, comprehenders sometimes report acceptability for a sentence but fail to assign a reliable meaning to it, as studies on ‘grammaticality illusions’ have shown (Phillips et al. 2011, Wellwood et al. 2017).

The grammatical status of voice mismatch in pseudogapping remains open to interpretation. Our results can be seen as supportive of both perspectives: permitted mismatch with reduced acceptability influenced by some extra-grammatical factors or illegal mismatch perceived as plausible. With regards to the first possibility, the present study did not find evidence that focus plays such an extra-grammatical role. However, it is possible that the auxiliary focus condition (e.g., *The engineers weren’t alerted by Adam as quickly as they could have been by Eric.*) in our experiments may have introduced an additional complexity due to post-elliptical contrastive material (e.g., *by Eric* in the example above). This contrastive material occupies the end of the sentence, a default focus position that may influence the overall focus structure of the sentence, even in the presence of other markers of focus (Harris and Carlson 2018). We leave the exploration of this effect for future research.

## 5 Conclusion

A long-standing puzzle in ellipsis research has been on the nature of identity required between the missing material and the corresponding one in the antecedent clause. Theorists have especially focused on drawing a division between those types of ellipsis that are sensitive to syntactic identity requirements and those that are not. Although the question is an empirical one, little attempt has been made to understand the existence of such requirements in pseudogapping from an experimental perspective.



In this context, the present study aimed to identify the pattern of acceptability in pseudogapping with voice mismatches. We found, firstly, that voice mismatch negatively impacts speakers' judgments on pseudogapping sentences. In addition, we tested whether information structure can modulate these negative impacts that are revealed in acceptability judgments, as previous research on VPE demonstrated such effects (Kertz 2013). Unlike the previous research, however, this study found no systematic influence of information structure on the acceptability of pseudogapping sentences, irrespective of mismatch in voice: a shift from contrastive topics to auxiliary focus did not result in increased acceptability ratings.

These findings raise questions about some of the theoretical accounts of the construction, which require only a semantic identity between the elided material and its corresponding one in the antecedent. Nonetheless, it is possible that the reduction in acceptability that has been associated with voice mismatch might in fact relate to some unknown factors at the discourse level.

While this study demonstrated that pseudogapping is sensitive to voice mismatch, it also showed that speakers do not entirely reject it, as evidenced by the relatively high ratings they assigned to voice-mismatched examples. Where in the grammar the phenomenon resides is a question that calls for further investigation in the broader discussion on the relation between acceptability and grammaticality.

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Examples in: English

Applicable Languages: English

Applicable Level: Tertiary

**Appendix A: Materials used in Experiment 1.** The full paradigm is shown in item 1 with the four conditions made by crossing two variables: VOICE (Match and Mismatch) and INFORMATION STRUCTURE (Contrastive topic and Auxiliary focus). The remaining items only involve the voice-matched condition with the contrastive topic structure.

1.
  - a. Adam didn't alert the engineers as quickly as Eric did the inspectors.
  - b. The engineers weren't alerted by Adam as quickly as they could have been by Eric.
  - c. The engineers weren't alerted by Adam as quickly as Eric did the inspectors.
  - d. Adam didn't alert the engineers as quickly as they could have been by Eric.
2. Liam didn't assault the old lady as badly as Tony did the young boy.
3. Anna didn't blame the doctors as severely as Claire did the nurses.
4. Lisa didn't contact the CEOs as promptly as Jane did the CFOs.
5. Jake didn't photograph the guests as nicely as Ivan did the bride.
6. Bryan didn't push the woman as aggressively as Jason did the man.
7. Julia didn't reprimand the boys as harshly as Kate did the girls.
8. Sean didn't praise the stunt woman as highly as Remy did the stuntman.
9. Mary didn't clean the pool as regularly as Susan did the garage.
10. Ella didn't criticize the movie as harshly as Laura did the sound track.
11. Peter didn't grade the final exam as thoroughly as Luis did the midterm.
12. Nathan didn't play the sonata as beautifully as Henry did the prelude.
13. Nolan didn't review the budget as quickly as Miles did the itinerary.
14. Grace didn't read the novel as quickly as Emma did the biography.
15. David didn't tune the guitar as carefully as Ethan did the bass.
16. Sally didn't water the tulips as often as Chloe did the roses.

**Appendix B: Materials used in Experiment 2.** The full paradigm is shown in item 1 with the four conditions made by crossing two variables: VOICE (Match and Mismatch) and INFORMATION STRUCTURE (Contrastive topic and Auxiliary focus). The remaining items only involve the voice-matched condition with the contrastive topic structure.

1.
  - a. Adam didn't alert the engineers as quickly as Eric did.
  - b. The engineers weren't alerted by Adam as quickly as they could have been.
  - c. The engineers weren't alerted by Adam as quickly as Eric did.
  - d. Adam didn't alert the engineers as quickly as they could have been.
2. Liam didn't assault the old lady as badly as Tony did.
3. Anna didn't blame the doctors as severely as Claire did.
4. Lisa didn't contact the CEOs as promptly as Jane did.
5. Jake didn't photograph the guests as nicely as Ivan did.
6. Bryan didn't push the woman as aggressively as Jason did.
7. Julia didn't reprimand the boys as harshly as Kate did.
8. Sean didn't praise the stunt woman as highly as Remy did.
9. Mary didn't clean the pool as regularly as Susan did.
10. Ella didn't criticize the movie as harshly as Laura did.
11. Peter didn't grade the final exam as thoroughly as Luis did.
12. Nathan didn't play the sonata as beautifully as Henry did.
13. Nolan didn't review the budget as quickly as Miles did.

14. Grace didn't read the novel as quickly as Emma did.
15. David didn't tune the guitar as carefully as Ethan did.
16. Sally didn't water the tulips as often as Chloe did.

**Appendix C: Materials used in Experiment 3.** The full paradigm is shown in item 1 with the six conditions made by crossing two variables: CONSTRUCTION (Full, PG, and VPE) and INFORMATION STRUCTURE (Contrastive topic and Auxiliary focus). The remaining items only involve the full condition with the contrastive topic structure.

1.
  - a. The engineers weren't alerted by Adam as quickly as Eric alerted the inspectors.
  - b. Adam didn't alert the engineers as quickly as they could have been alerted by Eric.
  - c. The engineers weren't alerted by Adam as quickly as Eric did the inspectors.
  - d. Adam didn't alert the engineers as quickly as they could have been by Eric.
  - e. The engineers weren't alerted by Adam as quickly as Eric did.
  - f. Adam didn't alert the engineers as quickly as they could have been.
2. The old lady wasn't assaulted by Liam as badly as Tony assaulted the young boy.
3. The doctors weren't blamed by Anna as severely as Claire blamed the nurses.
4. The CEOs weren't contacted by Lisa as promptly as Jane contacted the CFOs.
5. The guests weren't photographed by Jake as nicely as Ivan photographed the bride.
6. The woman wasn't pushed by Bryan as aggressively as Jason pushed the man.
7. The boys weren't reprimanded by Julia as harshly as Kate reprimanded the girls.
8. The stunt woman wasn't praised by Sean as highly as Remy praised the stuntman.
9. The pool wasn't cleaned by Mary as regularly as Susan cleaned the garage.
10. The movie wasn't criticized by Ella as harshly as Laura criticized the sound track.
11. The final exam wasn't graded by Peter as thoroughly as Luis graded the midterm.
12. The sonata wasn't played by Nathan as beautifully as Henry played the prelude.
13. The budget wasn't reviewed by Nolan as quickly as Miles reviewed the itinerary.
14. The novel wasn't read by Grace as quickly as Emma read the biography.
15. The guitar wasn't tuned by David as carefully as Ethan tuned the bass.
16. The tulips weren't watered by Sally as often as Chloe watered the roses.
17. The pilots weren't trained by Roy as intensively as Vincent trained the flight attendants.
18. The mayor wasn't interviewed by Frances as formally as Kelly interviewed the sheriff.
19. The SUV wasn't driven by Thomas as fast as Steven drove the convertible.
20. The chandelier wasn't dusted by Cinthia as carefully as Bobbie dusted the porcelain.
21. The puppies weren't petted by Steve as gently as Cora petted the kittens.
22. The main show wasn't organized by Jenny as fabulously as Eddie organized the afterparty.
23. The tables weren't repaired by Timmy as quickly as Penny repaired the chairs.
24. The main dish wasn't prepared by Pierre as impeccably as Martha prepared the dessert.