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Remnant connectivity in pseudogapping: Experimental evidence for a direct generation approach[1]

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This paper reports the results of two acceptability judgment experiments that examine the effect of PP remnants with mismatching correlates in the antecedent clause (either a PP, with a distinct preposition, or an NP) on the acceptability of pseudogapping as well as non-elliptical controls. Across both experiments, three novel findings emerge: First, utterances with mismatching PPs across the ellipsis clause and its antecedent were consistently degraded relative to their preposition-matched counterparts. Second, this mismatch penalty arose for elliptical and non-elliptical variants alike with only minor differences between the two. Finally, a significant portion of the mismatch penalties was explained away by the degree of semantic similarity between the thematic relations established by the mismatching prepositions with respect to the antecedent verb which was measured in a separate norming experiment. We examine the consequences of these new empirical results for current theories of pseudogapping, namely (i) the remnant-raising analysis, according to which the remnant XP is raised leftward out of the VP prior to VP ellipsis, licensed under identity with its antecedent; and (ii) the direct generation analysis, under which auxiliaries are verbal pro-forms that recover their referent anaphorically without the need for remnant movement or syntactic identity between the verb and its antecedent. We conclude that the data are more naturally accounted for under the direct generation approach.

KEYWORDS: acceptability judgment experiments, anaphora, ellipsis, mismatched antecedents, pseudogapping

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I. Introduction

Pseudogapping (PG), illustrated in (2),[2] is a construction similar to Verb Phrase Ellipsis (VPE) in that it involves ellipsis after an auxiliary (Aux). However, in VPE the entire VP complement of the Aux is ellipted, as in (1), whereas in PG the Aux is followed by an XP, the remnant, namely *me* in (2a) and (2b) and *to me* in (2c).[3]

(1) I thought it wouldn't bother you, but apparently it does ~~bother you~~.
(2) (a) It doesn't bother *you* but it does ~~bother~~ *me*.
(b) It bothers *you* more than it does ~~bother~~ *me*.
(c) She spoke *to you* more often than she did ~~speak~~ *to me*.

The remnant *me* in (2a) and (2b) is an NP. As is made clear by the way the example is marked up, this remnant corresponds to a subcategorized complement of the antecedent verb *bother*, namely its direct object *you*, which we call its 'correlate'. In (2c), the remnant is the PP[to] *to me*, corresponding once again to its correlate, the subcategorized complement of the antecedent verb *speak*, namely *to you*.[4]

Because the remnant in PG appears without an appropriate overt governor, it can be taken to be a type of fragment. PG is thus relevant to the general issue of the status of fragments in syntax, along with constructions like Bare Argument Ellipsis and Sluicing (e.g. Ginzburg & Sag 2000; Merchant 2001, 2004, 2013; Culicover & Jackendoff 2005; Chung 2006, 2013; Ginzburg & Miller 2019; Nykiel & Hawkins 2020; Nykiel & Kim 2021).

As is typical of fragment constructions, two main analyses of PG have been developed. The first is a transformational analysis, initially proposed by Jayaseelan (1990) – anticipated in N. Levin (1986) and Kuno (1981) – and refined by Lasnik (1999) and Gengel (2013), where the remnant is raised out of the VP, feeding deletion of the rest of the VP by VPE. The second is a direct generation approach (i.e. monostratal licensing of ellipsis, see Van Craenenbroek & Temmerman 2019, for introductions to a variety of such approaches; in particular, Ginzburg & Miller 2019; Jacobson 2019, which are especially relevant here) initially proposed by

[2] In examples of PG, for clarity, the correlate and the remnant are italics with underlined; in some cases we strike out the ellipted verb to make the intended interpretation explicit; in other cases we simply underline the antecedent.

[3] As illustrated in (2), PG occurs both in comparative and in non-comparative contexts, though it is rarer and less acceptable in the latter. This article uses only data from comparative PG. N. Levin (1986) and Miller (2014a) provide extensive corpus data on PG. Nancy Levin collected a sample of 37 naturally occurring spoken occurrences of non-comparative PG. Miller collected a corpus of over 1,500 examples of PG from the COCA corpus (Davies 2008) of which 45 are non-comparative.

[4] Stump (1977), who introduced the term 'pseudogapping', allowed the remnant to be any NP or PP that is in a contrast relation with a complement or adjunct of the ellipted verb. N. Levin (1986) proposed to restrict the term to cases with NP remnants, thus excluding cases like (2c). She was followed in this respect by Lasnik (1999), whose analysis applies only to direct objects. The general consensus, however, has been to use the term for all cases where an Aux is followed by a remnant corresponding to a subcategorized complement of the antecedent verb, irrespective of its category (see, e.g. Miller 1990; Gengel 2013; Kubota & Levine 2017).

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Miller (1990) in a Generalized Phrase Structure Grammar framework and also adopted by Hoeksema (2006). A more recent direct generation account in terms of hybrid type-logical categorial grammar is developed in Kubota & Levine (2017).

Under Gengel's remnant-raising analysis, the remnant is raised leftward out of the VP by Focus Movement (a form of A'-movement), feeding deletion of the rest of the VP by VPE, under syntactic identity with the antecedent:

(3) It doesn't bother *you* but it does *me*$_i$ [$_{VP}$ ~~bother t_i~~].

Such an analysis makes three central predictions: (i) there must be a syntactically identical antecedent; (ii) remnant movement should respect the relevant island constraints; and (iii) remnant movement should preserve connectivity (the case-marking or preposition marking of the remnant should be what is expected on the basis of the antecedent verb).[5]

Miller (2014a) cites naturally occurring examples from the COCA that constitute counterexamples to each of these predictions (see, e.g. his examples of locality violation (12a–f)[6] and absence of a syntactically identical antecedent (16a–c)). Of specific interest to the present paper are the examples of connectivity violations in (4a) and (4b) (in Miller 2014a: ex. (15a) and (16) respectively), to which we add further examples found in the COCA, (4c) and (4d):

(4) (a) Ask Doll, who spoke as much about his schoolboy career ending as he did *of the season in general*: 'I don't want it to end.' (COCA)
(b) '[…] It's hard enough to take two hours out of my day to put out a legal fire' – much less give *the matter* the same attention he would *to something that's actually going to generate some cash for the company*. (COCA)
(c) They gave *him* three months to live, the same as they did *to me*. (COCA)
(d) At some point, he started to wonder why he told *some patients* to have a good day and didn't *to others*. (COCA)

These examples are intuitively highly acceptable, yet in (4a), the remnant is a PP[of], whereas the correlate is a PP[about]; similarly, in (4b), (4c) and (4d), the remnant is a PP[to] complement of *give* or *tell*, whereas the correlate is the first NP direct object in the double direct object construction.

Under the direct generation approach, proposed by Miller (1990), auxiliaries are claimed to be verbal proforms, which can recover as antecedent any sufficiently salient predicate of the appropriate type present in the discourse.[7] They allow

[5] Lasnik (1999) assumes that the remnant raises by A-movement to spec of Agr_o. His analysis makes the same three predictions as Gengel's, plus the further prediction that remnants can only be NPs.

[6] An anonymous reviewer points out that some of these cases might plausibly be reanalyzed as not involving an island violation.

[7] Miller's analysis of pseudogapping is thus very similar to that proposed by Hardt (1993) for VPE and the arguments he advances (e.g. possibility of split antecedents, syntactic mismatches, etc.)

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arbitrary subcategorization frames, i.e. in HPSG terms, auxiliaries can take any COMPS list which the grammar makes available. Setting up the syntax this way will generate all of the examples exhibited by Miller (2014a), as this analysis does not make the predictions (i), (ii), and (iii). But it leads, of course, to massive syntactic overgeneration. Miller (1990) claimed that unacceptable instances of pseudogapping are grammatical and should be accounted for in semantic and pragmatic terms. Specifically, focusing on connectivity, on the basis of examples similar to (4a) and (4b) (Miller 1990: ex. (38)–(40)), he suggested that in cases where connectivity is violated, examples will be acceptable if the same semantic role is assigned by the antecedent verb to both complements. Thus, Miller (1990) claims that an example like (5a) is acceptable because *speak* assigns the same semantic role (the addressee) to a PP[to] and a PP[with] complement. Example (5b), however, is not acceptable because a PP[for] complement of *speak* has the semantic role of beneficiary, rather than addressee.[8]

(5) (a) John spoke to Mary more often than Peter did with Ann. (Miller 1990: ex. (38))
(b)??John spoke to Mary more often than Peter did for Ann. (Miller 1990: ex. (37c))

It should be noted that the attested examples of nonconnectivity given in (4) provide some initial corroboration for Miller's hypothesis.

In this paper we will address this question of remnant connectivity through controlled acceptability judgment experiments. Specifically, we provide evidence that the acceptability of PP remnants is not predicted by syntactic connectivity, but rather by proximity of semantic roles, thus supporting the claims of the direct generation approach as opposed to the remnant-raising approach.

2. Remnant connectivity

In this section we will have a closer look at remnant connectivity and its theoretical consequences for the competing analyses of pseudogapping (PG). We also provide a preliminary description of the experiments that we conducted to further our understanding of the role of connectivity in PG.

To avoid possible confusion, it should first be pointed out that in PG a PP complement as correlate in the antecedent does not necessarily correspond to a PP complement as remnant after the Aux. Specifically, as has been known since N. Levin (1986), the preposition is often omitted, as in (6) (what she calls

form a subset of those given by Hardt in his much more extensive discussion. The central difference between the two is technical, namely that Hardt proposes that the proform is an empty complement of the auxiliary, rather than the auxiliary itself.

[8] Miller (1990) characterizes this condition as semantic. But it is really a condition on the syntax–semantics interface since it involves reference both to syntactic subcategorization and to semantic roles, see Kubota & Levine (2017: 228n12).

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'deprepositionalized PG'; see also Miller 2014a: sect. 4.1, for corpus-based information on the frequency and variety of deprepositionalized PG cases):

(6) […] she cares for *Faith* like a mother would *any other normal baby*. (COCA)

Such examples do not raise any connectivity problems for Gengel's remnant-raising account, since Focus Movement can strand the preposition:[9]

(7) She cares for Faith like a mother would [$_{NP_i}$ any other normal baby] [$_{VP}$ ~~care for t_i~~].

Remnant connectivity holds in such cases, since what is moved is an NP.

In cases where the remnant is a PP, however, remnant-raising analyses lead to the prediction that the antecedent must also have a PP complement, otherwise examples like (8b) and (9b), with verbs subcategorizing either a direct or indirect object, would be predicted to be grammatical. That is, the category of the trace t_i, NP or PP, must be relevant in determining whether syntactic identity holds in (8b) and (9b), making ellipsis impossible.[10]

(8) (a) The president approved the bill just as she approved of its authors.
(b) *The president approved [$_{NP}$ *the bill*] just as she did [$_{PP_i}$ *of its authors*] ~~approve t_i~~

(9) (a) Peter actually kicked Kim more than he kicked at Sandy.
(b) *Peter actually kicked [$_{NP}$ *Kim*] more than he did [$_{PP_i}$ *at Sandy*] ~~kicked t_i~~.

Thus, syntactic identity of the antecedent must include identity of the subcategorization frame for the verb.

Beyond broad categorial identity, the question arises as to whether, in the case of PP remnants, identity should be further required between the preposition marking the remnant and that marking its correlate in the antecedent clause. If preposition identity is required, then only the matched (*to-to*) version of (10) is grammatical. If preposition identity is not required, all of the preposition pairings in (10) are predicted to be grammatical:

(10) John spoke to Mary more often than Peter did [$_{PP_i}$ to/with/for/of Anne] ~~spoke t_i~~.

[9] Despite citing a counter-example from N. Levin (1986), Gengel (2013: 12 ex. (27)) seems to believe that such cases are not grammatical, as suggested by her discussion on page 73. Under the analysis proposed by Lasnik (1999), remnant raising is A-movement to spec of Agr_o and is restricted to direct objects. Lasnik (1999: 145) suggests that deprepositionalized cases are made possible by reanalysis.

[10] The * judgments given on (8b) and (9b) are those naturally expected under remnant-raising analyses, whose goal is to account for acceptability on the basis of syntax. Under Miller's (1990) approach, these are predicted to be grammatical but unacceptable, since the remnant and correlate do not instantiate the same semantic role. It would of course be possible in principle to allow remnant raising to overgenerate and to propose an account similar to Miller's for unacceptable cases, but this clearly goes against the spirit of extant remnant-raising analyses and no one has proposed it to our knowledge.

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Though this specific issue is generally not directly addressed in the literature, it seems that the default assumption is that preposition match is required.[11]

The problem with this position is that there seems intuitively to be variable acceptability depending on the choice of mismatched preposition, as first noted by Miller (1990). Defenders of the remnant-raising approach might attempt to explain this situation by claiming that only strict identity leads to grammaticality, but that cases of mismatch can be repaired (see Frazier and her colleagues' theory of 'recycling', e.g. Arregui et al. 2006; Frazier 2013) and that acceptability correlates with ease of repair, assuming that similarity in semantic roles makes repair easier.

As noted above, Miller's (1990) analysis proposed that identity of semantic roles established by the prepositions was the factor determining acceptability. In this paper, we propose to evaluate a modified variant of this hypothesis that considers a gradient notion of SEMANTIC SIMILARITY which can be measured experimentally. In addition to this measure of semantic similarity, we conducted two acceptability judgment experiments to test whether PG with mismatched prepositions is degraded compared to preposition-matched cases. The first experiment considers verbs allowing PP[to] and PP[with] complements, namely verbs of speaking and verbs of combining and attaching (see B. Levin 1993: 159–164). The second acceptability judgment experiment examined verbs participating in the dative alternation (B. Levin 1993: 45). The specific verbs used are respectively listed in (11a) and (11b):

(11) (a) speak, talk, communicate, confide, join, associate, blend, conform, compare, link, correspond, connect, tie, correlate, comply, combine
(b) give, promise, offer, send, lend, loan, write, serve, teach, award

With experimental measures of acceptability and semantic similarity in hand, we can then evaluate the gradient reformulation of Miller's (1990) hypothesis, i.e. that preposition-mismatched PG is only degraded to the extent that the two prepositions express different semantic relations with respect to the antecedent verb. More specifically, we aim to address the following three questions:

— Is there a penalty for preposition mismatch?
— If such a penalty exists, to what extent is it correlated with similarity of semantic roles?

[11] The issue is not mentioned in N. Levin (1986) nor in Gengel (2013), the two book length references on PG, probably because the spirit of both analyses would clearly make it an obvious constraint not worth stating. However, in their paper on orphans hosted by VP anaphora, Mikkelsen, Hardt & Ørsnes (2012: 179) specifically contrast the case of PP remnants in pseudogapping to that of orphans after VP anaphora such as *do so/it/this/that/the same*. They claim that the latter specifically do NOT observe connectivity, as in Mikkelsen et al. (2012: 178 ex. (2)): 'You have jilted two previous fiancés and I expect you would do the same to me', taken from the COCA, in which the orphan *to me* has the direct object NP *two previous fiancés* as its correlate. Although Mikkelsen et al. (2012: 179) claim that in PG 'for PP remnants, the identity of the preposition is determined by the antecedent', providing the following example (Mikkelsen et al. 2012: 179 ex. (16)): 'I wouldn't rely on Harvey, but I would on/*to/*with Frank.'

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— If such a penalty exists, is it specific to ellipsis, or does it also appear in the corresponding non-elliptical sentences?

3. Experiment 1: Remnant connectivity with verbs exhibiting a PP[to]/PP[with] alternation

The purpose of Experiment 1 was two-fold: (i) to investigate the acceptability of PP remnant pseudogapping and its non-elliptical counterpart with matched and mismatched prepositions by examining verbs that allow both PP[to] and PP[with] complements; and (ii) to test whether the semantic similarity between the mismatched prepositions explains the mismatch penalty (if it exists) on an item-by-item basis.

3.1. *Methods*

The construction of materials, the experimental procedure, as well as the statistical analysis described below were pre-registered on aspredicted.org prior to data collection.[12]

3.1.1. *Materials*

As illustrated in (12), experimental items were constructed on the basis of two factors, ELLIPSIS – pseudogapping vs. non-elliptical controls – and PREPOSITION CONDITION, spanning two preposition-matched variants, labeled WITH-WITH and TO-TO, and four preposition-mismatched variants: TO-WITH, WITH-TO, WITH-FOR, and TO-FOR. The sentences involving *for* were included in an attempt to increase variability in semantic similarity between prepositions.[13]

(12) (a) [WITH-WITH] Eddy spoke with Susan more often than he {did | spoke} with Emily.
(b) [TO-TO] Eddy spoke to Susan more often than he {did | spoke} to Emily.
(c) [TO-WITH] Eddy spoke to Susan more often than he {did | spoke} with Emily.
(d) [WITH-TO] Eddy spoke with Susan more often than he {did | spoke} to Emily.
(e) [WITH-FOR] Eddy spoke with Susan more often than he {did | spoke} for Emily.
(f) [TO-FOR] Eddy spoke to Susan more often than he {did | spoke} for Emily.

We constructed 20 items following this pattern, which can be found in Appendix A, 2 for each of the 10 verbs listed in (11a).

[12] The pre-registration is available here: https://aspredicted.org/blind.php?x=tf6ra2.
[13] We chose the preposition *for* because it intuitively led to a relatively small decrease in acceptability, as opposed to other prepositions, which led to strongly degraded (and often uninterpretable) variants: ???*Eddy spoke with Susan more often than he did on/at/of/about Emily.*

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3.1.2. *Participants and procedure*

In line with the pre-registration prior to data collection, we recruited 153 participants through Amazon.com's Mechanical Turk crowd-sourcing platform and presented each with one variant of each experimental item, which were interspersed with 40 distractors of variable acceptability. Participants were asked to judge the acceptability of each sentence on a 7-point Likert scale.

3.1.3. *Norming experiment, semantic similarity*

In order to examine the effect of semantic similarity on acceptability, we recruited a separate set of participants ($N = 90$) to estimate the semantic similarity associated with the sentences in both Experiment 1 and Experiment 2 (reported below). The materials for this norming experiment were derived from the materials in the acceptability judgment experiment in a straightforward fashion: participants were presented with sentence pairs like the one in (13), derived from (12), and asked to use a 7-point Likert scale to indicate how similar they are in terms of their meaning.

(13) (a) Eddy spoke with Susan.
(b) Eddy spoke to Susan.

The sentences in each pair were presented in a random order and the experimental items were preceded by three practice items and interspersed with 20 distractors. As anticipated, the preposition mismatches in the experimental materials were associated with variable degrees of mean semantic similarity, which ranged from 2.1 to 6.4 (see Figure 1). Note that this way of setting up the experiment ensures that what we are measuring is the semantic similarity between the relations established by the two prepositions with respect to the governing verb, on the basis of a given subject, not simply the semantic similarity between the prepositions in general. In some cases, for brevity, we simply talk about 'semantic similarity between prepositions'. But this should always be understood as shorthand for the more specific, sentence-level similarity relation established here.[14]

3.2. *Results*

Two participants were excluded because they reported being non-native speakers of English at the end of the experiment. Another 64 trials were excluded because the response time was below 500 ms – a pre-registered exclusion criterion based on the reasoning that half a second would be too little time to read and judge the sentences faithfully.

[14] An anonymous reviewer raises the possibility of using computational models of distributional semantics in order to quantify the semantic similarity between item variants. While this is certainly possible and perhaps desirable for applications at scale that prohibit the collection of behavioral norms, we believe it is preferable to use human judgments from the same participant pool as the acceptability ratings we are looking to explain.

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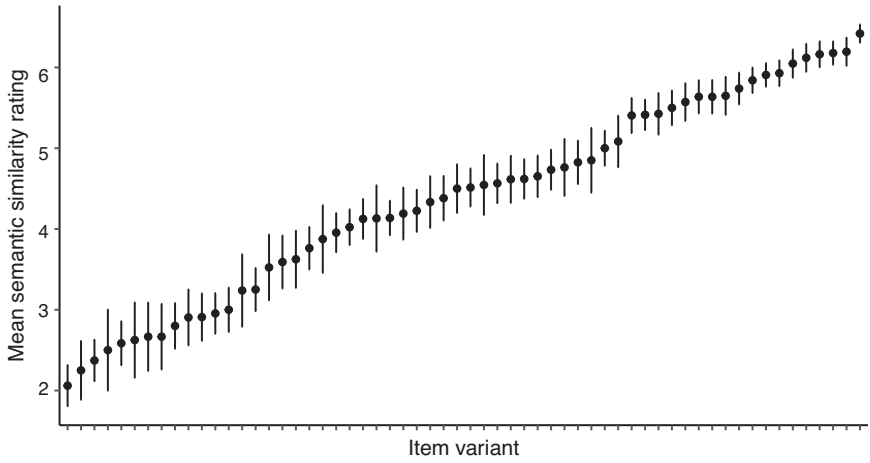

Figure 1
Results from the norming experiment: mean semantic similarity score of each item variant used in Experiment 1. Error bars indicate standard errors.

The data from the remaining 151 participants are summarized in Figure 2 and were analyzed in a hierarchical linear regression (using the R package `brms`; Bürkner 2018) with PREPOSITION CONDITION, ELLIPSIS, and their interaction as fixed effects along with the maximal random-effect structure including all by-item and by-participant group-level intercepts and slopes (Barr et al. 2013). CONDITION was treatment-coded, whereas ELLIPSIS was contrast-coded so that main effects of CONDITION indicate effects averaging over elliptical and non-elliptical variants and interaction coefficients indicate whether any main effects varied across ELLIPSIS.

With this model in place, we then compared each mismatch condition to its respective preposition-matched baseline: WITH-TO and WITH-FOR variants were both significantly degraded compared to the WITH-WITH baseline ($\Delta = -0.37$, $CI(\Delta) = [-0.62, -0.13]$, $P(\Delta < 0) = 0.99$, and $\Delta = -1.33$, $CI(\Delta) = [-1.67, -0.98]$, $P(\Delta < 0) = 1$, respectively); and TO-WITH and TO-FOR mismatches were less acceptable than their TO-TO counterpart, although the former comparison was only marginally significant ($\Delta = -0.31$, $CI(\Delta) = [-0.59, -0.03]$, $P(\Delta < 0) = 0.96$, and $\Delta = -1.46$, $CI(\Delta) = [-1.88, -1.05]$, $P(\Delta < 0) = 1$, respectively).[15] Note that this analysis compares each preposition-mismatch condition to its specific no-mismatch baseline condition, and that each mismatch penalty is independent from the others.

As for interactions with ELLIPSIS, three of the four mismatch penalties were either statistically indistinguishable or *ameliorated* under pseudogapping compared to

[15] We report the model's mean posterior estimate Δ, along with its 95% Credible Interval ($CI(\Delta)$) and the model's posterior probability that the coefficient is below (or above) 0, i.e. $P(\Delta < 0)$ or $P(\Delta > 0)$, respectively.

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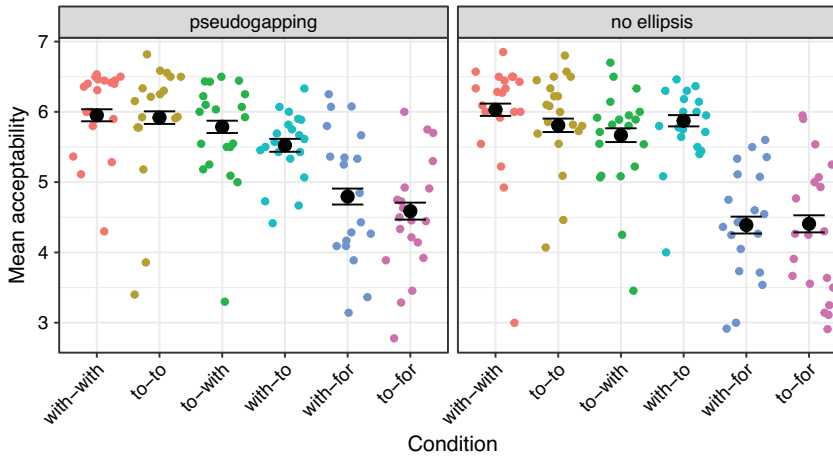

Figure 2
Mean acceptability of experimental items under pseudogapping (left panel) and unellipted variants (right panel) as a function of preposition-mismatch condition (X axis). Each point represents one variant of the 20 experimental items. Error bars indicate standard errors around the condition averages.

non-elliptical variants: WITH-FOR ($\Delta = 0.18$, $CI(\Delta) = [0.03,0.21]$, $P(\Delta > 0) = 0.98$), TO-WITH ($\Delta = 0.07$, $CI(\Delta) = [-0.08,0.21]$, $P(\Delta > 0) = 0.77$), and TO-FOR ($\Delta = 0.1$, $CI(\Delta) = [-0.05,0.26]$, $P(\Delta > 0) = 0.88$). Only one mismatch penalty – the degradation of WITH-TO items relative to their WITH-WITH counterparts – was *exacerbated* under pseudogapping, and this difference was only marginally significant ($\Delta = -0.14$, $CI(\Delta) = [-0.29,0.002]$, $P(\Delta < 0) = 0.95$).

The results reported thus far indicate that mismatched prepositions negatively affect both elliptical and non-elliptical variants of the sentences in question, with only minor differences between the two: the penalties in question are not systematically exacerbated under pseudogapping, and indeed in one case the mismatch penalty may be ameliorated under ellipsis.[16]

We now turn to the critical test of Miller's (1990) hypothesis, which concerns the effect of semantic similarity on acceptability. To evaluate this hypothesis, we conducted a second analysis, which was identical to the first one with one exception: we added the semantic similarity scores estimated in the norming experiment as a

[16] An anonymous reviewer points out that for some of the verbs in (11a) a *for* complement is semantically anomalous making the non-elliptical FOR conditions degraded. The reviewer further suggests that this might be enough to explain the degradation of acceptability of the FOR conditions in the elliptical variants under a remnant-raising approach. We do not think this objection holds because the deletion account predicts an independent mismatch penalty for the elliptical items, which should lead to an additive effect that should be detectable irrespective of the overall acceptability of the combination of verb and preposition. While we agree that the variable naturalness of the FOR items has an effect on acceptability, we do not believe it undermines our interpretation of the results because both MISMATCH and ELLIPSIS (as well as their interaction) was manipulated WITHIN items.

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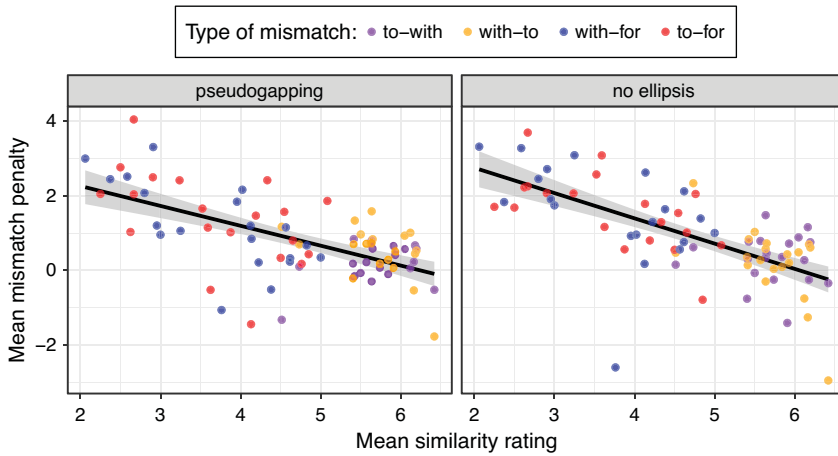

Figure 3
Average mismatch penalty as a function of mean semantic similarity. Each point represents a particular item variant used in Experiment 1.

fixed effect into the model (as well as the corresponding by-item and by-participant group-level effects), thereby allowing them to explain away the variance that was previously explained by the presence of a preposition mismatch. In order to align maximal similarity with the preposition-*matched* variants, we transformed semantic similarity to range from −6 to 0, where −6 means 'maximally dissimilar' and 0 means 'maximally similar' (corresponding to '1' and '7' on the Likert scale, respectively). The results reveal that semantic similarity is indeed positively correlated with acceptability ($\Delta = 0.49$, $CI(\Delta) = [0.32,0.66]$, $P(\Delta > 0) = 1$; see Figure 3). Crucially, once item-by-item semantic similarity is statistically controlled for, all mismatch penalties disappear (WITH-TO: $\Delta = 0.27$, $CI(\Delta) = [-0.02,0.57]$, $P(\Delta < 0) = 0.06$; WITH-FOR: $\Delta = 0.28$, $CI(\Delta) = [-0.22,0.77]$, $P(\Delta < 0) = 0.17$; TO-WITH: $\Delta = 0.33$, $CI(\Delta) = [-0.02,0.7]$, $P(\Delta < 0) = 0.06$; TO-FOR: $\Delta = 0.17$, $CI(\Delta) = [-0.38,0.74]$, $P(\Delta < 0) = 0.3$). It thus appears that the variance that was at first glance associated with the presence of a preposition mismatch is better explained by the perceived semantic (dis)similarity between the two prepositions.

3.3. *Discussion*

Experiment 1 examined the acceptability of pseudogapping as well as non-elliptical controls in preposition-matched and preposition-mismatched sentences. The results reveal three novel findings that speak to the theoretical underpinnings of pseudogapping. First, while every type of preposition mismatch was associated with reduced acceptability, elliptical and non-elliptical variants were affected in similar

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ways. Recall that deletion under identity approaches predict mismatch penalties to arise as a result of the grammatical requirements of pseudogapping and they should therefore manifest in an ellipsis-specific way. Our experiment, however, revealed only minor differences between elliptical and non-elliptical variants, some of which favored cases involving pseudogapping while others indicated an advantage for the non-elliptical variants.[17]

Second, we found a positive effect of semantic similarity, an item-by-item predictor that was independently measured in a norming experiment. This finding is consistent with a gradient reformulation of Miller's (1990) hypothesis, according to which the degree to which two prepositions are perceived to contribute different meanings to the sentence in question determines the acceptability of mismatching prepositions.

Finally, and most importantly, the penalties associated with mismatched prepositions disappeared once semantic similarity was statistically controlled for, indicating that the latter 'explained away' the variance that had at first glance been associated with the mismatch.

4. Experiment 2

The purpose of Experiment 2 was to further investigate the role of preposition mismatches in pseudogapping, this time leveraging verbs that participate in the dative alternation, listed in (11b). Specifically, we examined the effect of mismatch where the antecedent involves a double direct object construction and the ellipsis clause contains a mismatched prepositional object remnant corresponding to the NP direct object correlate:

(14) (a) They will give books *to Dana* just as they will *to Tim*. (TO-TO match)
(b) They will give *Dana* books just as they will *to Tim*. (NONE-TO mismatch)[18]

Unfortunately, it is not possible to investigate the converse mismatch configuration, where the antecedent involves an indirect object correlate and the ellipsis clause features a direct object remnant:

(15) (a) They will give *Dana* books, just as they will ~~give~~ *Tim* ~~books~~. (NONE-NONE match)
(b) They will give books *to Dana*, just as they will ~~give~~ *Tim* ~~books~~. (TO-NONE mismatch)

[17] An anonymous reviewer is concerned that these minor differences may not hold up in future replications, and we quite agree: we report the results as they are, but we do not draw any theoretical conclusions from the presence of these differences. The absence of a consistent ellipsis-specific mismatch penalty is theoretically significant, however, as such penalty is predicted under deletion-based theories of pseudogapping and not borne out in our data.

[18] For the sake of consistency with our descriptions of the experimental materials for Experiment 1, we use 'NONE' in condition labels for Experiment 2 to refer to the direct object construction.

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The possibility of 'deprepositionalized' PG (as in (6)) creates an insurmountable confound that makes it impossible to guarantee that (15b) is interpreted as the mismatched variant of (15a), since it could just as easily involve a matched antecedent with an ellipted preposition:

(16) They will give books to Dana, just as they will ~~give books to~~ Tim. (TO-TO match)

4.1. *Methods*

4.1.1. *Materials*

In parallel to Experiment 1, our experimental materials were constructed on the basis of two factors, ELLIPSIS and PREPOSITION CONDITION. The first is binary, with the values PSEUDOGAPPING and NO ELLIPSIS, whereas the second features four variants: a preposition-matched condition (TO-TO), and three mismatch conditions (NONE-TO, TO-FOR, and NONE-FOR). These are illustrated in (17), where the PSEUDOGAPPING variants differ from the NO ELLIPSIS conditions in that they do not include *give books* after the auxiliary *will*.

(17) (a) [TO-TO] They will give books to Dana just as they will (give books) to Tim.
(b) [NONE-TO] They will give Dana books just as they will (give books) to Tim.
(c) [TO-FOR] They will give books to Dana just as they will (give books) for Tim.
(d) [NONE-FOR] They will give Dana books just as they will (give books) for Tim.

As in Experiment 1, we included the conditions with *for* in order to increase variability in semantic similarity. This was even more important with verbs undergoing the dative alternation, since the alternating constructions exhibit much less semantic variability than the *to*/*with* alternating verbs used above, which will be reflected in the experimental results of Experiment 2.

Using the 10 verbs given in (11b), we constructed 20 items following the pattern shown in (17), which are listed in Appendix B.

4.1.2. *Participants and procedure*

We recruited 36 participants via Amazon.com's Mechanical Turk crowd-sourcing platform. Each participant was presented with one variant of each of the 20 experimental items – as well as 40 interspersed distractor items – and rated their acceptability on a seven-point Likert scale.

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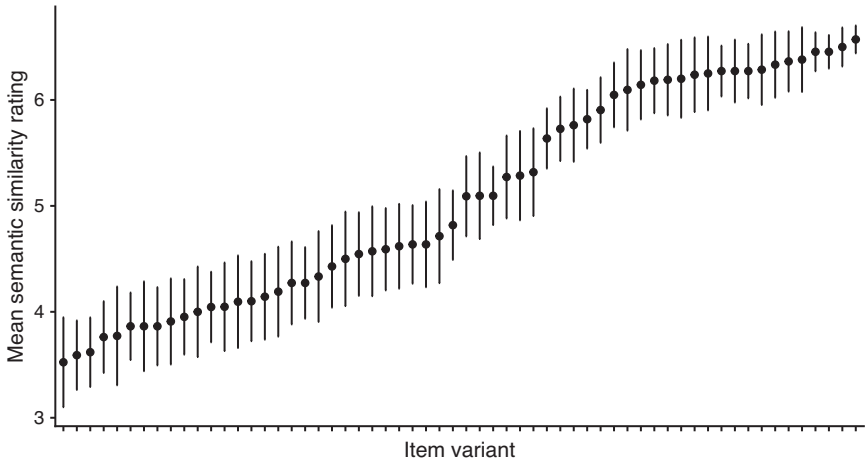

Figure 4
Results from the norming experiment: mean semantic similarity score of each item variant used in Experiment 2. Error bars indicate standard errors.

4.1.3. *Semantic similarity norming*

Just as we did for Experiment 1, we collected semantic similarity estimates for all preposition-mismatched items used in Experiment 2. This was done in the same norming experiment described in the context of Experiment 1 ($N = 90$), and the distribution of ratings that correspond to the items in Experiment 2 are shown in Figure 4. Overall, the items exhibit less variability in semantic similarity than the items in Experiment 1, with average ratings ranging from 3.52 to 6.57 and a greater proportion of ratings near the upper end of the scale.

4.2. *Results*

We excluded one participant who failed to report English as their native language, and two additional trials with response times below 500 ms. The statistical analysis of the data from the remaining 35 participants will proceed analogously to Experiment 1: we first fit a hierarchical regression model including ELLIPSIS, PREPOSITION CONDITION, and their interaction as population-level effects along with all by-item and by-participant group-level slopes and intercepts. As before, the purpose of this model is two-fold: it allows us to test whether there are any mismatch effects, and if so, whether they vary across elliptical and non-elliptical variants; and it will further also serve as the baseline for the next analysis, which examines the role of semantic similarity.

The results are summarized in Figure 5. As in Experiment 1, ELLIPSIS was contrast-coded and the main effects of PREPOSITION CONDITION are thus to be interpreted as overall penalties, averaging across elliptical and non-elliptical variants.

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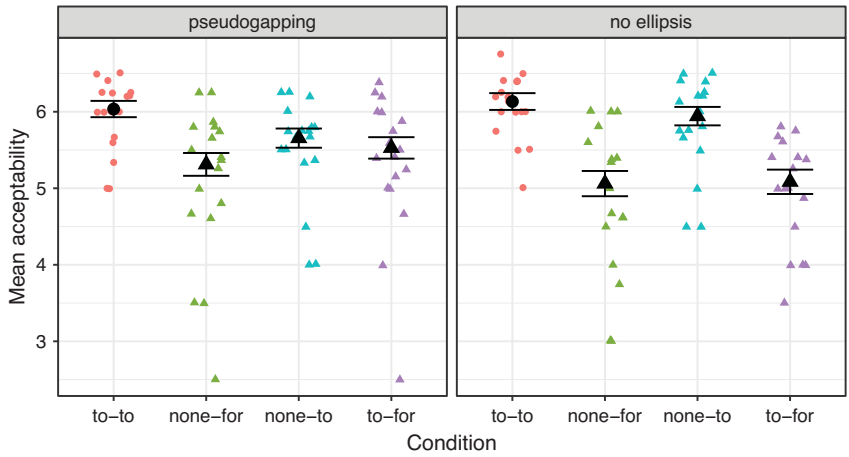

Figure 5
Results from Experiment 2: mean acceptability ratings by PREPOSITION CONDITION and ELLIPSIS. Error bars indicate standard errors around condition averages.

All three types of mismatch were significantly degraded compared to the TO-TO preposition-matched variants: $\Delta = -1.42$, $CI(\Delta) = [-1.88, -0.97]$, $P(\Delta < 0) = 1$ (NONE-FOR); $\Delta = -0.5$, $CI(\Delta) = [-0.76, -0.24]$, $P(\Delta < 0) = 1$ (NONE-TO); and $\Delta = -1.23$, $CI(\Delta) = [-1.69, -0.78]$, $P(\Delta < 0) = 1$ (TO-FOR).

As for the interaction with ELLIPSIS, all three mismatch effects were either indistinguishable across elliptical and non-elliptical variants (NONE-TO: $\Delta = -0.05$, $CI(\Delta) = [-0.34, 0.23]$, $P(\Delta < 0) = 0.61$) or *ameliorated* under pseudogapping (NONE-FOR: $\Delta = 0.33$, $CI(\Delta) = [0.04, 0.62]$, $P(\Delta > 0) = 0.97$; TO-FOR: $\Delta = 0.45$, $CI(\Delta) = [0.19, 0.71]$, $P(\Delta > 0) = 0.99$), strongly suggesting that the effect of mismatch is not specific to pseudogapping.

Finally, we conducted a second analysis that introduced population- and group-level effects for item-by-item semantic similarity (estimated in the norming experiment described above) into the model. The results resemble those for Experiment 1, however they are not as crisp (see Figure 6): the main effect of similarity (averaging across elliptical and non-elliptical variants), while trending in the predicted direction, did not reach significance ($\Delta = 0.24$, $CI(\Delta) = [-0.11, 0.57]$, $P(\Delta > 0) = 0.88$), but it nonetheless explained some of the variance previously associated with mismatch. Specifically, the magnitude of all mismatch effects was reduced substantially after controlling for similarity, and only one of them remained statistically significant (NONE-FOR: $\Delta = -0.89$, $CI(\Delta) = [-1.66, -0.15]$, $P(\Delta < 0) = 0.97$; NONE-TO: $\Delta = -0.34$, $CI(\Delta) = [-0.7, 0]$, $P(\Delta < 0) = 0.95$; and TO-FOR: $\Delta = -0.59$, $CI(\Delta) = [-1.43, 0.23]$, $P(\Delta < 0) = 0.89$).

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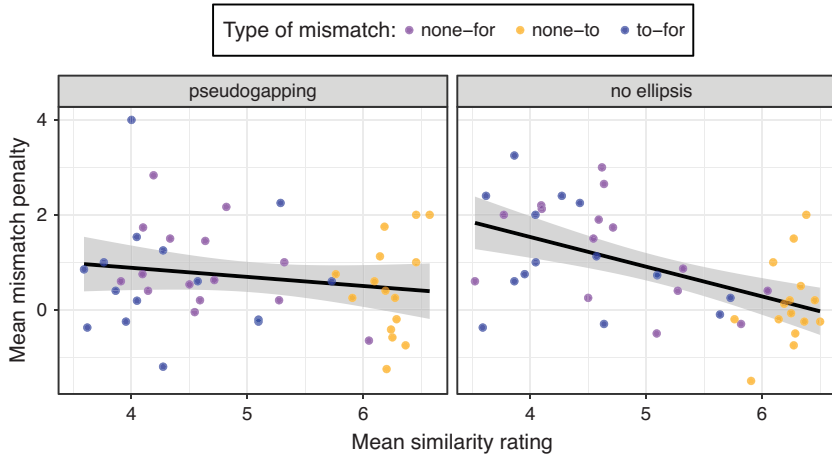

Figure 6
Average mismatch penalty as a function of mean semantic similarity. Each point represents a particular item variant used in Experiment 2

4.3. *Discussion*

The results from Experiment 2 are less clear than those from Experiment 1: there is only weak evidence for a main effect of similarity and at least one of the mismatch penalties – the reduced acceptability of NONE-TO variants relative to their TO-TO counterparts – cannot be explained fully in terms of similarity since the penalty remains significant after similarity is statistically controlled for. Although they may be less clear, however, all of the results from Experiment 2 go in the same direction as those from Experiment 1: all mismatch effects are reduced in magnitude once semantic similarity is entered into the model and two of them fall below the significance threshold, indicating that similarity does capture some of the variance associated with mismatching prepositions.

One possible reason behind the reduced impact of semantic similarity in Experiment 2 compared to Experiment 1 is the fact that variants of the dative alternation express more similar meanings than the *to*/*with* alternation we examined in Experiment 1. As a result, the similarity norming experiment identified fewer items at the lower end of the similarity scale (compare Figure 4 to Figure 1), while at the same time indicating that a greater proportion of items were perceived as highly similar. This reduced variance in the predictor may be a contributing factor in the results from Experiment 2, although this possibility remains speculative at present.

5. GENERAL DISCUSSION

We have reported two acceptability judgment experiments that investigate the effect of syntactic mismatches between the remnant and correlate on the acceptability of

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elliptical utterances involving pseudogapping with PP remnants, as well as the corresponding non-elliptical variants. In the first experiment, we studied cases where the mismatch is due to the presence of differing prepositions in the remnant and correlate. In the second, the mismatch involved having an NP correlate to the PP remnant. Across both experiments, several novel findings emerged. First, we confirmed that sentences exhibiting mismatches are consistently associated with reduced acceptability compared to the corresponding matched baseline sentences. However, we found no evidence that these mismatch penalties were specific to pseudogapping, and in fact several of them were exacerbated in the *absence* of ellipsis. Finally, we found that the perceived semantic similarity of the mismatched prepositions was positively correlated with acceptability, which was particularly pronounced in Experiment 1 and which explained away a substantial part of the penalty associated with the mismatch.

The finding that the mismatch penalty is not specific to ellipsis suggests that the present case is different from various other types of mismatch, for which acceptability experiments have shown that there *is* an ellipsis-specific penalty, e.g. Kim et al. (2011) for voice and category mismatches in VPE; SanPietro, Xiang & Merchant (2012), Kim & Runner (2018), and Poppels & Kehler (2019) for voice-mismatch in VPE; and Kertz (2013) on argument structure mismatches in VPE (some of these studies also report a penalty for mismatch in the non-elliptical controls, but it tends to be exacerbated under ellipsis).[19]

Our findings are thus consistent with the possibility that the effect of mismatch on acceptability is in fact simply due to a previously observed general preference for parallelism that exists independently of ellipsis – see, e.g. Frazier, Munn & Clifton (2000) for evidence from non-elliptical coordinate structures and Dubey, Sturt & Keller (2005) for more general evidence. In particular, Dubey et al. (2005: 834) conclude that 'the parallelism effect is an instance of a general processing mechanism, such as syntactic priming… rather than specific to coordination'. The present paper provides further experimental evidence in this direction, showing two cases where lack of parallelism may be responsible for reducing acceptability in a way that is not specific to ellipsis. Furthermore, the ameliorating effect of semantic similarity on mismatch suggests that the preference for parallelism may go beyond strict syntax.

Our findings raise difficulties for the predictions made by currently existing remnant-raising approaches to pseudogapping. As discussed in Section 2, these approaches predict that only matching prepositions in the correlate and remnant are grammatical and treat conditions with mismatched prepositions as connectivity violations produced by remnant movement. While the fact that mismatches are consistently degraded in acceptability might initially seem to support remnant-raising approaches, we found no evidence that the mismatch penalties are specific to

[19] Note that numerous studies on the effect of syntactic mismatch do not include non-elliptical controls, making it impossible to be sure that the effects found are indeed specific to ellipsis (e.g. Arregui et al. 2006; Grant et al. 2012).

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pseudogapping. In fact, in several mismatch configurations – including those involving a mismatch with the semantically dissimilar preposition *for* – ellipsis significantly improved acceptability relative to the corresponding non-elliptical utterances.[20] The remnant-raising analysis offers no insight into why this should be the case.

Beyond this, remnant-raising approaches provide no natural explanation for the semantic similarity findings, summarized in Figures 3 and 6. Specifically, they offer no obvious explanation for the fact that some mismatches come with a greater cost in acceptability than others, which we found across both experiments, nor for the fact that a significant amount of this variance was captured by the semantic similarity associated with the mismatched prepositions. A common rescue strategy for identity-based theories of ellipsis in the face of gradience is to explain it in terms of processing, that is, in terms of the competence/performance distinction (e.g. Arregui et al. 2006; Grant, Clifton & Frazier 2012; Frazier 2013). In particular, this strategy maintains a non-gradient grammatical constraint on ellipsis and explains gradient acceptability as the result of the same syntactic repair processes that allow the parser to recover from garden-path sentences by reanalyzing ungrammatical parses. Crucially, to avoid rampant overgeneration, the repair mechanism is constrained such that it has to be triggered by a grammatical violation (Arregui et al. 2006), such as the violation of the identity constraint that governs ellipsis, and it is this aspect of the approach that makes it inapplicable to our data: while the gradient effect of semantic similarity on mismatched cases of pseudogapping could be explained by positing that similarity in meaning (gradiently) facilitates repair, no such repair processes can be posited for the non-elliptical variants. Nonetheless, the semantic similarity effect we found does apply independently of ellipsis and thus cannot be explained by appealing to repair. More generally, as suggested above, our results call for an explanation that is independent of ellipsis, and invoking a general preference for parallelism that operates independently of ellipsis provides a more parsimonious explanation for our findings.

An alternative strategy to account for the data presented here within a remnant-raising framework would be to modulate connectivity requirements between remnant and correlate so that they ignore prepositions, i.e. so that verbs selecting different subcategorization frames should be treated as identical. This would make all of the examples used in Experiment 1 and 2 grammatical,[21] and acceptability could be accounted for in terms of semantic similarity, along the lines sketched here. This would provide a natural explanation for the parallelism in the judgments between elliptical and non-elliptical cases, since the former can simply be assumed to keep the same judgments as the latter after ellipses. However, it should be noted that such a move is incompatible with most current Minimalist analyses of similar

[20] Only in one case (degradation of WITH-TO items relative to their WITH-WITH counterparts) was the mismatch penalty exacerbated under pseudogapping, and this difference was only marginally significant.

[21] In the case of Experiment 2, this would depend on the precise syntactic structure assigned to the [–NP PP[to]] and [–NP NP] constructions for alternating verbs, but it seems pretty clear that it would be possible to set things up so that the VP left by remnant raising is identical.

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fragment constructions, specifically Sluicing and Bare Argument Ellipsis. Allowing a different preposition on the elliptical fragment in our PG data would clearly violate, for instance, the lexico-syntactic identity condition on sluicing (known as the 'no new words' constraint) proposed by Chung (2006), which was influential in shaping many subsequent proposals including Chung (2013), Merchant (2013), and Rudin (2019). Thus, re-defining identity to square our PG results with a deletion account would seem to hamper the pursuit of a unified account of ellipsis with respect to mismatch effects, which goes against the general suppositions in the literature.

However, our results seem to be relatively easy to integrate into a direct generation approach, specifically, within the most explicitly worked out approach in this line, that developed by Kubota & Levine (2017) in hybrid type-logical categorial grammar.

They discuss the following example from Miller (2014a), repeated from (4a):

(18) Ask Doll, who *spoke* as much *about his schoolboy career ending* as he did *of the season in general*: 'I don't want it to end.' (COCA)

and propose to explain its grammaticality by assigning the following category to *speak*:

(19) speak; ⟨**speak-about**, **speak-of** ⟩; $\text{VP/PP}_{about} \wedge \text{VP/PP}_{of}$ (Kubota & Levine 2017: 242, ex. (77), where ∧ is the meet connective)

They propose to limit such entries involving ∧ to cases where the two complementations have related yet distinct meanings. This proposal is unlikely to fully account for our findings because it fails to capture the gradient effect of semantic similarity: either the remnant and its correlate are sufficiently similar to warrant a lexical entry involving ∧, as in (19), in which case the mismatch is grammatical, or they are not, in which case the mismatch is ungrammatical. There is thus no reason to expect any gradient effects of the kind we observed. Finally, their proposals do not provide any insight as to why the corresponding non-elliptical constructions should exhibit similar patterns of acceptability degradation.

Obviously, however, the Kubota and Levine analysis could be revised to account for our data. This might involve one of two strategies. The simplest move would be to drop the idea of relying on lexical entries of the type given in (19) and to simply claim, that all of the examples of preposition mismatch are grammatical. Acceptability could then be explained in terms of semantic similarity along the lines of Miller (1990). However, Kubota and Levine specifically argue against this aspect of Miller's proposal. They maintain that it is not sufficiently constrained syntactically and that it would be difficult to provide a principled account for the unacceptability of the wide variety of cases where it overgenerates. They argue, however, that remnant-raising approaches are too syntactically restrictive to account for the variety of attested pseudogappings and that their hybrid type-logical categorial grammar approach allows them to 'augment the interpretive analysis of Miller

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(1990) with the insight from transformational approaches that syntactic information is also relevant in the licensing of pseudogapping, resulting in a synthesis of the seemingly antithetical transformational and nontransformational approaches' (Kubota & Levine 2017: 214).

In this spirit, one could imagine different ways of implementing gradient grammaticality into their hybrid type-logical framework. An anonymous reviewer suggests a particular extension of Kubota & Levine's (2017) analysis that injects gradience into the lexicon by way of computational models of distributional semantics (see Lewis & Steedman 2013 and Asher et al. 2016 for proofs-of-concept for such an approach). To the extent that vector representations might capture sentence-level semantic similarity in a way that resembles our behavioral norming measures, such an extended analysis may account for the results that we have reported here. However, we are not aware of any such analysis of pseudogapping at present, though one might be developed in future work.

6. The ameliorating effect of PP[*for*] remnants in PG

As mentioned above, three of the four conditions where the remnant was a mismatched PP[for][22] showed a small but significant amelioration under pseudogapping as compared to the non-elliptical counterparts. This was an unexpected result that led us to do further corpus research in order to see if it might be accounted for.

Specifically, it occurred to us that the classically assumed contrast between orphans and remnants (briefly mentioned in Section 2, Note 10) might not be as clear-cut as we thought. Recall that remnants in pseudogapping have been contrasted with orphans with VP anaphors (VPA; e.g. *do it*, *do this*, *do that*, *do so*, *do the same*; see Culicover & Jackendoff 2005: 284–295; Mikkelsen et al. 2012; Miller 2014b). As mentioned above, it is clear that VP anaphors allow PP orphans, corresponding to a subcategorized complement of the antecedent, but for which preposition choice is not at all linked to the syntactic form of the correlate, but rather predicted in semantic terms. As Mikkelsen et al. (2012: 180) put it: 'In orphans, the preposition is not determined by the antecedent, but loosely restricted by the thematic relations of the orphan to the VP hosting it.' They claim (with the qualification that further research is needed to make the details more precise) that *for* introduces benefactive orphans, *to* introduces patient orphans and *with* introduces themes, illustrating with naturally occurring examples like the following:

(20) (a) Why should we not give *Ukraine* the prospect of membership when we would do the same *for Turkey*. (Mikkelsen et al. 2012: 180 ex. (19))
(b) Which of us on finding *our car aerial* snapped off by a vandal have not momentarily wanted to do the same *to his neck*? (Mikkelsen et al. 2012: 180 ex. (21))

[22] WITH-FOR in Experiment 1 and NONE-FOR and TO-FOR in Experiment 2; the fourth, TO-FOR in Experiment 1, showed an amelioration effect that did not reach significance.

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Note that, contrary to remnants in pseudogapping, orphans with VPA do not have a syntactic form that allows them to occur in the corresponding sentences where the VPA is replaced by its antecedent. Compare (20) to their non-anaphoric counterparts:

(21) (a) *We would give the prospect of membership for Turkey.
(b) *Which of us have not momentarily wanted to snap off to his neck?

In this context, we decided to check to see whether there was any evidence to support the idea that pseudogapping might actually allow similar PP orphans, with similar semantic relations, corresponding to direct objects, and similarly unable to occur grammatically in the non-elliptical counterparts. As it turns out, there is clear evidence from the COCA that such examples do occur, as illustrated in (22):[23]

(22) (a) They will punish *you* more severely for making them look bad than they will *for a cop who's taking guns and drugs and selling them and beating innocent people*. (COCA)
(Compare: *[…] than they will punish for a cop who's […])
(b) And that will help *African-American women* achieve parity, equity and justice in this country, as it will *for everyone*. (COCA)
(Compare: *[…] as it will help for everyone to achieve parity, equity and justice in this country.)
(c) 'All you have to do is look at the highlights of the Oklahoma game to see that they are a heck of a football team', Georgia coach Mark Richt said. 'They took *Oklahoma* to the limit just as they did *to us* a couple years ago and just as they did *to Tennessee* last year.' (COCA)
(Compare: *[…] as they took to us to the limit […])
(d) The item was light on details, though it did confirm that the husband-wife team will also co-write and co-produce *the film*, just as they did *with The Boss*. (COCA)
(Compare: *[…] just as they co-wrote and co-produced with the boss.)
(e) I used the word 'overwhelmingly' to describe *Amherst and Northampton*, but I didn't *for Worcester*. (COCA)
(Compare: *[…] to describe for Worcester.)
(f) A lot of people keep their cats inside now. They live a lot longer and stay a lot healthier. People keep *dogs* in their houses, too. I knew that. We didn't *with* ours, but I know a lot of regular folks have made them house pets. I guess it's the cat's turn now. (COCA)
(Compare: *We didn't keep with ours in our house.)

[23] Faced with examples like (22c) and (22d), with *do* before the orphan, one might be tempted to suggest that these are in fact cases of main verb *do*, so that these would be orphans with VPA rather than with PG. Such an analysis cannot be proposed for (22a) and (22b), where *will* can only be an auxiliary, nor for (22e) and (22f), where negation of *do* with *n't* confirms auxiliary status.

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Notice that the non-elliptical counterparts, given in comparison, appear to be simply ill-formed.

In conclusion, it appears that pseudogapping does in fact allow mismatched PP ORPHANS introduced by the same prepositions as those introducing orphans after VP anaphora, namely *for*, *to*, and *with*, with the same type of semantic links. It similarly turns out that the corresponding non-elliptical utterances are typically ill-formed (as is the case in the attested examples provided in (22)), as opposed to the classical and far more frequent case of mismatched PP *remnants*, where the non-elliptical counterpart is grammatical.

It is thus possible that the ameliorative effect of ellipsis (as opposed to the non-elliptical counterparts) in cases with a mismatched PP[*for*] in the elliptical clause is due to the possibility of interpreting such cases as orphans in pseudogapping, rather than as remnants, contrasting with the impossibility of a parallel interpretation in the non-elliptical cases.

Beyond providing a plausible explanation for this ameliorative effect, the data provided in (22) constitute a serious challenge to both remnant raising and hybrid type-logical categorial grammar, specifically because both approaches require that the non-elliptical counterparts be grammatical. Though such cases are not mentioned in Miller (1990), his analysis naturally lends itself to an extension accounting for these cases. The pre-elliptical auxiliary is taken to be a verbal proform whose denotation is a variable of type $v_{\langle NP,\ VP\rangle}$, $v_{\langle NP,\ \langle NP,\ VP\rangle\rangle}$, etc.[24]

These variables can be instantiated to any sufficiently salient predicate of the appropriate type present in the discourse. This will immediately extend to the cases discussed in (22): in the case of (22d), for instance, the variable will be of type $v_{\langle NP,\ VP\rangle}$, instantiated by the discourse given predicate: '*x* co-write and co-produce *y*'.

7. CONCLUSION

Overall, the findings presented here appear to lend support to the intuitions on acceptability put forth in Miller (1990) and to his idea that the acceptability of mismatched PP remnants in pseudogapping is determined by the degree of similarity between the semantic relations established by the remnant and by the correlate with respect to the governing verb. Miller (1990) did not discuss the acceptability of the non-elliptical counterparts and we can assume that he did not have the intuition that similar mismatches would have similar effects on their acceptability. Thus, the finding that mismatched PPs similarly affect pseudogapping and its non-elliptical counterparts is an original and surprising finding of this paper.

We noted at the outset that our experimental materials would be restricted to cases of comparative pseudogapping. It has been well known since N. Levin (1986) that non-comparative PG is more restricted than comparative PG (in particular, the

[24] Where TYP(NP) = ⟨ s, ⟨ ⟨ e,t ⟩,t ⟩ ⟩, TYP(S) = ⟨ s,t ⟩, and TYP(VP) = ⟨ NP,S ⟩, see Miller (1990: 298).

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latter allows a wider range of categories as remnants). Because of this, it has been suggested (in particular by Thoms 2016) that non-comparative and comparative pseudogapping require separate analyses. If this is true, then our experiments might not directly shed light on the more restrictive non-comparative case. Note, however, that among the attested examples of remnants with mismatched prepositions given in (4), the fourth, (4d), is a case of non-comparative PG. Intuitively, it does not seem to be degraded with respect to the other cases in (4). This suggests that our experimental results on comparative PG might carry over to the non-comparative case, though obviously further experiments would be necessary to corroborate this idea.

As far as we are aware, this paper is the first to report standard acceptability experiments on PG.[25] It thus sheds some light on the question of the acceptability of pseudogapping in general. The lack of any significant difference in judgments between the matched pseudogapping stimuli and their non-elliptical counterparts shows that it is simply not true that pseudogapping is marginal in general, as is often claimed (e.g. by Lasnik 1999: 150, who says that '[t]he construction has a certain marginal character'). Miller (2014a) showed that comparative pseudogapping is a very frequent construction, and our results further confirm that it is highly acceptable as well. By contrast, Hoeksema's findings on *non*-comparative PG suggest that it *is* degraded in acceptability relative to comparative PG.

More generally, the findings reported here have implications for theories of ellipsis in general. These fall into two broad categories: identity-based theories, which require some form of identity between the ellipted material and its antecedent (see, among many others, Merchant 2001, 2013; Chung 2013; Rudin 2019), and referential theories of ellipsis, which consider that ellipses simply involves an unpronounced proform whose referent is recovered through general means of anaphora resolution (see, among others, Dalrymple, Shieber & Pereira 1991; Hardt 1993; Kehler 2002; Miller & Pullum 2014; Poppels & Kehler 2019; Poppels 2020). Although our findings certainly do not allow us to settle the complex issues involved in the ongoing debate between these two positions, it is clear that the absence of any ellipsis-specific mismatch penalty is hard to understand in the context of identity-based theories. However, our findings are consistent with referential theories that allow elliptical fragments to be directly generated rather than derived from their non-elliptical counterparts since identity of prepositions is not required under such theories.

A. Experimental materials used in Experiment 1

(1) (a) Eddy spoke with Susan more often than he did/spoke with Emily.
(b) Eddy spoke to Susan more often than he did/spoke to Emily.

[25] Hoeksema (2006) reports an 'informant survey' that he conducted, which provides useful preliminary data on the acceptability of different pseudogapping configurations.

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(c) Eddy spoke to Susan more often than he did/spoke with Emily.
(d) Eddy spoke with Susan more often than he did/spoke to Emily.
(e) Eddy spoke with Susan more often than he did/spoke for Emily.
(f) Eddy spoke to Susan more often than he did/spoke for Emily.

(2) (a) Freddy talked with Veronica less often than he did/talked with Fanny.
(b) Freddy talked to Veronica less often than he did/talked to Fanny.
(c) Freddy talked to Veronica less often than he did/talked with Fanny.
(d) Freddy talked with Veronica less often than he did/talked to Fanny.
(e) Freddy talked with Veronica less often than he did/talked for Fanny.
(f) Freddy talked to Veronica less often than he did/talked for Fanny.

(3) (a) Andrea confided with Kevin more often than she did/confided with Pete.
(b) Andrea confided to Kevin more often than she did/confided to Pete.
(c) Andrea confided to Kevin more often than she did/confided with Pete.
(d) Andrea confided with Kevin more often than she did/confided to Pete.
(e) Andrea confided with Kevin more often than she did/confided for Pete.
(f) Andrea confided to Kevin more often than she did/confided for Pete.

(4) (a) Sally communicated with Carl less often than she did/communicated with Terry.
(b) Sally communicated to Carl less often than she did/communicated to Terry.
(c) Sally communicated to Carl less often than she did/communicated with Terry.
(d) Sally communicated with Carl less often than she did/communicated to Terry.
(e) Sally communicated with Carl less often than she did/communicated for Terry.
(f) Sally communicated to Carl less often than she did/communicated for Terry.

(5) (a) The parents spoke with the girls like they did/spoke with the boys.
(b) The parents spoke to the girls like they did/spoke to the boys.
(c) The parents spoke to the girls like they did/spoke with the boys.
(d) The parents spoke with the girls like they did/spoke to the boys.
(e) The parents spoke with the girls like they did/spoke for the boys.
(f) The parents spoke to the girls like they did/spoke for the boys.

(6) (a) The general talked with the soldiers like he did/talked with the officers.
(b) The general talked to the soldiers like he did/talked to the officers.
(c) The general talked to the soldiers like he did/talked with the officers.
(d) The general talked with the soldiers like he did/talked to the officers.
(e) The general talked with the soldiers like he did/talked for the officers.
(f) The general talked to the soldiers like he did/talked for the officers.

(7) (a) The student confided with her teacher just as she did/confided with her parents.

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(b) The student confided to her teacher just as she did/confided to her parents.
(c) The student confided to her teacher just as she did/confided with her parents.
(d) The student confided with her teacher just as she did/confided to her parents.
(e) The student confided with her teacher just as she did/confided for her parents.
(f) The student confided to her teacher just as she did/confided for her parents.

(8) (a) The admiral communicated with the battleship like he did/communicated with the aircraft carrier.
(b) The admiral communicated to the battleship like he did/communicated to the aircraft carrier.
(c) The admiral communicated to the battleship like he did/communicated with the aircraft carrier.
(d) The admiral communicated with the battleship like he did/communicated to the aircraft carrier.
(e) The admiral communicated with the battleship like he did/communicated for the aircraft carrier.
(f) The admiral communicated to the battleship like he did/communicated for the aircraft carrier.

(9) (a) This piece joins with that one more easily than it does/joins with that other one.
(b) This piece joins to that one more easily than it does/joins to that other one.
(c) This piece joins to that one more easily than it does/joins with that other one.
(d) This piece joins with that one more easily than it does/joins to that other one.
(e) This piece joins with that one more easily than it does/joins for that other one.
(f) This piece joins to that one more easily than it does/joins for that other one.

(10) (a) This symptom associates with this disease more clearly than it does/associates with that one.
(b) This symptom associates to this disease more clearly than it does/associates to that one.
(c) This symptom associates to this disease more clearly than it does/associates with that one.
(d) This symptom associates with this disease more clearly than it does/associates to that one.
(e) This symptom associates with this disease more clearly than it does/associates for that one.

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(f) This symptom associates to this disease more clearly than it does/associates for that one.

(11) (a) The flour blends with this batter more easily than it does/blends with that one.
(b) The flour blends to this batter more easily than it does/blends to that one.
(c) The flour blends to this batter more easily than it does/blends with that one.
(d) The flour blends with this batter more easily than it does/blends to that one.
(e) The flour blends with this batter more easily than it does/blends for that one.
(f) The flour blends to this batter more easily than it does/blends for that one.

(12) (a) This approach conforms with the liberal perspective more than it does/conforms with the conservative.
(b) This approach conforms to the liberal perspective more than it does/conforms to the conservative.
(c) This approach conforms to the liberal perspective more than it does/conforms with the conservative.
(d) This approach conforms with the liberal perspective more than it does/conforms to the conservative.
(e) This approach conforms with the liberal perspective more than it does/conforms for the conservative.
(f) This approach conforms to the liberal perspective more than it does/conforms for the conservative.

(13) (a) Her point of view compares with mine as clearly as it does/compares with yours.
(b) Her point of view compares to mine as clearly as it does/compares to yours.
(c) Her point of view compares to mine as clearly as it does/compares with yours.
(d) Her point of view compares with mine as clearly as it does/compares to yours.
(e) Her point of view compares with mine as clearly as it does/compares for yours.
(f) Her point of view compares to mine as clearly as it does/compares for yours.

(14) (a) This new story links with my account more clearly than it does/links with yours.
(b) This new story links to my account more clearly than it does/links to yours.

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(c) This new story links to my account more clearly than it does/links with yours.
(d) This new story links with my account more clearly than it does/links to yours.
(e) This new story links with my account more clearly than it does/links for yours.
(f) This new story links to my account more clearly than it does/links for yours.

(15) (a) This version corresponds with yours more than it does/corresponds with mine.
(b) This version corresponds to yours more than it does/corresponds to mine.
(c) This version corresponds to yours more than it does/corresponds with mine.
(d) This version corresponds with yours more than it does/corresponds to mine.
(e) This version corresponds with yours more than it does/corresponds for mine.
(f) This version corresponds to yours more than it does/corresponds for mine.

(16) (a) That pipe connects with this one more easily than it does/connects with to other one.
(b) That pipe connects to this one more easily than it does/connects to that other one.
(c) That pipe connects to this one more easily than it does/connects with that other one.
(d) That pipe connects with this one more easily than it does/connects to that other one.
(e) That pipe connects with this one more easily than it does/connects for that other one.
(f) That pipe connects to this one more easily than it does/connects for that other one.

(17) (a) This article ties in with her research more than it does/ties in with mine.
(b) This article ties in to her research more than it does/ties in to mine.
(c) This article ties in to her research more than it does/ties in with mine.
(d) This article ties in with her research more than it does/ties in to mine.
(e) This article ties in with her research more than it does/ties in for mine.
(f) This article ties in to her research more than it does/ties in for mine.

(18) (a) The first variable correlates with the second variable as strongly as it does/correlates with the third.
(b) The first variable correlates to the second variable as strongly as it does/correlates to the third.

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(c) The first variable correlates to the second variable as strongly as it does/correlates with the third.
(d) The first variable correlates with the second variable as strongly as it does/correlates to the third.
(e) The first variable correlates with the second variable as strongly as it does/correlates for the third.
(f) The first variable correlates to the second variable as strongly as it does/correlates for the third.

(19) (a) This rule complies with the spirit of the guidelines more than it does/complies with the specific wording.
(b) This rule complies to the spirit of the guidelines more than it does/complies to the specific wording.
(c) This rule complies to the spirit of the guidelines more than it does/complies with the specific wording.
(d) This rule complies with the spirit of the guidelines more than it does/complies to the specific wording.
(e) This rule complies with the spirit of the guidelines more than it does/complies for the specific wording.
(f) This rule complies to the spirit of the guidelines more than it does/complies for the specific wording.

(20) (a) His proposals combine with mine more than they do/combine with yours.
(b) His proposals combine to mine more than they do/combine to yours.
(c) His proposals combine to mine more than they do/combine with yours.
(d) His proposals combine with mine more than they do/combine to yours.
(e) His proposals combine with mine more than they do/combine for yours.
(f) His proposals combine to mine more than they do/combine for yours.

B. Experimental materials used in Experiment 2

(1) (a) They will give books to Dana just as they will (give books) to Tim.
(b) They will give Dana books just as they will (give books) to Tim.
(c) They will give books to Dana just as they will (give books) for Tim.
(d) They will give Dana books just as they will (give books) for Tim.

(2) (a) They will promise a promotion to Patrick just as they will (promise a promotion) to Andy.
(b) They will promise Patrick a promotion just as they will (promise a promotion) to Andy.
(c) They will promise a promotion to Patrick just as they will (promise a promotion) for Andy.

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(d) They will promise Patrick a promotion just as they will (promise a promotion) for Andy.

(3) (a) They will offer gifts to Mary just as they will (offer gifts) to Tom.
(b) They will offer Mary gifts just as they will (offer gifts) to Tom.
(c) They will offer gifts to Mary just as they will (offer gifts) for Tom.
(d) They will offer Mary gifts just as they will (offer gifts) for Tom.

(4) (a) They will send letters to Kevin just as they will (send letters) to Chris.
(b) They will send Kevin letters just as they will (send letters) to Chris.
(c) They will send letters to Kevin just as they will (send letters) for Chris.
(d) They will send Kevin letters just as they will (send letters) for Chris.

(5) (a) They will lend a bike to Sally just as they will (lend a bike) to Rob.
(b) They will lend Sally a bike just as they will (lend a bike) to Rob.
(c) They will lend a bike to Sally just as they will (lend a bike) for Rob.
(d) They will lend Sally a bike just as they will (lend a bike) for Rob.

(6) (a) They will loan money to John just as they will (loan money) to Sandy.
(b) They will loan John money just as they will (loan money) to Sandy.
(c) They will loan money to John just as they will (loan money) for Sandy.
(d) They will loan John money just as they will (loan money) for Sandy.

(7) (a) They will write a letter to Sarah just as they will (write a letter) to Sam.
(b) They will write Sarah a letter just as they will (write a letter) to Sam.
(c) They will write a letter to Sarah just as they will (write a letter) for Sam.
(d) They will write Sarah a letter just as they will (write a letter) for Sam.

(8) (a) They will serve fish to Sammy just as they will (serve fish) to Vinnie.
(b) They will serve Sammy fish just as they will (serve fish) to Vinnie.
(c) They will serve fish to Sammy just as they will (serve fish) for Vinnie.
(d) They will serve Sammy fish just as they will (serve fish) for Vinnie.

(9) (a) They will teach the basics to Lara just as they will (teach the basics) to Dora.
(b) They will teach Lara the basics just as they will (teach the basics) to Dora.
(c) They will teach the basics to Lara just as they will (teach the basics) for Dora.
(d) They will teach Lara the basics just as they will (teach the basics) for Dora.

(10) (a) They will award medals to Jim just as they will (award medals) to Ellen.
(b) They will award Jim medals just as they will (award medals) to Ellen.
(c) They will award medals to Jim just as they will (award medals) for Ellen.
(d) They will award Jim medals just as they will (award medals) for Ellen.

(11) (a) They will give cake to Clara just as they will (give cake) to Evelyn.
(b) They will give Clara cake just as they will (give cake) to Evelyn.
(c) They will give cake to Clara just as they will (give cake) for Evelyn.
(d) They will give Clara cake just as they will (give cake) for Evelyn.

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(12) (a) They will promise a new job to Lucy just as they will (promise a new job) to Kathy.
(b) They will promise Lucy a new job just as they will (promise a new job) to Kathy.
(c) They will promise a new job to Lucy just as they will (promise a new job) for Kathy.
(d) They will promise Lucy a new job just as they will (promise a new job) for Kathy.

(13) (a) They will offer a longer vacation to Steve just as they will (offer a longer vacation) to Lily.
(b) They will offer Steve a longer vacation just as they will (offer a longer vacation) to Lily.
(c) They will offer a longer vacation to Steve just as they will (offer a longer vacation) for Lily.
(d) They will offer Steve a longer vacation just as they will (offer a longer vacation).

(14) (a) They will send packages to Grace just as they will (send packages) to Harry.
(b) They will send Grace packages just as they will (send packages) to Harry.
(c) They will send packages to Grace just as they will (send packages) for Harry.
(d) They will send Grace packages just as they will (send packages) for Harry.

(15) (a) They will lend skates to Will just as they will (lend skates) to Julie.
(b) They will lend Will skates just as they will (lend skates) to Julie.
(c) They will lend skates to Will just as they will (lend skates) for Julie.
(d) They will lend Will skates just as they will (lend skates) for Julie.

(16) (a) They will loan equipment to Stacey just as they will (loan equipment) to Mitzi.
(b) They will loan Stacey equipment just as they will (loan equipment) to Mitzi.
(c) They will loan equipment to Stacey just as they will (loan equipment) for Mitzi.
(d) They will loan Stacey equipment just as they will (loan equipment) for Mitzi.

(17) (a) They will write a check to Arthur just as they will (write a check) to Kurt.
(b) They will write Arthur a check just as they will (write a check) to Kurt.
(c) They will write a check to Arthur just as they will (write a check) for Kurt.
(d) They will write Arthur a check just as they will (write a check) for Kurt.

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(18) (a) They will serve pasta to Marianne just as they will (serve pasta) to Zoe.
(b) They will serve Marianne pasta just as they will (serve pasta) to Zoe.
(c) They will serve pasta to Marianne just as they will (serve pasta) for Zoe.
(d) They will serve Marianne pasta just as they will (serve pasta) for Zoe.

(19) (a) They will teach some Spanish to Niles just as they will (teach some Spanish) to Harper.
(b) They will teach Niles some Spanish just as they will (teach some Spanish) to Harper.
(c) They will teach some Spanish to Niles just as they will (teach some Spanish) for Harper.
(d) They will teach Niles some Spanish just as they will (teach some Spanish) for Harper.

(20) (a) They will award points to Hannah just as they will (award points) to Max.
(b) They will award Hannah points just as they will (award points) to Max.
(c) They will award points to Hannah just as they will (award points) for Max.
(d) They will award Hannah points just as they will (award points) for Max.

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