Universität Konstanz

Towards solving Hartman's puzzle

M. Luise Schwarzer
luise.schwarzer@uni-konstanz.de

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tl;dr

- Hartman's puzzle: object movement in matrix clauses + VPE is unexpectedly bad even with contrast, whereas adverbial movement is rescued by contrast
- Experimental evidence: Rebinding (for objects and adverbials alike) can be ameliorated by making the antecedent information-structurally parallel ⇒ support for Griffiths (2019), contra Messick & Thoms (2016)
- Analyzing MaxElide effects as contrast failures can potentially solve Hartman's puzzle

1 Extraction out of VP-ellipsis

- Extraction out of VPE sites is restricted. It induces so called **MaxElide** effects. In **rebinding** configurations, when the trace is contained in the ellipsis site and the binder of the trace is outside, as (1), extraction is impossible.
- (1-a) contrasts with movement of something that does not originate in the ellipsis site, (1-b).

(1) a. *Mary kissed someone, but I don't know who$_i$ she did [$_{VP}$ ~~kissed t_i~~].

b. Someone kissed Mary, but I don't know who$_i$ did [$_{vP}$ t_i [$_{VP}$ ~~kiss Mary~~]]

- In embedded clauses, the problem seems to be that the antecedent (A) and the elliptical domain (E) are **too similar** (Griffiths 2019; Stockwell 2020).[1]
- (1-a) is bad for the same reason that (2-b) is bad: ellipsis can't be licensed if A and E are not contrastive enough (see appendix A for details).

[1] Early work explained the restrictions on extraction out of VPE in terms of *MaxElide*: there is competition between VP-ellipsis and sluicing such that the more economical (in terms of syntactic size, semantic size, derivational steps) sluicing can block VPE (Merchant 2008; Takahashi & Fox 2005; Hartman 2011; Messick & Thoms 2016; Jacobson 2019). It has since been shown conclusively (Griffiths 2019; Stockwell 2020) that the restrictions persist even if nothing blocks VPE.

(2) a. If John$_j$ wins, then he$_j$ wins.
b. *If John$_j$ wins, then he$_j$ does [$_{VP}$ ~~win~~]. (Stockwell 2022, 78)

- A **contrastively focused phrase intervening** between the launching and the landing site makes extraction possible in embedded contexts (Schuyler 2001; Takahashi & Fox 2005; Hartman 2011; Griffiths 2019), (3).

(3) I know who MARY kissed but I don't know who$_i$ LUKE did [$_{VP}$ ~~kiss t_i~~].

- **Hartman's puzzle**: in matrix questions, contrast unexpectedly doesn't help object extraction, (4)

(4) a. *Mary kissed someone. Who did she?
b. *MARY will kiss Bill. Who will JOHN? (Hartman 2011, 385)

- But it still ameliorates movement of adverbs, as expected:

(5) a. *The guests left already. Really? When did they?
b. MARY woke up at 7:00. When did JOHN? (Hartman 2011, 378,385)

(6) The pattern for objects and adverbs

	adverbs	objects
embedded, with Foc	✓	✓
embedded, no Foc	✓	*
matrix, with Foc	✓	*
matrix, no Foc	*	*

Hartman's puzzle

Why is there this difference between adverbs and objects in matrix clauses? Why is there this difference between embedded and matrix contexts for adverb and object extraction?

Roadmap:
~~1. Extraction out of VPE~~
2. Two observations
   2.1 Only high adverbials are different
   2.2 The role of parallel movement in matrix questions
3. AJT experiment: ELEMENT x PARALLELISM
4. Towards solving the puzzle
5. Conclusion

2 Two observations

2.1 Only high adverbials behave different than objects

- It's not clear whether adverbs attach to VP (and can lead to a rebinding structure) or to TP, (7).[2]

(7) ... [$_{TP}$ [$_{TP}$ the guests did [$_{VP}$ [$_{VP}$ leave] (when)] (when)]

- Adverbs that **originate unambiguously inside the ellipsis site** actually pattern with objects (Hartman 2011): contrast alone doesn't improve their acceptability, (8). (Ungrammaticality is expected from Griffiths 2019; Stockwell 2020).
- This contrast between low and high attachment sites can be shown experimentally (influence of intervening contrast present with high but not with low adverbials, i.e., **Hartman's puzzle does exist**), see Appendix B and C.

(8) JOHN will ask Mary to leave at 5. When will TOM?
✓matrix: when will [$_{TP}$ *t* [$_{TP}$ Tom ~~[$_{VP}$ ask Mary to leave]~~]]
✗embedded: when will Tom ~~[$_{VP}$ ask [$_{TP}$ *t* [$_{TP}$ Mary to leave]]]~~

(9) John will invite someone. *Who will TOM?

⇒ In rebinding, there is no argument-adjunct asymmetry.

2.2 The role of parallel movement in matrix questions

- It's clear that rebinding is only licensed if there is a completely parallel antecedent, (10).

(10) a. I know who JOHN kissed and who [$_{PD}$ BILL did ~~[$_{VP}$ kiss *t*]~~].
b. Who will JOHN kiss *t* and who [$_{PD}$ will BILL ~~[$_{VP}$ kiss *t*]~~]?
c. JOHN will kiss Mary. *Who [$_{PD}$ will BILL t_V ~~[$_{VP}$ kiss t_{wh}]~~].

- Hartman (2011); Messick & Thoms (2016); Griffiths (2019); Stockwell (2020) can all derive (10), but with different means.
  - Hartman (2011); Messick & Thoms (2016) argue that parallel movement makes the difference: (10-c) is bad because there is T-to-C movement in E but not A.
  - Griffiths (2019) argues that (10-c) is bad because there is a contrastive-topic structure in A but not E. E is not a focus-alternative to A and ellipsis can't be licensed (see (21) in app. A for details).

⇒ Is parallelism in the antecedent is enforced by a syntactic/LF parallelism constraint (Messick & Thoms 2016) or indirectly by focus membership calculation (Griffiths 2019)?

- Recently, the syntactic-parallelism view has been supported by this observation in Stockwell (2020): matrix adverb movement (11), but not object movement can be ameliorated by parallel head movement alone, (11)

(11) a. John ate cheese. Really? *When did he?
b. Boy, does John eat cheese! Really? When does he?
(Stockwell 2020, 183)

- The behavior of adverbials is still unexplained. Plus: No data on the influence of head movement on low adverbials.

Question
Given the observations about head movement in adverbial questions, should the syntactic-parallelism account be reconsidered?
When we control for attachment height, what matters for licensing ellipsis in rebinding, information-structural parallelism or syntactic parallelism?

3 AJT experiment: ELEMENT x PARALLELISM

Hypothesis: Syntactic parallelism is needed in addition to contrast to license matrix rebinding configurations.

Method, material, participants.[3]

[2] Hartman (2011), Messick & Thoms (2016) assume they uniformly attach to TP. Hartman uses as evidence that they can survive VP-ellipsis: *John called today, so he doesn't have to ~~[$_{VP}$ call]~~ tomorrow* (Hartman 2011, 372, fn. 8). But note that they can also be included in the VP-ellipsis site, (i).

(i) John didn't call today but Susan did ~~[$_{VP}$ call today]~~.

[3] Material, plots, scripts available at `https://osf.io/v9bn6/`.

- Acceptability judgment task, 1–7 Likert scale, ends of scale labeled *"very unnatural"*, *"very natural"*
- **2x2**: Interaction of moved ELEMENT (OBJ, ADV) and presence of syntactic PARALLELISM (head movement)
- within-subject Latin square: each participant judged 2 out of 4 lexicalizations, 4 controls (bare movement of OBJ/ADV), 10 fillers from the standard set (Gerbrich et al. 2019), 3 trial items = 19 sentences (median duration: 4:31min)
- 52 participants recruited on Prolific (paid £11,30/hr), questionnaire hosted on SoSciSurvey (Leiner 2025)
- 6 participants excluded for being outside 2x sd at least twice for fillers; 11 excluded for accepting bare object movement, i.e., not showing MaxElide effects (determined by z-score > -0.25) → **35 entered analysis** (all native English speakers, almost all from Great Britain (England, Scotland, Wales))
- Long-distance wh-movement to ensure rebinding. Adverbial condition is ambiguous, but the low reading is the more natural one.
- Antecedent = question, with or without head movement[4]
- All test items contained a contrast in polarity to avoid a contrastive topic configuration.

(12) *Sample item set*

a. Who did Carl want Lindsay to invite, and also: who didn't he? *obj, parallel*

b. I wonder who Carl wanted Lindsay to invite. And also: who didn't he? *obj, non_parallel*

c. When did Carl want Lindsay to invite her parents, and also: when didn't he? *adv, parallel*

d. I wonder when Carl wanted Lindsay to invite her parents. And also: when didn't he? *adv, non_parallel*

Predictions.

- Under the embedded reading, adverbials and objects should show identical behavior.
- If there is a syntactic parallelism constraint, the PARALLEL condition should be significantly better than the NON_PARALLEL one.
- If syntactic parallelism doesn't matter, all conditions should be equally good.

Results.

(13)

ELEMENT	CONTRAST	*n*	*mean z-score*	*sd*	*median z-score*
adv	non_parallel	35	-0.242	0.532	-0.490
adv	parallel	35	-0.116	0.609	-0.24
obj	non_parallel	35	-0.192	0.672	-0.49
obj	parallel	35	-0.0626	0.622	-0.0704

[4] I assume with, e.g., Sailor (2018) that head movement is syntactic.

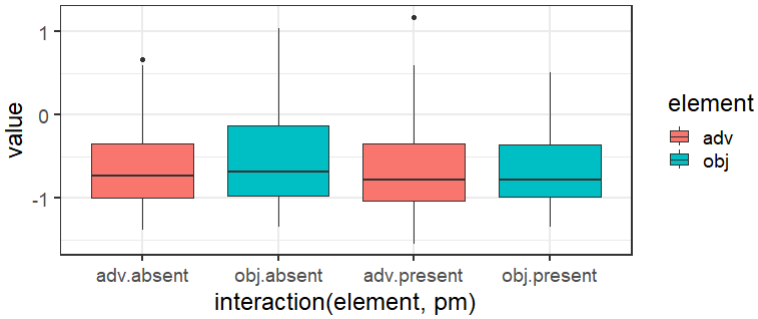

Figure 1: No influence of parallel head movement.

- Equivalence testing: two one-sided t-test procedure (independent groups) with TOSTER (Lakens 2017; Caldwell 2022; R Core Team 2021)
- Comparing the PARALLEL condition to the NON_PARALLEL one ⇒ the TOST equivalence test was significant ($t(138) = 2.151$, $p < 0.05$, alpha = 0.05, ΔL = -0.35, $\Delta U = 0.35$).
- The null hypothesis test was not significant ($t(138) = -1.271$, $p = 0.2$).

⇒ The conditions are statistically equivalent.

⇒ Reject the syntactic-parallelism hypothesis.

4 Towards solving the puzzle

- The rebinding part of the puzzle can be accounted for straightforwardly in Griffiths' (2019) analysis: **rebound elements** (objects, adverbs, subjects) **behave uniformly** in embedded and matrix contexts.
- They become grammatical if there is (i) intervening contrast, making A and E contrastive, and (ii) A has a information-structural form such that its focus alternatives can be compared to E's focus alternatives.
- If A has a contrastive-topic structure, focus-alternatives can't be computed and ellipsis can't be licensed, for objects and low adverbials alike, (14).

(14) *MARY asked Bill to leave AT 7. When did JOHN ~~[$_{VP}$ ask Bill to leave t]~~?

a. $[\![A]\!]^o$ = ∃time x.Mary asked Bill to leave at x

b. $[\![E]\!]^o$ = ∃time y.John asked Bill to leave at y

c. $[\![A]\!]^f$ = {{Mary asked Bill to leave at 7, Mary asked Bill to leave at 5,...}, {John asked Bill to leave at 7, John asked Bill to leave at 5,...}}

d. $[\![E]\!]^f$ = {John asked Bill to leave at x, Mary asked Bill to leave at x,...}

e. ✓$[\![A]\!]^o \in [\![E]\!]^f$

f. 💣$[\![E]\!]^o \notin [\![A]\!]^f$

- The puzzle should then be reframed as: why do **non-rebound (high) adverbials** not pattern with subjects? They should be acceptable without any amelioration, (15).

(15) a. Someone called Bill. Who did t [~~$_{VP}$ call Bill~~].
b. Someone called Bill. *When did they t [~~$_{VP}$ call Bill~~].

- An analysis based on contrast can account for the difference. Here is a not fully worked out direction for a potential solution:
- **Subject questions and contrast**. If we assume that A′ movement doesn't block the generation of focus alternatives (Charlow 2021), we have no independent limit on PDs. We could maintain as an assumption that rebinding has the effect of limiting PDs to the position of the binder, and non-rebinding doesn't limit PDs at all.
  In (15-a), PDs can encompass the entire clause, i.e., including the A′-binder. With a λ-bound variable, A and E contrast: A denotes a proposition, E a set of propositions. Since subjects are always overt, the wh-phrase always finds a **contrastive correlate**.[5]
- **Adverbial questions and contrast.** The correlate in A is implicit in (15-b). Stockwell (2020) argues that implicit arguments cannot contrast. The motivation are voice mismatches in VPE, (16). The implicit agent in A cannot serve as a contrast to overt *Gorbachev*.

(16) *This information was released, but Gorbachev didn't.

  We can adopt this for adverbials: the adverbial itself cannot establish contrast with an implicit antecedent in (15-b); ellipsis can't be licensed.
- In embedded contexts, PDs encompass the whole biclausal second conjunct, (17). Here, we have a different source of contrast: VERUM (Stockwell 2022; Romero & Han 2004; Hardt & Romero 2004).
  The most natural stress in A falls on the verb. This can signal focus on polarity or intensionality. VERUM contributes alternatives to the proposition being true, i.e., the contrast is between *knowing, believing* etc. p and the actual truth value.

(17) The wizard bamboozled the villagers, but I don't know when he did.
  a. A: [VERUM [the wizard bamboozled the villagers (at time x)]]
  b. E: [know [the wizard bamboozled the villagers (at time x)]]

- This predicts that adverbial questions should improve with overt correlates, (18):

(18) The wizard bamboozled the villagers already at some point in the past. Really? When (exactly) did he?

- What about parallel head movement, (11)? ⇒ In an experiment not reported here, I found no significant effect of head movement for high adverbials.

5 Conclusion

- Experimental evidence: low adverbials behave just like objects. Both require an information-structurally parallel antecedent, not a parallel syntax. This supports analyses of VPE in terms of focus membership and contrast.
- Adverbs behave differently along the dimensions of (i) different attachment heights (rebinding vs. non-rebinding) and (ii) optional realization (contrastive yes/no).
- The lens of contrast can help us understand the complex patterns of ARGUMENT/ADJUNCT x MATRIX/EMBEDDED.
- There are still lots of open questions (how exactly do indefinites and wh-phrases contrast and how is that compatible with theories of sluicing, role of topicality, heterogeneous behavior of different adverbials,....)

References

Bates, Douglas, Martin Mächler, Ben Bolker, & Steve Walker. 2015. Fitting linear mixed-effects models using lme4. *Journal of Statistical Software* 67:1–48.

Caldwell, Aaron R. 2022. Exploring equivalence testing with the updated TOSTER R package. *PsyArXiv* URL `https://doi.org/10.31234/osf.io/ty8de`.

Charlow, Simon. 2021. ∃-closure and alternatives. *Linguistic Inquiry* 52:143–152.

Gerbrich, Hannah, Vivian Schreier, & Sam Featherston. 2019. Standard items for English judgement studies: syntax and semantics. In *Experiments in focus: Information structure and processing*, ed. Sam Featherston, Robin Hörnig, Sophie von Wietersheim, & Susanne Winkler, 305–328. Berlin: De Gruyter.

Griffiths, James. 2019. Beyond MaxElide: An investigation of A′-movement from elided phrases. *Linguistic Inquiry* 50:571–607.

Hardt, Daniel, & Maribel Romero. 2004. Ellipsis and the structure of discourse. *Journal of Semantics* 21:375–414.

Hartman, Jeremy. 2011. The semantic uniformity of traces: Evidence from ellipsis parallelism. *Linguistic Inquiry* 42:367–388.

Jacobson, Pauline. 2019. Against grammatical competition: The case of MaxElide. In *New frontiers in artificial intelligence. Lecture notes in Computer Science vol. 11717*, 225–239. Springer.

Kuznetsova, Alexandra, Per B. Brockhoff, & Rune H. B. Christensen. 2017. lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software* 82:1–26.

Lakens, Daniel. 2017. Equivalence tests: A practical primer for t-tests, correlations, and meta-analyses. *Social Psychological and Personality Science* 1:1–8.

Leiner, D. J. 2025. SoSci Survey (version 3.6.11). URL `https://www.soscisurvey.de`.

Merchant, Jason. 2008. An asymmetry in voice mismatches in VP-ellipsis and pseudogapping. *Linguistic Inquiry* 39:169–179.

Messick, Troy, & Gary Thoms. 2016. Ellipsis, economy, and the (non)uniformity of traces. *Linguistic Inquiry* 47:306–332.

[5] This is excluded for object questions because rebinding limits the PD to underneath the λ binder → the object variable is existentially closed, making it identical to its indefinite correlate.

R Core Team. 2021. *R: A language and environment for statistical computing (version 4.3.2)*. R Foundation for Statistical Computing, Vienna, Austria. URL `https://www.R-project.org/`.
Romero, Maribel, & Chung-Hye Han. 2004. On negative yes/no questions. *Linguistics and Philosophy* 27:609–658.
Rooth, Mats. 1992a. Ellipsis redundancy and reduction redundancy. In *Proceedings of the Stuttgarter Ellipsis Workshop. Arbeitspapiere des Sonderforschungsbereichs 340*, ed. S. Berman & A. Hestvik, volume 29.
Rooth, Mats. 1992b. A theory of focus interpretation. *Natural Language Semantics* 1:75–116.
Sailor, Craig. 2018. The typology of head movement and ellipsis: A reply to Lipták & Saab (2014). *Natural Language & Linguistic Theory* 36:851–875.
Schuyler, Tamara. 2001. *Wh*-movement out of the site of VP ellipsis. In *Syntax at Santa Cruz*, ed. Séamas Mac Bhloscaidh, 1–20. Santa Cruz: University of California.
Sprouse, Jon, & Diogo Almeida. 2017. Design sensitivity and statistical power in acceptability judgment experiments. *Glossa: a journal of general linguistics* 2:1–32.
Stockwell, Richard. 2020. Contrast and verb phrase ellipsis: Triviality, symmetry, and competition. Doctoral dissertation, University of California, Los Angeles.
Stockwell, Richard. 2022. Contrast and verb phrase ellipsis: The case of tautologous conditionals. *Natural Language Semantics* 30:77–100.
Takahashi, Shoichi, & Danny Fox. 2005. MaxElide and the re-binding problem. In *Proceedings of SALT 15*, ed. Efthymia Georgala & Jonathan Howell, 223–240.

A Contrast in VPE

- Ellipsis is licensed based on **focus alternatives** and **contrast** as in (19) (Griffiths 2019; Stockwell 2020 based on Rooth 1992a,b).

(19) For a phrase X to be elided, X must be contained in a parallelism domain in a constituent E that has an antecedent A such that
  a. $[\![A]\!]^o \neq [\![E]\!]^o$, *contrast*
  b. $[\![A]\!]^o \in [\![E]\!]^f$, and
  c. $[\![E]\!]^o \in [\![A]\!]^f$ *focus membership*
  (adapted from Griffiths 2019, 575,590)

- In rebinding, the parallelism domain (PD) extends until just below the λ binder (Griffiths 2019) or just above it (Stockwell 2020).
- Contrast constraint on ellipsis licensing at work:

(20) *They've arrested someone, but I don't know who they did ~~[$_{VP}$ arrest *t*]~~
  a. A: someone λy [$_{PD}$ they arrest y] (∃-clo)
  b. E: who λx [$_{PD}$ they arrest x] (∃-clo)
  c. $[\![A]\!]^o$ = ∃y. they arrest y
  d. $[\![E]\!]^o$ = ∃x. they arrest x
  e. #$[\![A]\!]^o = [\![E]\!]^o$

- Analyzing MaxElide effects as contrast failures also accounts for cases in which intervening focus doesn't seem to help, (21). Griffiths (2019, 594): the antecedent contains a contrastive topic, making its focus alternatives a set of sets of propositions ⇒ $[\![E]\!]^o$ not contained in A's focus alternatives ⇒ ellipsis can't be licensed

(21) *MARY kissed a HIPSTER, but I don't know who JOHN did ~~[$_{VP}$ kiss *t*]~~
  a. $[\![A]\!]^o$ = Mary kissed a hipster
  b. $[\![E]\!]^o$ = John kissed someone
  c. $[\![A]\!]^f$ = {{Mary kissed a hipster, Mary kissed a punk,... }, {John kissed a hipster, John kissed a punk,...}}
  d. $[\![E]\!]^f$ = {John kissed someone, Mary kissed someone, ...}
  e. ✓$[\![A]\!]^o \in [\![E]\!]^f$
  f. #$[\![E]\!]^o \notin [\![A]\!]^f$

⇒ Contrastive focus makes ellipsis possible if A and E were **too similar** without it.

B Experiment 1 ELEMENT x FOCUS

Method, material, participants.

- Acceptability judgment task, 1–7 Likert scale, ends of scale labeled *"very unnatural"*, *"very natural"*
- 2x2: Interaction of moved element (OBJ, ADV) and presence of polarity focus
- within-subject Latin square: 4 lexicalizations, 8 fillers from the standard set (**?**), 3 trial items → each participant judged 15 sentences (median duration: 2:27min)
- 66 participants recruited on Prolific (paid £13,47/hr), questionnaire hosted on SoSciSurvey (Leiner 2025)
- 16 participants excluded for being outside 2x sd at least twice in the control items → 50 entered analysis (all native English speakers, 2 bilinguals, almost all from Great Britain (England, Scotland, Wales))
- polarity contrast to avoid a contrastive topic configuration

(22) *Sample item set*
  a. Jane was eating something, but what was she? *obj, no_con*
  b. Jane was eating something, but what wasn't she? *obj, con*
  c. Jane was eating something, but when was she? *adv, no_con*
  d. Jane was eating something, but when wasn't she? *adv, con*

Results.

(23)

ELEMENT	CONTRAST	*n*	*mean z-score*	*sd*	*median z-score*
adv	absent	50	-0.462	0.600	-0.628
adv	present	50	0.436	0.750	0.690
obj	absent	50	-0.478	0.512	-0.652
obj	present	50	-0.708	0.526	-0.735

- Linear mixed effects model (with lme4, lmerTest in R; R Core Team 2021; Bates et al. 2015; Kuznetsova et al. 2017)
- There was also a main effect of element (β for OBJ=0.59, std. error=0.17, df=12.69, t=-3.45, p<0.01).

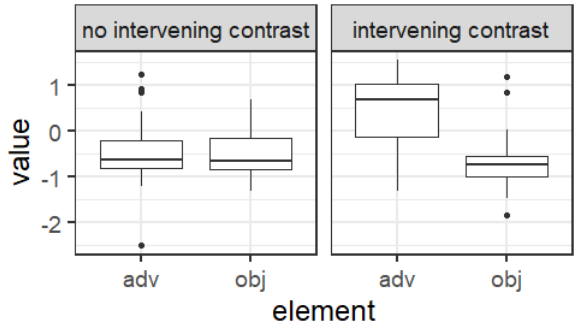

Figure 2: Influence of contrast on adverbial matrix questions.

(24) `value ~ element * contrast + (1|part) + (1|item)`

	Estimate	Std. Error	df	t-value	Pr(>|t|)
element (obj)	-0.01574	0.12089	196	-0.130	0.897
contrast (present)	0.89809	0.12089	196	7.429	3.30e-12 ***
element(obj): contrast(present)	-1.12787	0.17097	196	-6.597	3.82e-10 ***

- Effect size of ADV,NO_CON - ADV,CON is extra large: Cohen's d=1.322 → more than 80% statistical power (Sprouse & Almeida 2017)

Discussion.

- Bare adverb and object extraction is fairly unacceptable.
- Contrast clearly ameliorates adverb extraction but not object extraction, i.e. we find Hartman's puzzle

C Experiment 2 forced low reading

Method, material, participants.

- Acceptability judgment task, 1–7 Likert scale
- 2x2x2: Interaction of moved element (OBJ, ADV), presence of polarity focus, presence of parallel head movement
- within-subject Latin square: 4 lexicalizations
- 15 fillers from the standard set (Gerbrich et al. 2019) + 2 trial items → each participant judged 25 sentences (median duration: 9min)
- 50 participants recruited on Prolific (paid £8/hr), questionnaire hosted on SoSciSurvey (Leiner 2025)
- 7 participants excluded for being outside 2x sd at least twice + 18 excluded for accepting bare object etxraction → 25 entered analysis (almost all from Great Britain)
- All items were presented with a context that should facilitate the embedded reading of the adverbial and polarity contrast.

(25) *Sample item set: Objects*

a. Context: According to Luke, Hannah should send out invitations to someone, but I don't remember who he mentioned.
Luke wanted Hannah to invite someone, but who did he? (no_con,no_pm)

b. Context: According to Luke, Hannah should send out invitations to a couple of people but I don't remember exactly who Luke did and did not mention.
Luke wanted Hannah to invite someone, but who didn't he? (con,no_pm)

c. Context: Hannah has been told to send out invitations to her party either to her high school friends or her grandparents. It may have been Luke who said that and specified who exactly but I don't remember.
Did Luke want Hannah to invite someone and who did he? (no_con,pm)

d. Context: Hannah has been told to send out invitations to her party either to her high school friends or her grandparents. It may have been Luke who said that and specified for who it wouldn't be appropriate but I don't remember.
Did Luke want Hannah to invite someone and who didn't he? (con,pm)

(26) *Sample item set: Adverbial*

a. Context: According to Luke, Hannah should send out invitations to her party either one or two weeks before, but I don't remember which time he specified.
Luke wanted Hannah to invite someone, but when did he? (no_con,no_pm)

b. Context: According to Luke, Hannah should send out invitations to her party either one or two weeks before the party. I don't remember which time he said and which he didn't.
Luke wanted Hannah to invite someone, but when didn't he? (con,no_pm)

c. Context: Hannah has been told to send out invitations to her party either one or two weeks before. It may have been Luke who said that and specified a time but I don't remember exactly.
Did Luke want Hannah to invite someone and when did he? (no_con,pm)

d. Context: Hannah has been told to send out invitations to her party either one or two weeks before. It may have been Luke who said that and specified a time when it wouldn't be appropriate but I don't remember exactly.
Did Luke want Hannah to invite someone and when didn't he? (con,pm)

Results.

element	contrast	pm	n	mean	sd	median
adv	con	no_pm	25	-0.262	0.714	-0.349
adv	con	pm	25	-0.445	0.398	-0.411
adv	no_con	no_pm	25	-0.14	0.811	-0.411
adv	no_con	pm	25	-0.109	0.681	-0.281
obj	con	no_pm	25	-0.557	0.442	-0.681
obj	con	pm	25	-0.439	0.424	-0.539
obj	no_con	no_pm	25	-0.342	0.379	-0.407
obj	no_con	pm	25	-0.299	0.493	-0.383

- Main effect of ELEMENT: object movement is less acceptable than adverbial movement (β = -0.17, t(25.7)= -2.12, p < 0.05)

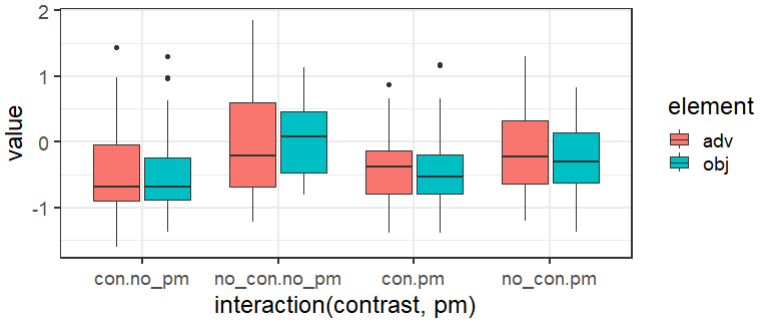

Figure 3: Results of exp. 2

- Main effect of CONTRAST: contrast makes extractions less acceptable overall (β = -0.2, t(25.7)= 2.5, p < 0.05)

Discussion.

- In contrast to what Stockwell (2020) reports for high adverbs, a parallel head movement dependency doesn't improve low adverb (or object) movement.
- Adverbs that unambiguously originate in the ellipsis site behave like object gaps: contrast does not improve their acceptability in matrix questions.

⇒ no argument-adjunct asymmetry in rebinding configurations