

Explaining variation in the acceptability of relative clause island violations

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1 Introduction

- Relative clauses (RCs) are one of the prototypical islands, typically giving rise to severe degradation (1) when extracted from.
- (1) a. *What does Phineas trust the guy [who sold ___]?
b. *The building that Courtney called the woman [who designed ___] is tall.
c. *That candidate, I met an author [who wrote a book about ___].
- Theories of island constraints typically completely ban extraction from RCs.
 - **Some languages tolerate extraction from RCs under select circumstances**, most famously the Mainland Scandinavian languages,¹ but also Hebrew (Rubovitz-Mann 2000a; Sichel 2018) and Romance languages (Cinque 2010).

SELECTIVE EXTRACTION FROM RELATIVE CLAUSES

EXTRACTION ALLOWED

Existence of the head noun of the RC is asserted or denied canonically **EXIST**

—OR—

RC is in the object of a “reporting” verb^a with a first person subject **RPTG-V**

—OR—

RC is modifying a DP predicate (in a nonverbal clause) **DP-PRED**

EXTRACTION BANNED

Elsewhere

^a. A verb that is a “conventional [way] of reporting how some information has become available to the speaker” (Rubovitz-Mann 2000b, p. 147).

1. Danish (Erteschik-Shir and Lappin 1979), Swedish (Engdahl 1997; Lindahl 2017), and Norwegian (Kush et al. 2013; Taraldsen 1982)

1.1 Examples of selective extraction from RCs

- (2) **SWEDISH** (MSc) **RPTG-V** (Allwood 1982, p. 24)
De blommorna *känner jag* en man [som säljer ___].
those flowers know I a man that sells
'Those flowers, I know a man that sells (them).'
- (3) **DANISH** (MSc) **EXIST** (Erteschik-Shir and Lappin 1979, p. 55)
Det *er der* mange [der kan lide ___].
that are there many that can suffer
'That, there are many people who like (it).'
- (4) **NORWEGIAN** (MSc) **RPTG-V** (Taraldsen 1982, p. 206)
Rødsprit *slipper vi* ingen *inn* [som har drukket ___].
red.spirit let we nobody in that has drunk
'Red spirit, we let nobody in that has drunk (it).'
- (5) **ITALIAN** (Rom) **EXIST** (Cinque 2010, p. 83)
Ida, di cui non *c'è* nessuno [che sia mai stato innamorato ___], ...
Ida, of who not there.is nobody that was never in love
'Ida, whom there is nobody that was ever in love with (her), ...'
- (6) **FRENCH** (Rom) **RPTG-V** (Cinque 2010, p. 84)
(?)Jean, à qui *je ne connais* personne [qui soit prêt à confier ses secrets
Jean to who I not know anyone who is willing to entrust their secrets
___], ...

'Jean, to whom I don't know anybody that would be ready to confide their secrets,
...'
- (7) **HEBREW** **RPTG-V** (Sichel 2018, p. 336)
Al lexem šaxor, *ani makira* rak gvina levana axat [še-efšar limroax
on bread black I know only cheese white one that-possible to.spread
___].

'On black bread, I know only one white cheese that can be spread.'
- (8) **HEBREW** **DP-PRED** (Sichel 2018, p. 358)
Et ha-toxnit ha-zot, ata *ha-yaxid* [še-ro'e ___].
ACC the-program the-this you the-single that-watches
'This program, you're the only one who watches.'

1.2 Who invited English to this party?

- Some literature indicates that English also selectively tolerates extraction (Chung and McCloskey 1983; Kuno 1976; McCawley 1981)
- Examples from this literature (9) are notably parallel to those from languages that are more noted for selectively allowing extraction from RCs.

(9) **ENGLISH**

- a. **EXIST** (Kuno 1976, p. 423)
This is the child who *there is* nobody [who is willing to accept ___].
- b. **RPTG-V** (Chung and McCloskey 1983, p. 708)
That's one trick that *I've known* a lot of people [who've been taken in by ___].
- c. **DP-PRED** (McCawley 1981, p. 108)
This is the one that Bob Wall *was the only person* [who hadn't read ___].

2 The questions

① HOW ROBUST ARE THE JUDGMENTS?

- Is the phenomenon robust enough in English to be detected in judgment experiments?

② PERFORMANCE OR COMPETENCE?

- Assuming the phenomenon is robust, is this a performance effect or a competence effect? How could we tell by looking at ratings data?

PERFORMANCE ACCOUNT (§2.1)

Extraction from RCs is always
ungrammatical

Apparent acceptability due to
grammatical illusion

(Almeida 2014; Kush et al. 2013)

COMPETENCE ACCOUNT (§2.2)

Extraction from RCs is selectively
grammatical

The grammar conspires to allow
extraction in select environments

(Lindahl 2017; Sichel 2018)

2.1 Performance account

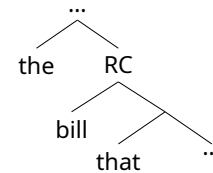
- Extraction from RCs is always ungrammatical, even when the judgments are within the range of acceptable judgments.
- Mismatch between grammaticality and acceptability is potentially due to a **grammatical illusion**.
 - Known cases of bad sentences seeming good exist and include AGREEMENT ATTRACTION (10a) and the COMPARATIVE ILLUSION (10b); see Phillips et al. (2011) for a survey.

- (10) a. The key to the cabinets unsurprisingly were on the table.
b. More people have been to Russia than I have.

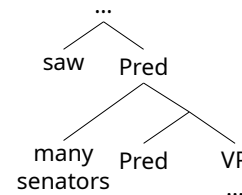
HOW AN UNGRAMMATICAL ISLAND VIOLATION COULD BECOME ACCEPTABLE

That was the bill that he saw many senators who supported ___ in the congress.

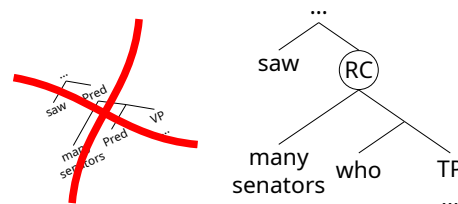
① At the complementizer, a RC structure is posited and the head of a filler-gap dependency is initiated with the head noun *bill* as the filler. A number of gap positions are considered.



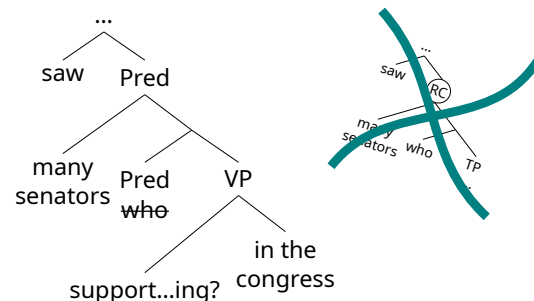
② At the RC verb + object, the parser sees that the gap can't be the object of *saw*. It continues forming structural hypotheses that are compatible with the tail of the filler-gap dependency, positing a small clause complement of *see* that has *many senators* as its subject.



③ At the relative pronoun *who*, the small clause hypothesis is discarded, and an RC is posited. The RC would not be a legitimate place for the gap of *bill*, so the parser suspends dependency formation.



④ When an illicit gap is identified in the RC, parsing fails, and the analysis is discarded. The small clause hypothesis is still in memory, and it is selected despite being incompatible with the bottom-up evidence because it provides a coherent interpretation.



- Takes inspiration from reanalysis in garden path repairs (Staub 2007); similar to Gibson and Thomas (1999).

2.2 Competence account

- Extraction from RCs is **grammatical** when conditions are met (Sichel 2018).
- **NO FREEZING:** DP containing the RC is in situ (no movement, covert or overt).
- **RAISING RC:** The RC that is extracted from is a raising RC (CP complement to D), rather than a matching RC (CP adjoined to NP).²
- **MULTIPLE SPECIFIERS:** Additional “escape hatch” at the left edge of the RC.

3 Experiment 1: Definiteness (Acceptability Judgment)

- The basic design above was enriched to include a **DEFINITENESS** manipulation.
- It has been argued that the DP extracted from must be a nonspecific indefinite.³

Table 1: **EXPERIMENT 1 SAMPLE ITEM (DEFINITENESS MANIPULATION)**

NON-ISLAND SHORT	Who ___ understands [_{CP} that (the) teachers hate unstapled papers]?
NON-ISLAND LONG	What does Lorena understand [_{CP} that (the) teachers hate ___]?
ISLAND SHORT	Who ___ understands (the) teachers [_{RC} who hate unstapled papers]?
ISLAND LONG	What does Lorena understand (the) teachers [_{RC} who hate ___]?

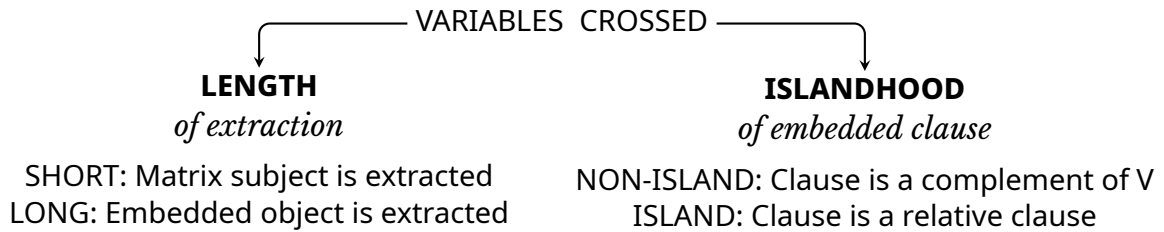
- **BUT** definiteness is neither a necessary nor a sufficient condition to allow extraction:

2. This particular competence account assumes that RCs are structurally ambiguous between a raising analysis and a matching analysis in most cases; see Bhatt 2002; Hulsey and Sauerland 2006.

3. Kluender 1992; Erteschik-Shir 1973; also see Jiménez Fernández 2009 and Davies and Dubinsky 2003 on related ideas around extraction from simple NPs.

SIFTING FOR ISLAND EFFECTS EXPERIMENTALLY

USING THE FACTORIAL DEFINITION OF ISLANDS (Sprouse et al. 2012)



SAMPLE ITEM FOR A BASIC ISLAND EXPERIMENT

- a. NO-ISLD | SHORT Who __ understands [_{CP} that teachers hate unstapled papers]?
- b. NO-ISLD | LONG What does Lorena understand [_{CP} that teachers hate __]?
- c. ISLAND | SHORT Who __ understands teachers [_{RC} who hate unstapled papers]?
- d. ISLAND | LONG What does Lorena understand teachers [_{RC} who hate __]?

CALCULATING ISLAND EFFECTS

EYEBALLING A MEAN RATINGS PLOT

Parallel lines: NO ISLAND EFFECT
Non-parallel lines: ISLAND EFFECT

Length	Non-Island (●)	Island (▲)
SHORT	~0.6	~0.4
LONG	~0.0	~-1.0

DIFFERENCE-IN-DIFFERENCES (DD) SCORE

1st DIFF: NO-ISLD | LONG – ISLAND | LONG
2nd DIFF: NO-ISLD | SHRT – ISLAND | SHRT
DD: 1st DIFF – 2nd DIFF

DD score ≈ island strength

Language	DD Score
ENGLISH	~0.75
NORWEG. WH	~0.25

(Norwegian WH-island DD score from Kush et al. 2018)

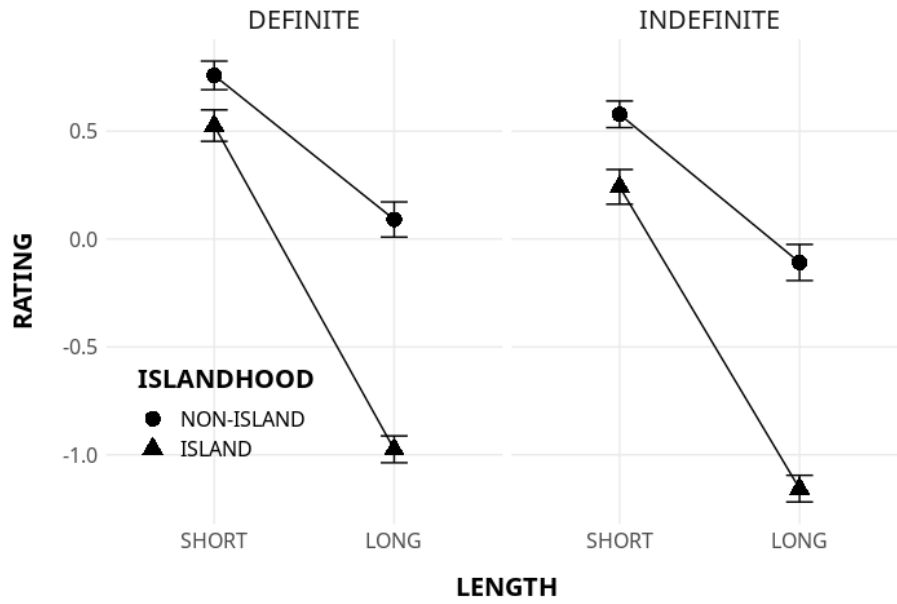


Figure 1: **MEAN Z-SCORED RATINGS (EXPERIMENT 1)**

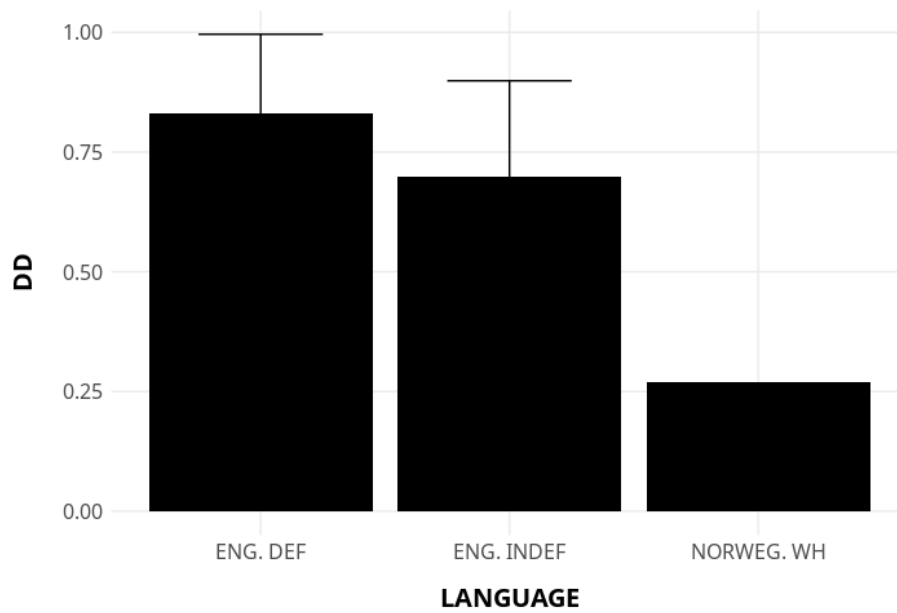


Figure 2: **ISLAND STRENGTH (VIA DD SCORES); NORWEGIAN WH PROVIDED FOR REFERENCE** (Kush et al. 2018)

4 Experiment 2: Environment (Acceptability Judgment)

- The basic design above was expanded to include an **ENVIRONMENT** manipulation.
 - Transitive object environment (**TR-OBJ**)
 - Existential environment (**EXIST**)
 - Predicate nominal environment (**DP-PRED**)

Table 2: **EXPERIMENT 2 SAMPLE ITEM (ENVIRONMENT MANIPULATION)**

TR-OBJ NO-ISLD SHORT	Who ___ thinks that Courtney saw [CP that only one art collector bid on this painting?]
TR-OBJ NO-ISLD LONG	Which painting do you think that Courtney saw [CP that only one art collector bid on ___]?
TR-OBJ ISLAND SHORT	Who ___ thinks that Courtney saw the only art collector [RC who bid on this painting]?
TR-OBJ ISLAND LONG	Which painting do you think that Courtney saw the only art collector [RC who bid on ___]?
DP-PRED NO-ISLD SHORT	Who ___ thinks that Courtney believes [CP that only one art collector bid on this painting]?
DP-PRED NO-ISLD LONG	Which painting do you think that Courtney believes [CP that only one art collector bid on ___]?
DP-PRED ISLAND SHORT	Who ___ thinks that Courtney believes that she is the only art collector [RC who bid on this painting]?
DP-PRED ISLAND LONG	Which painting do you think that Courtney believes that she is the only art collector [RC who bid on ___]?
EXIST NO-ISLD SHORT	Who ___ thinks that there is only one art collector [SC bidding on this painting]?
EXIST NO-ISLD LONG	Which painting do you think that there is only one art collector [SC bidding on ___]?
EXIST ISLAND SHORT	Who ___ thinks that there is only one art collector [RC who bid on this painting]?
EXIST ISLAND LONG	Which painting do you think that there is only one art collector [RC who bid on ___]?

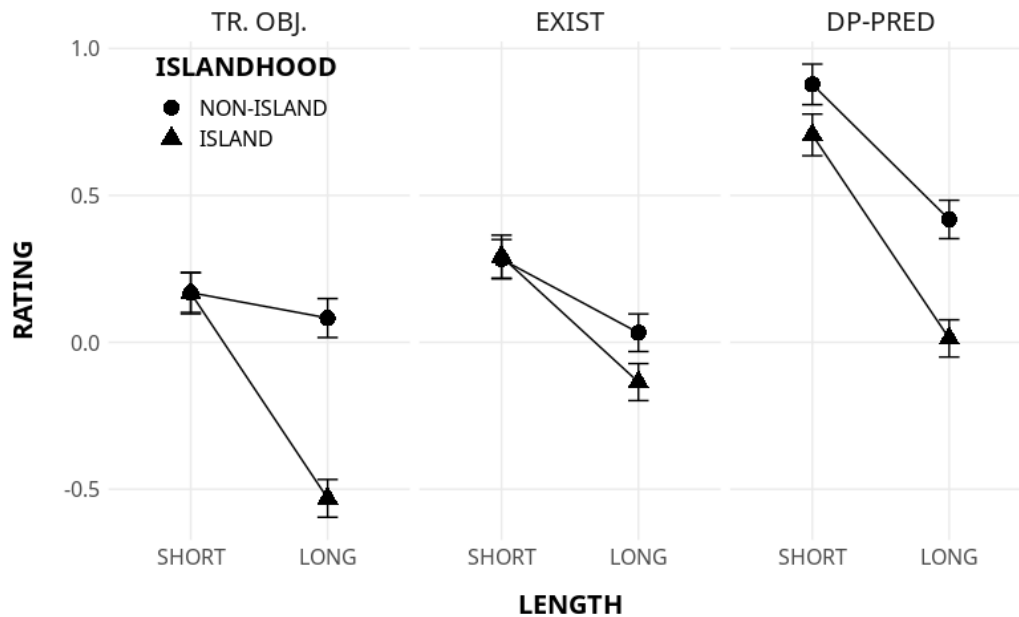


Figure 3: **MEAN Z-SCORED RATINGS (EXPERIMENT 2)**

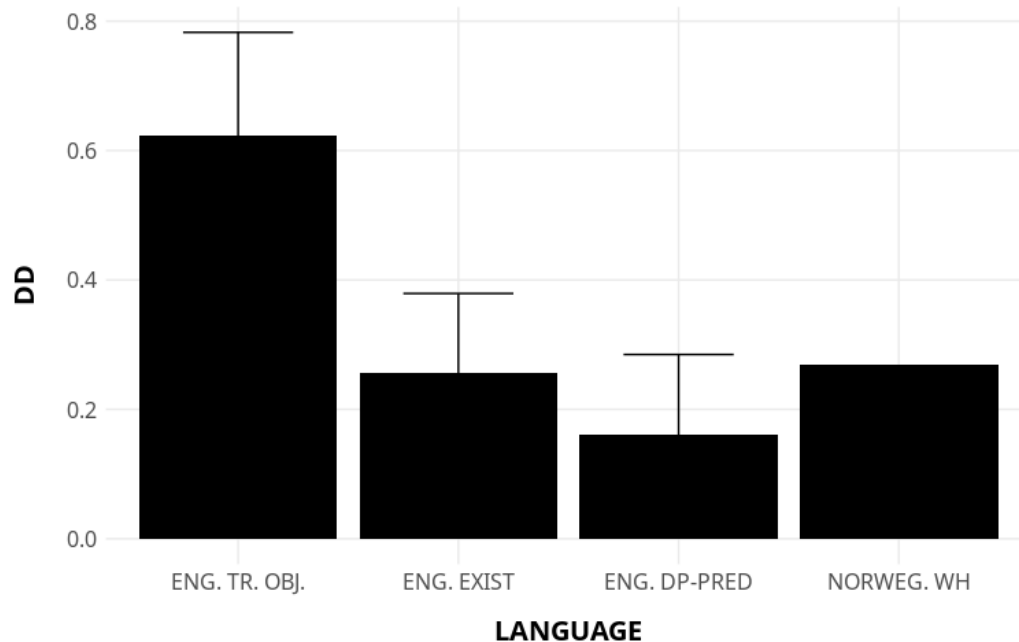


Figure 4: **ISLAND STRENGTH (VIA DD SCORES)**; NORWEGIAN WH PROVIDED FOR REFERENCE (Kush et al. 2018)

5 Making sense of intermediate ratings

- In Experiment 2, no significant island effect was found for **EXIST** or **DP-PRED**.

IF THERE IS NO SIGNIFICANT ISLAND EFFECT IN **EXIST** AND **DP-PRED**, THEN WHY DOES THE ISLAND | LONG CONDITION IN THESE ENVIRONMENTS HAVE A RELATIVELY LOW RATING?

CONSIDER TWO POSSIBILITIES:

- ① On a given trial, an intermediate rating was typically given. The intermediate average rating reflects many intermediate individual ratings.
- ② On a given trial, the rating was either in the range of ratings characteristic of grammatical sentences, or in the range of ratings characteristic of uncontroversially ungrammatical sentences. This diverse collection of ratings averages out to an intermediate rating.

- Performance account
 - Grammatical illusion is related to relative “activation” of a recently discarded grammatical parse.
 - Participants may have different degrees of susceptibility to the illusion.

- May predict a large number of intermediate ratings
- Competence account
 - Competence account requires selection of a particular RC analysis: raising vs. matching; English RCs are systematically ambiguous between these two analyses (Hulsey and Sauerland 2006).
 - Participants who choose a matching analysis may give ratings characteristic of an ungrammatical sentence.
 - Participants who choose a raising analysis or reanalyze to a raising analysis may give ratings characteristic of a grammatical sentence.
 - Predicts two distinct ratings distributions.

5.1 Simulations

- Monte Carlo simulation run (500 times for each ISLAND | LONG condition) to determine whether the ratings are better described by a single intermediate ratings distribution or two discrete ratings distributions (following Dillon et al. 2017).
- Fillers used as reference distributions (pre-categorized as grammatical and ungrammatical)
- **EXIST**: Discrete model fared better in all simulations.
- **DP-PRED**: Discrete model fared better in all simulations.

6 Conclusion

6.1 Paths forward

- Real-time experiment: Are people willing to form a dependency into RCs in **EXIST** and **DP-PRED** on the first pass?
 - Filled gap effects in self-paced reading tasks (Stowe 1986)
 - Plausibility mismatch effect (Traxler and Pickering 1996)
- What gives rise to super-additive interactions? How do grammatical constraints interact with processing constraints in ratings?
 - “Stress testing” embedded clauses (CPs and RCs in each environment by comparing a long dependency to an extra-long dependency (additional processing challenge).
 - Does increased length have an outside effect when interacting with grammatical constraints like island constraints?

6.2 Conclusion

- RCs can be substantially more transparent to extraction, even in English, depending on the syntactic–semantic context of the RC.
- More cross-linguistic than previously thought.
- Experimentation is an effective tool when judgments are intermediate or unclear.

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A Mixture modeling notes

A.1 Method

1. Using ratings for filler sentences, define the ranges of ratings that count as grammatical and ungrammatical (the grammatical/ungrammatical reference distributions)
2. The discrete and gradient models are defined in the following way:
 - (a) discrete model: draws n ratings from either the grammatical or ungrammatical reference distributions
 - The proportion of ratings drawn from each distribution is determined by π , a number between 0 and 1.
 - π is optimized computationally by finding the value of π that best simulates the observed mean.
 - (b) gradient model: draws n ratings from each of the grammatical and ungrammatical reference distributions, weights each set of ratings and adds them together.
 - The amount that the ratings are scaled down is determined by π .
 - π is optimized as above.
3. The simulation is run a given amount of times (e.g. 500).
 - For each run of the simulation under each model, a difference score is calculated that represents how close that run of the simulation is to the observed data.
4. The results from all 500 runs of the simulation are averaged within each model.
5. The average results from the discrete and gradient models are evaluated using the Bayesian Information Criterion (BIC) to see how well they fit the response distribution for the test condition.

A.2 Simulation results

- Simulation was run 500 times for each model under each subextraction condition (object, predicate, existential).
- object subextraction conditions:
 - Observed mean: 2.6
 - Gradient model mean: 2.69
 - Gradient model π : 0.93 (ungrammatical distribution scaled by 0.93, grammatical distribution scaled by 0.07)
 - Discrete model mean: 2.75
 - Discrete model π : 0.97 (97% of ratings drawn from ungrammatical distribution)

- Out of 500 simulations, the gradient model fared better 374 times (75% of the time).
- predicate subextraction conditions:
 - Observed mean: 3.3
 - Gradient model mean: 3.28
 - Gradient model π : 0.66
 - Discrete model mean: 3.31
 - Discrete model π : 0.65 (65% of ratings drawn from ungrammatical distribution, 35% drawn from grammatical distribution)
 - Out of 500 simulations, the discrete model fared better 500 times (100% of the time).
- existential subextraction conditions:
 - Observed mean: 3.57
 - Gradient model mean: 3.49
 - Gradient model π : 0.54
 - Discrete model mean: 3.56
 - Discrete model π : 0.51 (51% of ratings drawn from ungrammatical distribution, 49% drawn from grammatical distribution)
 - Out of 500 simulations, the discrete model fared better 500 times (100% of the time).

Table 3: **EXPERIMENT 2 SAMPLE ITEM (ENVIRONMENT MANIPULATION)**

TR-OBJ	NO-ISLD SHORT	Who ___ thinks that Courtney saw [CP that only one art collector bid on this painting:]
TR-OBJ	NO-ISLD LONG	Which painting do you think that Courtney saw [CP that only one art collector bid on ___]?
TR-OBJ	ISLAND SHORT	Who ___ thinks that Courtney saw the only art collector [RC who bid on this painting]?
TR-OBJ	ISLAND LONG	Which painting do you think that Courtney saw the only art collector [RC who bid on ___]?
DP-PRED	NO-ISLD SHORT	Who ___ thinks that Courtney believes [CP that only one art collector bid on this painting]?
DP-PRED	NO-ISLD LONG	Which painting do you think that Courtney believes [CP that only one art collector bid on ___]?
DP-PRED	ISLAND SHORT	Who ___ thinks that Courtney believes that she is the only art collector [CP who bid on this painting]?
DP-PRED	ISLAND LONG	Which painting do you think that Courtney believes [CP that she is the only art collector who bid on ___]?
EXIST	NO-ISLD SHORT	Who ___ thinks that there is only one art collector [SC bidding on this painting]?
EXIST	NO-ISLD LONG	Which painting do you think that there is only one art collector [SC bidding on ___]?
EXIST	ISLAND SHORT	Who ___ thinks that there is only one art collector [RC who bid on this painting]?
EXIST	ISLAND LONG	Which painting do you think that there is only one art collector [RC who bid on ___]?