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Comparing syntactic and discourse accounts of islands and parasitic gaps: experimental evidence from acceptability judgments

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Abstract: This study evaluates a recent account of islands and parasitic gaps, which proposes that island violations are unacceptable in part because they contain a referring argument in the predicate that contributes discourse-processing complexity. In two acceptability judgment experiments in Dutch, participants rated three types of filler-gap constructions that were preceded by a context manipulating the discourse accessibility of a referring argument in the target construction. The constructions differed in the location of the gap, which was realized as the complement of the matrix verb (regular filler-gap dependencies), as the complement of the verb in an adjunct clause (adjunct island violations), or as both (parasitic gap constructions). Adjunct clauses were untensed in Experiment 1 and tensed in Experiment 2. In both experiments, island violations were rated as unacceptable, regardless of whether the referring argument was discourse-accessible or discourse-novel. Parasitic gap constructions, which do not contain a referring argument in the predicate, were rated as acceptable, but only when the parasitic gap was located in an untensed clause. Reviewing these results from syntactic and discourse-processing perspectives, we conclude that the difference between islands and parasitic gap constructions is not a matter of discourse-processing complexity. The data instead support a primarily syntactic account of parasitic gaps.

Keywords: adjunct islands; island constraints; filler-gap dependencies; processing complexity; experimental syntax

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1 Introduction

1.1 Filler-gap dependencies

A major debate in both theoretical and experimental linguistics revolves around the question to what extent linguistic phenomena can be explained in terms of syntactic principles or non-syntactic factors, such as effects of discourse or general properties of human cognition. For over three decades, filler-gap dependencies have been at the center of this debate (Abeillé et al. 2020; Chaves 2013; Chaves and Putnam 2020; Culicover and Winkler 2022; Culicover et al. 2022; Cuneo and Goldberg 2023; Deane 1991; Hawkins 1999; Hofmeister and Sag 2010; Kluender 1991, 1998, 2004; Kush et al. 2019; Liu et al. 2022; Phillips 2006, 2013; Pritchett 1992; Sprouse et al. 2012, 2016). Filler-gap dependencies are unbounded dependencies in which a displaced constituent – the *filler* – appears in a position different from its canonical position. The latter is called the *gap* site, which is an empty syntactic position licensed by the filler. The sentence in (1) illustrates an acceptable filler-gap dependency. Although *the paper* is interpreted as the complement of *read*, it appears in a position different from the postverbal position it would normally occur in (this gap site is indicated by the underscore). An important observation of generative linguistics is that not all constructions allow dependency formation of this type. Certain syntactic environments, including subjects, adjuncts, and relative clauses, are known to block the formation of filler-gap dependencies. An example of such a construction is shown in (2), whose acceptability is strongly reduced because a dependency needs to be formed between a filler and a gap in an adjunct clause.[1]

(1) This is the paper that John read _ [before filing his mail]. >

(2) *This is the paper that John read his mail [before filing _].

Syntactic theories have shown that constraints on filler-gap dependencies can be formulated in terms of syntactic principles (e.g. Chomsky 1973, 1981, 1986; Huang 1982; Kayne 1983; Ross 1967). According to this view, (2) is unacceptable because it violates a grammatical constraint that blocks extraction from adjuncts (or non-complements, see Chomsky 1986; Huang 1982). Since Ross (1967), the domains

1 We intend to avoid giving categorical judgments as much as we can. Where possible, we will therefore use > and < to indicate relative judgments, where (A) > (B) indicates that (A) is more acceptable than (B), and (A) < (B) indicates that (B) is more acceptable than (A).

from which extraction cannot occur are referred to as *islands*. Unacceptable filler-gap dependencies like the one in (2) are therefore called *island violations*. Although the term *islands* arguably suggests a syntactic source for the unacceptability, we will use it in a theory-neutral way, only to describe structures that resist filler-gap dependency formation.

Various alternative theories maintain that the unacceptability of (2) should be explained in terms of non-syntactic properties, like conflicting semantic or discourse-packaging conditions (Abeillé et al. 2020; Chaves and Putnam 2020; Cuneo and Goldberg 2023; Erteschik-Shir 1973; Goldberg 2006, 2013; Kuno 1987; Truswell 2007, 2011) or non-linguistic demands on cognitive processing (Deane 1991; Hofmeister and Sag 2010; Kluender 1991, 1998, 2004; Pritchett 1992). The specific claims and predictions of these non-syntactic approaches differ, but they share the underlying idea that the unacceptability of islands is due to factors other than the violation of a syntactic constraint.

A finding extensively discussed in the syntactic literature is that certain island violations can be ameliorated by a parasitic gap configuration (Culicover 2001; Engdahl 1983; Taraldsen 1981). A parasitic gap construction is a type of sentence in which one filler phrase is associated with two different gaps, one of which is located inside an island, and one of which is not. This is exemplified by sentence (3), in which *the paper* is the object of both *read* and *filing*.

(3) This is the paper that John read _ [before filing _].

(Engdahl 1983: 14)

The gap located inside the adjunct clause *before filing* _ is said to be parasitic on the gap in the complement position of *read*, as the acceptability of the former depends on the presence of the latter (cf. the unacceptability of (2)). The latter, by contrast, is a regular, licit gap, because it appears in a position that normally permits extraction (cf. the acceptability of (1)). Given that (2) is unacceptable, the amelioration effect in (3) is somewhat surprising: in both constructions, a dependency is established with a gap inside an island.

1.2 Syntactic constraints on filler-gap dependencies

The generative literature explains observations such as (1)–(3) in terms of the structural properties of these sentences. The unacceptability of extraction from subject- and adjunct islands, as in (2), is claimed to be due to a constraint that blocks extraction from non-complements, known as the *Condition on Extraction Domain* (Huang 1982). Likewise, in the *Barriers* framework (Chomsky 1986), non-complements are identified as *Blocking Categories*, because they do not receive a

theta role from a lexical category under government and can therefore turn into barriers to extraction. A notion of structural government also underlies Kayne's (1983) *Connectedness Condition*, which bans movement out of left branches. As such, this condition can account for the illegitimacy of extraction out of subjects, but Longobardi (1985) later extended Kayne's machinery to apply to adjuncts as well. That different operations are at play in the two types of non-complements is also at the heart of Stepanov's (2007) 'eclectic' account. Stepanov advocates distinguishing between subject- and adjunct clauses when describing island effects, because these clauses behave differently cross-linguistically: adjuncts are more robust islands than subjects. He therefore proposes that different mechanisms are at work in the derivation of subject- and adjunct islands. What these different formal approaches have in common is that extraction from adjuncts and subjects is ungrammatical and, consequently, unacceptable.

1.2.1 Syntactic accounts of parasitic gaps

Syntactic accounts link the unacceptability of (2) to a violation of a grammatical island constraint, which makes it ungrammatical. The parasitic gap construction in (3), however, is licensed because of the structural relationship between the parasitic gap and either the filler or the real gap. Since the early 1980s, various analyses have been proposed to account for this difference, and so what exactly the structural relationship between the two gaps entails depends on the specific syntactic theory. In particular, the theories make different claims about where the filler originates: in the main clause, the adjunct clause, or both at the same time.[2] Proponents of the first view are Chomsky (1982), Cinque (1990), Kayne (1983), and Postal (1993), who argue that the filler moves from the main clause into sentence-initial position, leaving a gap; the 'gap' in the adjunct clause is occupied by a phonologically empty *pro* or an extracted pronoun that is rendered invisible by the licensing gap under control. The filler/operator in the main clause binds the empty category in the adjunct, making the latter a bound variable. Relatedly, Chomsky (1986), Contreras (1984), and Nissenbaum (2000) argue that the parasitic gap in the adjunct clause is a gap left behind by movement of an empty operator, which moves into the specifier position of the adjunct and as such creates an operator-variable relation independently. Parasitic

2 Yet others claim that these parasitic gap constructions involve coordination rather than adjunction. For instance, Fanselow (2001) claims that the filler is generated in the first conjunct and that the filler in the second conjunct undergoes phonological deletion. Williams (1990), by contrast, claims that the two gaps have an equal status and so the filler is extracted from both of them at the same time, an instance of across-the-board extraction. For an across-the-board analysis of parasitic gaps in Dutch, see Huybregts and van Riemsdijk (1985), discussed in Section 1.2.2. And see Postal (1993) for arguments against a linkage between parasitic gaps and across-the-board gaps.

gaps are licensed if the chains of both movements can be composed, satisfying the *Chain Condition* (Chomsky 1986). Nunes (2001, 2004; Hornstein and Nunes 2002), by contrast, claim that the filler itself is generated in the adjunct clause. It moves into the matrix clause before the two clauses are derivationally connected to each other, something they label *sideward movement*. The filler then moves into sentence-initial position. A third group of researchers includes Kiss (1986), who proposes that instances of the filler are initially present in both the matrix and the adjunct clause. Before moving into sentence-initial position, the two instances are merged into a single element. Likewise, Frampton (1990) argues that the filler is present in both the matrix and the adjunct clause, but suggests that the first is fronted to sentence-initial position, whereas the second is deleted. The resulting (parasitic) gap is bound by the filler/operator via a process of parasitic chain formation.

What these accounts have in common is that the parasitic gap is licensed by the filler or the regular gap (which itself is properly bound by an antecedent), rendering it a licit gap. Moreover, they share the idea that, because parasitic gaps do not involve movement out of the adjunct, the acceptability of these constructions does not pose a challenge to the view that adjunct islands block extraction. Thus, parasitic gap constructions are grammatical and, hence, acceptable, in contrast to island violations such as (2). As the specific details of the analysis explaining parasitic gap behavior are not directly relevant for the purposes of this paper, we will refer to the theories described above collectively as 'Syntactic Theory'. Syntactic Theory predicts that island violations (viz. extraction out of adjuncts) are unacceptable, because a grammatical island constraint is violated. Parasitic gaps, however, can leverage its licensing properties (e.g. binding, control) to salvage the construction, rendering it grammatical and thus acceptable.

1.2.2 The tense contrast

It has often been noted that it is easier to construct filler-gap dependencies into untensed adjunct clauses than into tensed adjunct clauses. The a-b contrasts in examples (4) and (5) illustrate that this effect of tense on acceptability occurs both in islands and in parasitic gap constructions. That tense reduces the acceptability of parasitic gaps has been observed for several languages, including English (Engdahl 1983; Frampton 1990; Manzini 1994), Dutch (Bennis and Hoekstra 1985; Huybregts and van Riemsdijk 1985), and the Romance languages (García Mayo and Kempchinsky 1994; see Cinque 1990 for Italian).

(4) a. ?**What** did John arrive [whistling _] ? >
(Borgonovo and Neeleman 2000: 200)

b. ***What** did John arrive [after he whistled _] ?

(5) a. **Who** did she call _ [right after meeting _] ? >
b. ?**Who** did she call _ [right after she met _] ?

To account for the degradedness of extraction from tensed islands (e.g. (4a) versus (4b)), Syntactic Theory typically assumes that tense interferes with dependency formation, e.g. because tensed clauses block head government and therefore impede extraction (Frampton 1990), or because they are weak inherent barriers to movement (Chomsky 1986). However, these explanations do not account for the tense contrast between the parasitic gap constructions in (5a) and (5b), because these do not involve extraction from an island. Thus, in order to explain the effect of tense in syntactic terms, it would have to be assumed that the tense of the adjunct clause interferes with binding, chain composition, sideward movement, or any other process that has been proposed to license the parasitic gap. In the absence of independent empirical motivation, such assumptions would remain stipulative.

For Dutch, however, two principled syntactic accounts of the tense contrast exist. First, Huybregts and van Riemsdijk (1985) analyze Dutch parasitic gap constructions like those in (6) as across-the-board (ATB) extraction from coordinates. This allows them to explain the contrast between (6a) and (6b).

(6) a. Welke artikelen heeft hij [zonder (*om) _ te lezen] _ opgeborgen? >
which articles has he without om to read filed
'Which articles has he filed _ without reading _?' (untensed adjunct clause)
b. ?Welkeartikelen heeft hij [zonder *(dat) hij _ had gelezen] _ opgeborgen?
which articles has he without that he had read filed
'Which articles has he filed _ without reading _?' (tensed adjunct clause)

According to Huybregts and van Riemsdijk (1985), ATB rule application is allowed in constructions with untensed adjuncts (6a) because *zonder* 'without' can be analyzed as a coordinating conjunction. However, when the adjunct clause is tensed (6b), the subordinating complementizer *dat* 'that' forces the analysis as subordination. In that case, the clauses are not coordinates anymore, and the ATB derivation is blocked.

Second, Bennis and Hoekstra (1985) explain the effect of tense in terms of structural government, which is thought to make tensed clauses less transparent for the kind of antecedent-gap relation found in parasitic gap constructions. In Dutch, infinitival clauses may be introduced by the prepositional complementizer *om*, but *om* is obligatorily absent if the infinitival clause is the complement of a preposition (like *zonder* 'without', see (6a)). When the complement of the preposition is a finite clause, the finite complementizer *dat* 'that' is instead obligatorily present (see (6b)). Based on these facts, Bennis and Hoekstra (1985) argue that *zonder* 'without' occupies the complementizer position in the untensed adjunct clause in (6a). In tensed adjunct clauses, that position is filled by *dat* 'that', and *zonder* 'without' is the head of the

prepositional phrase (PP) dominating the clause (6b). Because the preposition is not a structural governor in Dutch, it stands in the way of connecting the paths of the parasitic and the real gap (Kayne 1983), which explains why tensed adjuncts do no allow parasitic gaps in Dutch. In untensed clauses, the PP is absent, so the path of the parasitic gap connects directly to the path of the real gap, and the parasitic gap is licensed. In sum, the accounts of Huybregts and van Riemsdijk (1985) and Bennis and Hoekstra (1985) rely on different theoretical notions to explain the difference between parasitic gaps in tensed and untensed domains, as well as to explain the different distribution of parasitic gaps in Dutch and English (i.e. the different government properties of prepositions). However, they share the idea that parasitic gaps in tensed adjunct clauses in Dutch are categorically ruled out by the grammar.

An alternative explanation for the tense contrast comes from Truswell (2011), who emphasizes semantic conditions in the operation. In particular, for (*wh*-) extraction to be legitimate, the events denoted by the adjunct (e.g. *whistling* in (4a)) and the main predicate (e.g. *arrive* in (4a)) must be construable as a single event – that is, they must map onto a single independent time (see also Ernst 2022: §2.2). This condition, formalized as the Single Event Grouping Condition in (7), can be used to explain the transparency of various types of adjuncts, including the prepositional participial adjuncts under investigation in the present paper (see also Borgonovo and Neeleman 2000; Ernst 2022; Truswell 2007).

(7) **Single Event Grouping Condition**
An instance of *wh*-movement is legitimate only if the minimal constituent containing the head and the foot of the chain can be construed as describing a single event grouping.

(Truswell 2011: 157)

Regarding tensed clauses, Truswell (2011) claims that the tense operator in adjuncts such as (4b) blocks event grouping, because application of this operator fixes the relations among event variables. Tensed clauses are therefore independent events and the event denoted by the adjunct can never be included in the event structure of the main predicate. Extraction would result in a violation of the condition in (7). Thus, the main predicate and the adjunct can form a single event in sentences with an untensed adjunct, such as (4a), (5a), and (6a), but not in those with a tensed adjunct, such as (4b), (5b), and (6b).

In all, formal theories of extraction from adjunct clauses postulate syntactic constraints and/or semantic conditions according to which tensed adjuncts interfere more strongly with filler-gap dependency formation than untensed adjuncts do. Having discussed the syntactic edifices proposed to explain (adjunct) island effects, parasitic gap configurations, and the tense contrast, we now turn to a recent proposal

by Culicover and Winkler (2022), who appeal to non-syntactic factors to explain why parasitic gap constructions are more acceptable than island gap constructions.

1.3 The Uninvited Guest Hypothesis

Culicover and Winkler (2022) maintain that the difference between islands and parasitic gap constructions is a matter of processing complexity, not a matter of syntactic well-formedness. Focusing on extraction from subject islands, as in (9), they propose the *Uninvited Guest Hypothesis*. For consistency with examples (1)–(3), we also added an example of a regular gap construction (8) and a parasitic gap construction (10) here.

(8) Which professor did [the students of her colleague] nominate _ for the award? >

(9) *Which professor did [the students of _] nominate her colleague for the award? <

(10) Which professor did [the students of _] nominate _ for the award?

According to Culicover and Winkler (2022), the island violation in (9) is unacceptable not because it violates a grammatical constraint that blocks extraction from subjects, but because it contains multiple sources of processing difficulty, which together lead to a strong reduction in acceptability. Specifically, (9) contains a referring argument in the predicate, *her colleague*, which they call the *Guest*. When (9) is presented in isolation, the Guest is *Uninvited*; it refers to a novel discourse entity and therefore adds complexity to the interpretation of the sentence (Gibson 2000; Warren and Gibson 2002). Extraction from a subject island also induces a processing cost, because it leads to a discourse clash between the foregrounded status of the extracted element and the backgrounded status of the domain of extraction (Abeillé et al. 2020; Erteschik-Shir 1973; Goldberg 2006, 2013; see Section 5.2.1.1 for further discussion). The combined cost associated with introducing a novel discourse referent and (*wh*-) extraction from backgrounded material then leads to full unacceptability.

Culicover and Winkler (2022) provide two types of evidence to support their hypothesis. First, they show that the acceptability of the sentence is improved when there is no overt expression in the predicate. This is the case in the parasitic gap construction in (10), which contains no Guest, because the object in the predicate is replaced by a gap. Besides extraction from a subject island, (10) contains no other source of processing complexity, and it is consequently considered more acceptable than (9).

Second, they show with a corpus analysis using Google searches that, when subject island violations are produced and the predicate contains a transitive verb, the argument in that predicate does not denote a novel discourse entity. These accessible or discourse-given arguments are referred to as *Invited Guests*. Extraction from subject islands occurs with two types of transitive predicates. One type attributes a property to the subject, as in …*those* ***who spending time with*** *always feels like a positive experience*. The other type contains a noun phrase (NP) that refers to an antecedent in the preceding discourse. Consider two examples from Culicover and Winkler's (2022) Google search. Example (11) (their (13a)) contains a subject island violation (in bold) in which the predicate (underlined) contains the pronoun *him*, whose antecedent is immediately available in the discourse. It does not introduce a new discourse entity and is therefore an Invited Guest.

(11) But even if that were so, it would seem that he had at least one person in his life **who spending time with** and whose love made him feel pure bliss.
(Culicover and Winkler 2022: 12)

Example (12) (their (15c)) shows a subject island violation in which the predicate contains a NP *the postulated meaning* which bears on the topic of the discourse. The NP is again an Invited Guest; it does not introduce a discourse entity and has the discourse status 'given'. In cases such as these, no additional processing cost is incurred by the predicate, because the referent of the argument is accessible in the discourse context.

(12) For purposes of Proof the important distinction lies solely between assertions capable of denial with a meaning, and those **which to deny** would contradict the postulated meaning.
(Culicover and Winkler 2022: 13)

Thus, Culicover and Winkler (2022) argue, island- and parasitic gap phenomena should not be explained in grammatical terms. Extraction from islands is grammatical and therefore acceptable in principle, but it is associated with increased demands on processing. In cases where this leads to a strong reduction in acceptability, the additional cost associated with processing an Uninvited Guest can push the sentence below the threshold of acceptability, giving rise to the appearance of ungrammaticality. Furthermore, they claim that there is no parasitic gap mechanism that can make island extraction grammatical; islands are simply more difficult to process than parasitic gap constructions due to the presence of an Uninvited Guest. Replacing the Guest with a true gap keeps the sentence above the threshold of acceptability (see also Culicover 2013). While this may seem like some form of grammatical amelioration, according to Culicover and Winkler (2022) the

amelioration associated with the parasitic gap configuration is only a consequence of reduced processing complexity.

1.3.1 Problems with the Uninvited Guest hypothesis

We endorse the general approach of Culicover and Winkler (2022), who aim to account for gradience in the acceptability of (subject) island violations, an important current topic in experimental syntax (see e.g. recent contributions in Goodall 2021; Sprouse 2023). However, their Uninvited Guest Hypothesis (henceforth UGH) has both empirical and inferential problems, which we address in the present section.

The empirical problems with the UGH pertain to examples it does not explain, which include unacceptable island extraction without an additional discourse referent and acceptable island extraction with a novel discourse referent. In (13) and (14), the predicate is intransitive, so there cannot be an Uninvited Guest, yet both sentences are unacceptable.

(13) *This is the paper that John was anxious [before filing _] .

(14) *Which professor did [the students of _] recently graduate?

The sentences in (13) and (14) are adapted from (2) and (9) respectively by making the predicate intransitive, thereby removing the Uninvited Guest. Given that neither (13) nor (14) contains a predicate with a referring argument, their unacceptability cannot be caused by the costly introduction of a novel discourse entity. Culicover and Winkler (2022) might explain these observations by noting that the island extractions in these cases lead to such an increase in processing complexity that the sentences are judged as unacceptable even though there is no Uninvited Guest. However, this would predict that the addition of a regular gap will not ameliorate the unacceptability, as the processing demands posed by island extraction are simply too high. The parasitic gap constructions in (3) and (10) show that this prediction is not borne out. Both sentences are acceptable, even though they contain an additional dependency and therefore have at least one additional source of processing complexity compared to (13) and (14) respectively.

Conversely, there are examples of acceptable island extraction with an Uninvited Guest. In the parasitic gap construction in (15), the predicate is ditransitive. The sentence contains both extraction from an adjunct island and, when presented in isolation, an Uninvited Guest (*Sandy*). According to the UGH, the conjunction of these two resource-intensive processes should lead to a strong reduction in acceptability, but (15) seems fine. Indeed, it is more acceptable than (16), which is minimally different from (15) in that it contains a transitive instead of a ditransitive predicate.

(15) War and Peace is a book that I always tell Sandy about _ [while reading _] . >

(16) *War and Peace is a book that I always amuse Sandy [while reading _] .
(Culicover and Winkler 2022: 14)

As noted, Culicover and Winkler (2022) explain the unacceptability of (16) (their (18b)) in terms of the additional processing difficulty associated with introducing a novel discourse entity for *Sandy*. This explanation fails to account for the acceptability of (15), however, which contains that same source of processing complexity. From a processing perspective, (15) is in fact more complicated than (16), because it contains an additional filler-gap dependency while having the same number of referring arguments. The 'amelioration' in (15) can therefore not be due merely to reduced processing cost, because its processing costs are in fact higher than those of (16).

An inferential problem with the UGH concerns the type of data that is used to support its claims. The corpus search of Culicover and Winkler (2022) shows that the referring argument in the predicate is discourse-accessible in all island violations found, which they take to mean that island violations are unacceptable (in part) because they contain a discourse-novel referent. This argument relies on two inferential fallacies.[3] First, the fact that no island violations with discourse-novel arguments were found (absence of evidence) does not license the conclusion that island violations occur *exclusively* with a discourse-accessible argument (evidence of absence). Second, the fact that island violations were found only with discourse-accessible arguments (correlation) does not imply that these violations were produced *because* the additional argument was discourse-accessible (causation). More generally, the fact that sentences with island violations are produced does not in and of itself indicate that those sentences are acceptable. People frequently produce (ungrammatical) sentences that would be considered unacceptable upon reflection (Phillips et al. 2011), which means that not every instance of usage involves well-formedness. Culicover and Winkler (2022) correctly note that not every instance of unacceptability reflects ungrammaticality (see also Culicover et al. 2022), but at the same time they use the presence of island violations in corpora to argue that these do not involve the violation of a grammatical principle. By assuming that constructions that are used are acceptable and therefore grammatically well-formed, they do not consistently adhere to the same (assumed) relation between acceptability and grammaticality.

3 Moreover, it does not explain why their Google searches yielded only three instances of parasitic gap constructions, compared to over one hundred subject island violations. On their assumption that, from a processing point of view, parasitic gap constructions are less complex than island violations, this mismatch is surprising and requires an explanation.

In sum, to determine whether discourse accessibility is the relevant variable to explain the (un)acceptability of island violations, corpus data are not the way to go – instead, an experimental approach is required. Experiments make it possible to measure people's responses to island violations in which the discourse accessibility of the referring argument is experimentally manipulated, and the experimental materials are properly controlled (e.g. through testing minimal pairs using a Latin Square design). Echoing Culicover and Winkler's (2022: 19) suggestion that "it would be productive to explore the question of the relationship between referentiality and acceptability experimentally", we therefore conducted two acceptability judgment experiments in Dutch, in which we manipulated the referential properties of the Guest via preceding context.

1.4 Current study

We asked participants to rate regular gap constructions, parasitic gap constructions, and island gap constructions, which were preceded by a short context that manipulated the discourse status of a referring argument in the sentence, the Guest. An example of a stimulus item is given in Table 1. In the target sentences, the NP *the church* is the Guest. Depending on whether the Guest has been introduced in the context or not, it is Invited or Uninvited. When the context introduces a church, *the church* in the subsequent target sentences is discourse-given and therefore Invited.

Table 1: Example stimulus item for Experiment 1. For expository purposes only, the words distinguishing the contexts for Invited and Uninvited Guests are highlighted in bold.

Construction	Context	Target sentence
Regular gap	Tim heeft tijdens een trip naar Spanje allerlei steden bezocht, maar de stad met de/het allerbekendste **kerk**$_{\text{invited}}$/**voetbalstadion**$_{\text{uninvited}}$ heeft hij niet gezien. Toch heeft hij op internet een beoordeling achtergelaten. 'Tim visited various cities during a trip to Spain, but he did not see the city with the most famous **church**$_{\text{invited}}$/**football stadium**$_{\text{uninvited}}$. He nevertheless left a rating on the internet.'	De stad heeft hij zonder de kerk te bezoeken beoordeeld. 'The city, he rated without visiting the church.'
Parasitic gap		De stad heeft hij zonder te bezoeken beoordeeld. 'The city, he rated without visiting.'
Island gap		De stad heeft hij zonder te bezoeken de kerk beoordeeld. 'The city, he rated the church without visiting.'

In the alternative context, *church* is replaced by *football stadium*, making *the church* in the target sentences discourse-novel and therefore Uninvited.[4]

In terms of form, the target sentences only differed in the presence and position of the Guest. In the regular gap construction, the Guest is embedded in a clausal adjunct (*without visiting the church* in Table 1). The regular gap in the complement position of the main verb is bound by the filler *the city*, which is the topicalized object of the sentence. In the parasitic gap construction, the Guest is entirely absent. *The city* is linked to two gaps, one in the adjunct island (the parasitic gap) and one in the complement position of the main verb (the regular gap). In the island gap construction, the Guest is the complement of the main verb. The only gap there is in the adjunct, making this sentence an adjunct island violation. Using short discourse contexts in two experiments, we thus evaluate whether the discourse status and accessibility of the Guest in the target sentence affects the acceptability of different kinds of filler-gap constructions.

The stimuli in the two experiments are highly similar, the only difference being that the adjunct in the target sentence is an untensed clause in Experiment 1 (as in Table 1) but a tensed clause with a pronominal subject in Experiment 2. From a discourse-processing perspective, the two experiments are minimally different, because the cognitive load introduced by the manipulation of tense is not only minimal (Gibson 2000; Kluender 1998; Warren and Gibson 2002) but also the same across the three types of constructions. Thus, to the extent that finite tense has an effect on acceptability judgments, it should concern a main effect that does not interact with the construction manipulation; i.e. the effect should be similar across constructions, according to the Uninvited Guest Hypothesis. According to Syntactic Theory, however, tense has a strong effect on the acceptability of certain filler-gap dependencies, in particular islands and parasitic gap constructions (see Section 1.2.2). Our two experiments combined therefore allow for a comprehensive comparison of the Uninvited Guest Hypothesis and Syntactic Theory. On the one hand, these theories make different predictions about the acceptability of different kinds of filler-gap constructions, especially when embedded in context. And on the other hand, they make different predictions about the effect of finite tense.

4 It should be noted that this manipulation of context is somewhat different from manipulations of discourse accessibility in the literature. Previous studies have investigated how the acceptability of island violations is affected by the discourse status of the extracted constituent (*the city* in Table 1; e.g. Kush et al. 2019; Villata et al. 2016). In contrast, we are concerned with the discourse status of the additional referent (*the church* in Table 1).

2 Experiment 1

The Uninvited Guest Hypothesis (UGH) holds that island gap constructions are considered unacceptable because they contain both extraction from an island and a referring expression in the predicate, i.e. the Uninvited Guest. Parasitic gap constructions, by contrast, have island extraction but are not accompanied by an Uninvited Guest. As they contain only one source of processing complexity, the UGH predicts that parasitic gap constructions should be intermediate in terms of acceptability. Regular gap constructions contain neither of these two sources of processing cost, so they should be acceptable. In Experiment 1, this translates into a main effect of CONSTRUCTION, whereby regular gap constructions receive the highest ratings and island gap constructions the lowest ratings, with the ratings of parasitic gap constructions in between the two. These predictions are visually represented in Figure 1 (left panel). Additionally, according to the UGH, the Guest in the predicate is cognitively demanding only when it is discourse-new. The UGH therefore predicts an effect of CONTEXT on the acceptability of island gap constructions, which should receive higher ratings when the Guest is discourse-given and thus Invited compared to when it is discourse-new and Uninvited. We visualized these predictions in Figure 1 by adding a hypothetical 'threshold of acceptability' (Culicover 2013; Culicover and Winkler 2022), which separates island gap constructions with Invited Guests from those with Uninvited Guests. The UGH predicts no effects of CONTEXT on the acceptability of parasitic gap constructions, because the Guest does not appear in these target sentences. This translates into an interaction between CONTEXT and CONSTRUCTION, with CONTEXT only affecting island gap constructions.

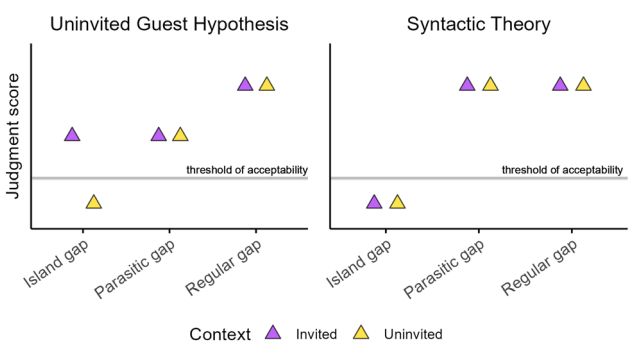

Figure 1: Predicted results for Experiment 1 under the Uninvited Guest Hypothesis (left) and Syntactic Theory (right). The predictions only indicate the expected pattern of results and do not reflect effect sizes. The horizontal gray line reflects a hypothetical threshold of acceptability.

According to Syntactic Theory, island gap constructions violate a grammatical constraint, so they are ungrammatical and remain below the threshold of acceptability (Figure 1, right panel). Regular gap and parasitic gap constructions, by contrast, are both grammatically licensed. Syntactic Theory therefore predicts that both constructions will receive similar acceptability ratings at the high end of the scale. No effects of CONTEXT on the acceptability of any of the three constructions are predicted.

2.1 Methods

2.1.1 Participants

80 participants were recruited via the SONA system of Radboud University and completed the full questionnaire. All participants were self-reported first language speakers of Dutch, and none reported having a language or reading disorder. After exclusion criteria were applied (see Section 2.1.4), data from 72 participants were entered into the statistical analysis (age: M = 19.7, SD = 3.5, range = 17–46).

2.1.2 Design and materials

We designed an acceptability judgment experiment with a 2×3 design, crossing the factors CONTEXT (invited or uninvited (guest)) and CONSTRUCTION (island gap, parasitic gap, or regular gap). For this, we created 30 items according to the paradigm in Table 1, in which target sentences were preceded by a brief preamble. The target sentences contained an adjunct clause and a topicalized direct object. The gap of the direct object could be located in three distinct positions: it could be realized as the complement of the matrix verb (Regular Gap; RG in (17a)), as the complement of the verb in the adjunct clause (Island Gap; IG in (17c)), or as both (Parasitic Gap; PG in (17b)). By topicalizing the same NP in all conditions, we ensured that the three conditions were as closely matched in terms of word order as possible. However, this did result in a difference between conditions regarding which verb is combined with which NP (i.e. *de stad* 'the city' is the complement of *beoordeeld* 'rated' in (17a) but it is the complement of *bezoeken* 'visit' in (17c)). We intended to avoid any potential differences in verb-argument plausibility by making sure that both NPs (*the city*, *the church*) were semantically plausible complements of both verbs (*rated*, *visit*). The verbs in both the matrix clause and the adjunct clause were unambiguously transitive and could not be used as intransitive verb.

The factor CONTEXT pertains to the discourse status of the Guest in both the island gap construction (i.e. the referring argument of the matrix verb in the target

sentence; *de kerk* 'the church' in (17c)) and the regular gap construction (i.e. the argument of the verb in the adjunct clause; *de kerk* 'the church' in (17a)). The Guest is by definition absent in the parasitic gap construction (17b), but nonetheless the manipulation of the preceding context remains present, leading to two different contexts for the parasitic gap construction as well. The CONTEXT was determined by the preamble preceding the target sentence (see Table 1). Thus, the Guest in the target sentence could either be Invited (discourse-given) or Uninvited (discourse-new), where discourse-givenness is defined as explicit mention in the preamble. The full set of stimulus materials is made available on the Open Science Framework (OSF): https://osf.io/8pmfq/.

(17) a. De stad heeft hij [zonder de kerk te bezoeken] _RG beoordeeld.
the city has he without the church to visit rated
'The city, he rated _RG without visiting the church.'

b. De stad heeft hij [zonder _PG te bezoeken] _RG beoordeeld.
the city has he without to visit rated
'The city, he rated _RG without visiting _PG.'

c. De stad heeft hij [zonder _IG te bezoeken] de kerk beoordeeld.
the city has he without to visit the church rated
'The city, he rated the church without visiting _IG.'

We focus on adjunct islands, because adjuncts are typically considered strong islands (Stepanov 2007; Szabolsci 2006; Truswell 2007, 2011) and they also allow parasitic gaps in Dutch, at least when they are untensed (Bennis and Hoekstra 1985). In Engdahl's (1983) accessibility hierarchy, the best cases of parasitic gaps involve manner adjuncts. Configurations such as those in (17) should thus present us with a good contrast in acceptability and are therefore a good test case. Indeed, as Culicover and Winkler (2022: 13) suggest, "in adjunct islands, in particular, the effect of the Uninvited Guest can be clearly identified." Also note that topicalization configurations such as those in (17) are more common in Dutch than in English, and, because of the discourse-givenness of the topicalized object, they follow the preceding discourse preamble naturally.

The 30 stimulus items were distributed over six experimental lists following a Latin Square design, such that each list contained five tokens of each of the six conditions. Each list was supplemented with the same 20 filler items (taken from Schoenmakers 2023), which were chosen such that they would cover the entire acceptability scale. Like the experimental items, all filler items contained a discourse context. Five filler items contained regular grammatical target sentences. Five other filler items were ungrammatical and contained a postverbal NP complement in a verb-final construction (e.g. *de tafelgast heeft geïrriteerd de presentator* 'the table guest annoyed the presenter'). The ten remaining filler items contained a fronted

participle or a violation of the Animate First principle, both of which lead to degraded acceptability. The 50 experimental items were pseudorandomized using the software Mix (van Casteren and Davis 2006), which allows users to reorder their items based on the individual factors in the design. The only constraint of our pseudorandomization was that the minimal distance between two items containing the same target construction should be two (items). Each of the six lists was filled in by twelve participants.

2.1.3 Procedure

The experiment was conducted online using the Qualtrics platform (Version 2024). Participants were instructed to locate themselves in a quiet environment for the duration of the experiment, and to carefully read the brief stories (discourse preambles) presented to them. They were stimulated to imagine that these stories were being told by a first language speaker of Dutch. After 7,500 ms, the corresponding target sentence and rating scale would appear. Presentation of the target sentence was delayed so as to stimulate participants to carefully read the story, and not to proceed with the experiment without paying much attention to this discourse context (Schoenmakers 2023). Participants were asked to judge the naturalness of the

Figure 2: Sample trial. The context sentences are presented at the top. De target sentence (in bold) is presented in the middle, just above the judgment labels *erg natuurlijk* 'very natural' and *erg onnatuurlijk* 'very unnatural', which are presented on opposite ends of the sliding scale. In this trial, which is taken from the item presented in Table 1, the target sentence is an island gap construction with an Uninvited Guest.

target sentence, which was presented on a new line in bold font (see Figure 2 for a sample trial), by relying on their first intuition; they were told that there were no right or wrong answers. Judgments were made on a semi-continuous sliding scale ranging from 0 (very unnatural) to 100 (very natural). The initial score value was set to 50, but the slider bar had to be moved in order to proceed with the experiment. The numerical value was hidden to the participants, so that participants had to rely on spatial rather than numerical reasoning when providing their response. We note that 100-point slider scales are no less sensitive than the Likert scales more commonly used in experiments investigating island effects. Systematic investigations of different scale types conclude that continuous and unnumbered graphic slider scales with few labels, such as the one used in our experiment, offer good sensitivity and yield reliable data (Cook et al. 2001; Marty et al. 2020). Finally, we checked whether participants carried out the experiment seriously by analyzing their responses following a number of exclusion criteria (Section 2.1.4).

2.1.4 Analysis

We used the following two criteria to exclude participants. First, participants were excluded if the difference between their average response to grammatical fillers and their average response to ungrammatical fillers was less than 20 points (on a 100-point scale), or if their average response to ungrammatical fillers was higher than their average response to grammatical fillers. Given the clear contrast between the filler types, such a pattern would indicate that participants were not paying close enough attention to the stimuli. Second, participants were excluded if their average response to constructions with an island gap was higher than their response to constructions with a regular gap. This criterion was based on the fact that adjuncts are typically considered strong islands and should therefore be judged low in acceptability (Stepanov 2007; Szabolsci 2006; Truswell 2007, 2011).[5] Eight participants were excluded and replaced based on these criteria.

Acceptability judgments were *z*-transformed per participant using all items. They were then analyzed with linear mixed-effects models (Baayen et al. 2008), using the *lme4* package (Bates et al. 2015) in *R* (version 4.4.0; R Core Team 2024). P-values were calculated via Satterthwaite's degrees of freedom method, implemented in *LmerTest* (Kuznetsova et al. 2017). The factors CONSTRUCTION (island gap, parasitic gap, regular gap) and CONTEXT (invited, uninvited (guest)) were entered into the model as

5 An anonymous reviewer noted that this criterion is based on experimental items and might therefore inadvertently bias the results. However, this was not the case; a reanalysis of the data without excluding these participants (n = 76 in Exp. 1; n = 75 in Exp. 2) yielded qualitatively similar results.

fixed effects, together with their interaction. We used Helmert coding for the three-level factor CONSTRUCTION. The first contrast (0.67, −0.33, −0.33) tests the difference between grammatical and ungrammatical conditions by comparing the difference between island gaps and the mean of parasitic and regular gaps. The second contrast (0, 0.5, −0.5) tests the difference between the grammatical conditions parasitic gap and regular gap. We used deviation coding (−0.5, 0.5) for the two-level factor CONTEXT. Participant and item were included as random effects. We opted for a parsimonious model selection approach (Bates et al. 2015; Matuschek et al. 2017), in which random slopes were included only if they reduced the conditional AIC (Säfken et al. 2018). As this was not the case, and inclusion of random slopes led to overfitting, we only included random intercepts for participant and item. The data and scripts for running the statistical analysis can be found on OSF (https://osf.io/8pmfq/).

Some of the conclusions in this paper are derived from either null results or significant results with small effect sizes. To provide additional support for our conclusions, we supplemented all of these statistical tests with a Bayes Factor analysis. A Bayes Factor (BF) can be used to quantify how much more likely the data are to be observed under either the null hypothesis (H_0) or the alternative hypothesis (H_1). When distinguishing BFs for the two hypotheses, we use two notations. We report BF_{10} when there is more support for H_1 than H_0, and BF_{01} (calculated as $1/BF_{10}$) when the data favor H_0. These values have a straightforward relative interpretation: a BF_{01} of 8, for example, means that the support in the data for H_0 is eight times larger than the support for H_1. BFs between 1 and 3 are regarded as "anecdotal" evidence for an effect, BFs between 3 and 10 are considered to show "moderate" evidence, BFs between 10 and 30 are considered to show "strong" evidence, and BFs over 30 show "very strong" evidence (Jeffreys 1961; Lee and Wagenmakers 2014). All Bayesian model comparisons and corresponding BFs were estimated using the R package *BayesFactor* (version 0.9.12-4.7; Morey et al. 2024) with default priors and using 500,000 iterations. Bayes Factors associated with a specific effect were calculated by dividing two BFs: (i) the BF associated with a model with that effect, and (ii) the BF associated with the model without that effect.

2.2 Results

Figure 3 shows the acceptability judgment scores in each condition. The three-level factor CONSTRUCTION was coded with two contrasts. The first contrast compared the (traditionally considered) ungrammatical condition (island gap) to the average of the grammatical conditions (regular and parasitic gap). As expected, this comparison showed that the constructions with an island gap (M = 14.2, SE = 0.83) were judged as less acceptable than the constructions with a parasitic gap (M = 58.3, SE = 1.08) or a

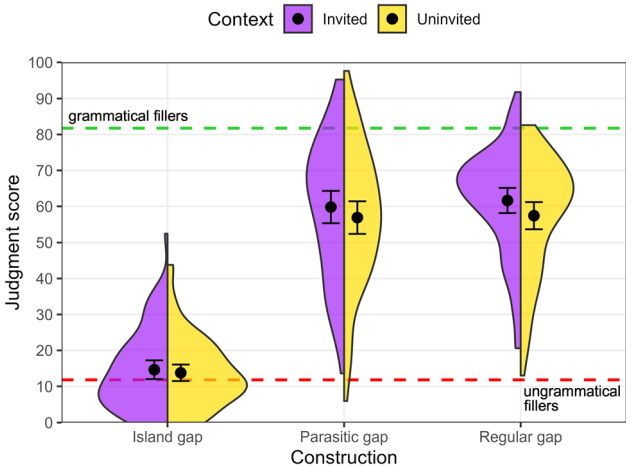

Figure 3: Acceptability judgment scores of Experiment 1, grouped by CONSTRUCTION and CONTEXT. The black dot encodes the mean, the error bars indicate 95 % confidence intervals around the mean. The average judgment scores of the grammatical and ungrammatical filler items are added as rough points of reference. These should not be interpreted as reflecting thresholds of acceptability or unacceptability.

regular gap (M = 59.5, SE = 1.11), β = –1.33, SE = 0.03, p < 0.001. The second contrast compared parasitic gaps to regular gaps. This comparison revealed no statistically significant difference between the two constructions, β = –0.04, SE = 0.03, p = 0.257, which received highly similar judgment scores (BF_{01} = 9.35). Furthermore, the acceptability of the target sentences was modulated by the discourse CONTEXT: sentences with an Invited Guest (M = 45.4, SE = 1.33) were judged as slightly more acceptable than sentences with an Uninvited Guest (M = 42.7, SE = 1.31), β = –0.08, SE = 0.03, p = 0.003. A Bayes factor analysis showed that there was moderate evidence for this difference, BF_{10} = 3.60. Moreover, the effect of CONTEXT was similar across constructions (see Table 2), showing that a supporting context did not increase the acceptability of sentences with an island gap more than it increased the acceptability of sentences with a regular or a parasitic gap. Importantly, the absence of a significant interaction (in the direction predicted by the Uninvited Guest Hypothesis) is not a matter of statistical power, as the effect of CONTEXT is numerically larger for both regular and parasitic gaps than it is for island gaps. Indeed, the Bayes Factor analysis showed strong evidence for the null hypothesis, BF_{01} = 28.87. The fixed and random effects of the full model are shown in Table 2.

Table 2: Results of the mixed-effects model in Experiment 1. The effect of 'Construction1' corresponds to the comparison between the average of the grammatical conditions (regular and parasitic gap) and the ungrammatical condition (island gap). The effect of 'Construction2' corresponds to the comparison between regular gaps and parasitic gaps. *p*-Values lower than 0.05 are indicated in bold.

Predictors	Estimates	CI lower-upper	*t*-Statistic	*p*-Value
(Intercept)	−0.04	−0.10–0.01	−1.50	0.135
Context	−0.08	−0.13 to −0.03	−2.93	**0.003**
Construction1	−1.33	−1.38 to −1.27	−45.76	**<0.001**
Construction2	−0.04	−0.10–0.03	−1.13	0.257
Context × Construction1	0.07	−0.04–0.19	1.27	0.203
Context × Construction2	0.03	−0.10–0.16	0.48	0.633
Random effects				
σ^2				0.40
$\tau_{00\ participant}$				0.00
$\tau_{00\ item}$				0.02
ICC				0.05
N_{item}				30
$N_{participant}$				72
Observations				2,160
Marginal R^2/Conditional R^2				0.482/0.506

2.3 Discussion

The results of Experiment 1 reveal that topicalization out of adjunct islands is rated as unacceptable. By contrast, regular and parasitic gap constructions received (equally) high acceptability scores, even though they were minimally different from the island gap constructions. Moreover, the effect of context was not different across the three types of constructions. These results are in line with Syntactic Theory in the sense that what is deemed grammatically licensed is judged as acceptable, and what violates a grammatical principle is judged as unacceptable. In contrast, this categorical pattern does not corroborate the gradient pattern predicted by the Uninvited Guest Hypothesis (see Figure 1). According to this hypothesis, parasitic gap constructions should be degraded (compared to regular gap constructions), because they contain extraction from an island. This is not what we observe. Moreover, island gap constructions should be judged as more acceptable when the Guest in the predicate is Invited compared to when it is Uninvited. This prediction is not borne out either; while island gap constructions were judged as slightly more acceptable when they contained an Invited Guest, a similar effect of context was observed in the other two

constructions. This suggests that the introduction of a novel discourse referent is not what makes island gap constructions unacceptable or difficult to process.

Relatedly, according to the Uninvited Guest Hypothesis, the increase in acceptability that is commonly seen when the Uninvited Guest is replaced by a true gap, as in a parasitic gap configuration, is simply a matter of reduced processing complexity. A prediction following from this idea is that the island violation cannot be 'rescued' by a parasitic gap configuration when the processing demands incurred by island extraction for a given sentence are already very high. In that case, the unacceptability is too strong to show sensitivity to the presence or absence of the Uninvited Guest, and the parasitic gap construction should stay below the threshold of acceptability (see also Culicover 2013). Our results do not corroborate this prediction. For each individual item, it is the case that its acceptability substantially improves with a parasitic gap configuration (see Figure A1 in the Appendix): no matter how unacceptable (and/or difficult to process) the island gap construction, replacing the Guest by a true gap strongly improves the acceptability. In all, the results of Experiment 1 do not suggest that the difference between islands and parasitic gap constructions is a matter of processing complexity involving a new discourse entity.

3 Experiment 2

Section 1.2.2 discussed the common observation that untensed adjunct clauses license extraction more easily than tensed adjunct clauses. Syntactic Theory typically accounts for this observation in terms of the properties of the tensed domains, which block dependency formation because of a syntactic constraint – or, on Truswell's (2011) account, whose introduction prevents the grouping of the events denoted by the main predicate and by the predicate in the adjunct (see also Ernst 2022). Non-grammatical accounts instead explain the difference in non-syntactic terms, pointing out the fact that tensed domains are referential (Chaves 2013; Culicover and Winkler 2022; Hofmeister et al. 2013; Kluender 1998, 2004). Tensed verbs index a new discourse event and also require an overt subject, both of which might contribute to their increased processing cost (Gibson 1998, 2000). The cognitive load incurred by the discourse requirements of tense might interfere with or reduce the activation of other discourse referents, including the filler (Kluender 1998; Warren and Gibson 2002). It is therefore more difficult to establish a dependency between the filler and a gap in a tensed clause than between the filler and a gap in an untensed clause.

We conducted a second acceptability judgment experiment in which we adjusted the stimuli of Experiment 1 such that the adjuncts were tensed clauses with an anaphoric pronominal subject (e.g. *zonder dat hij bezocht,* lit. 'without that he visited') instead of infinitival clauses (e.g. *zonder te bezoeken*, lit. 'without to visit').

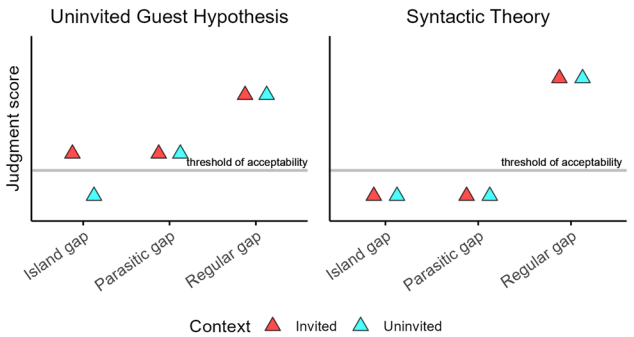

Figure 4: Predicted results for Experiment 2 under the Uninvited Guest Hypothesis (left) and Syntactic Theory (right). The predictions only indicate the expected pattern of results and do not reflect effect sizes. The horizontal gray line reflects a hypothetical threshold of acceptability.

Discourse-based processing theories predict that filler-gap constructions with tensed adjuncts are more difficult to process, which would result in reduced acceptability ratings in all constructions. Because the subject of the adjunct is an anaphoric pronoun for which no novel discourse referent needs to be introduced, the additional processing cost incurred by the subject should only be minimal (Ariel 1990; Gibson 2000; Kluender 1998; Warren and Gibson 2002). The judgment pattern predicted by the Uninvited Guest Hypothesis is therefore the same as in Experiment 1, but with lower overall judgment scores due to the tensed nature of the adjunct clause (Figure 4, left). The predicted pattern for Experiment 2 from Syntactic Theory is different from that for Experiment 1. As Syntactic Theory argues that tense interferes with dependency formation (see Section 1.2.2), island gap and parasitic gap constructions with tensed clauses are thought to be ungrammatical. Both should therefore yield unacceptable ratings, whereas the acceptability of regular gap constructions should be unaffected by the tense of the adjunct. The predictions for the context manipulation remain unchanged (Figure 4, right).

3.1 Methods

3.1.1 Participants

84 self-reported first language speakers of Dutch completed the full questionnaire. None of the participants reporting having a language or reading disorder, and none had participated in Experiment 1. After exclusion criteria were applied (see Section

2.1.4), data from 72 participants were entered into the statistical analysis (age: M = 24.6, SD = 11.2, range = 18–74).

3.1.2 Design and materials

The design of the second experiment was identical to the design of Experiment 1, crossing the factors CONTEXT (invited or uninvited (guest)) and CONSTRUCTION (island gap, parasitic gap, or regular gap) in a 2×3 design. The 30 stimulus items were adjusted so that the adjunct clauses were tensed. For this, we used the periphrastic present perfect with the auxiliary preceding the main verb. The subject of the auxiliary in the adjunct clause was a third-person pronoun, co-referential with the subject of the matrix clause. A sample item is given in (18). There were four exceptions to this adjustment, all of which contained the verb *kennen* 'know', for which we used the simple past because the present perfect would have sounded more unnatural (e.g. *Het spel heeft zij zonder dat zij de regels {kende/?heeft gekend} meteen begrepen* 'the game, she immediately understood without {knowing/?having known} the rules').

(18) a. De stad heeft hij$_i$ [zonder dat hij$_i$ de kerk heeft bezocht] $_{\_RG}$ beoordeeld.
the city has he without that he the church has visited rated
'The city, he rated $_{\_RG}$ without visiting the church.'

b. De stad heeft hij$_i$ [zonder dat hij$_i$ $_{\_PG}$ heeft bezocht] $_{\_RG}$ beoordeeld.
the city has he without that he has visited rated
'The city, he rated $_{\_RG}$ without visiting $_{\_PG}$.'

c. De stad heeft hij$_i$ [zonder dat hij$_i$ $_{\_IG}$ heeft bezocht] de kerk beoordeeld.
the city has he without that he has visited the church rated
'The city, he rated the church without visiting $_{\_IG}$.'

In sum, the experimental materials were the same as those in Experiment 1, except for the adjunct clause, which contained a tensed verb and a pronominal subject in Experiment 2. The items were preceded by the same discourse contexts as in the first experiment, and the same filler items were added to the same experimental lists.

3.1.3 Procedure and analysis

The procedure and exclusion criteria were the same as in Experiment 1. We excluded twelve participants based on these criteria. We also used the same statistical models as in Experiment 1, except that the by-participant random intercept was dropped because it led to singular fit.

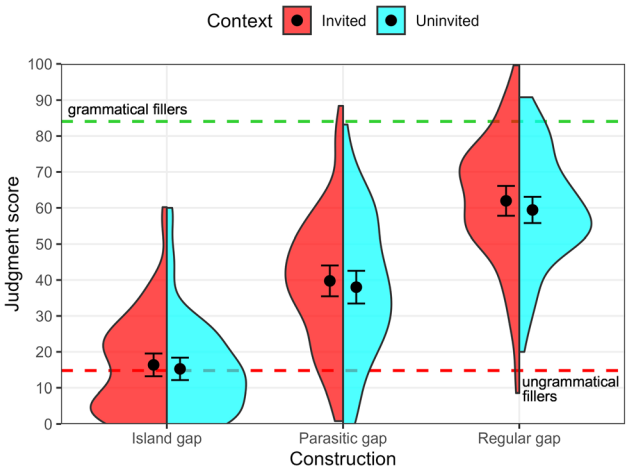

Figure 5: Acceptability judgment scores of Experiment 2, grouped by CONSTRUCTION and CONTEXT. The black dot encodes the mean, the error bars indicate 95 % confidence intervals around the mean. The average judgment scores of the grammatical and ungrammatical filler items are added as rough points of reference. These should not be interpreted as reflecting thresholds of acceptability or unacceptability.

3.2 Results

Figure 5 shows the acceptability judgment scores in each condition. The factor CONSTRUCTION was again coded with two contrasts, the first of which compared the ungrammatical condition (island gap) to the average of the grammatical conditions (regular and parasitic gap). Like in Experiment 1, this comparison showed that the constructions with an island gap (M = 15.8, SE = 0.84) were judged as less acceptable than the constructions with a parasitic gap (M = 38.9, SE = 1.17) or a regular gap (M = 60.7, SE = 1.27), β = –1.00, SE = 0.03, p < 0.001. In contrast to Experiment 1, however, the second contrast showed a significant effect as well: parasitic gap constructions were judged as less acceptable than regular gap constructions, β = –0.64, SE = 0.04, p < 0.001. The effect of discourse CONTEXT in Experiment 2 was numerically similar to that of Experiment 1, with sentences with an Invited Guest (M = 39.4, SE = 1.31) receiving slightly higher acceptability scores than sentences with an Uninvited Guest (M = 37.5, SE = 1.30). However, this effect was not significant, β = –0.06, SE = 0.03, p = 0.054, and the Bayes Factor analysis showed moderate evidence for the null hypothesis, BF_{01} = 3.23. The interactions between CONSTRUCTION and CONTEXT were also not significant, and this null effect was very strongly supported by the Bayes Factor analysis, BF_{01} = 74.48. The fixed and random effects of the full model are shown in Table 3.

Table 3: Results of the mixed-effects model in Experiment 2. The effect of 'Construction1' corresponds to the comparison between the average of the grammatical conditions (regular and parasitic gap) and the ungrammatical condition (island gap). The effect of 'Construction2' corresponds to the comparison between regular gaps and parasitic gaps. *p*-Values lower than 0.05 are indicated in bold.

Predictors	Estimates	CI lower-upper	*t*-Statistic	*p*-Value
(Intercept)	−0.15	−0.21 to −0.09	−5.05	**<0.001**
Context	−0.06	−0.11–0.00	−1.93	0.054
Construction1	−1.00	−1.06–0.94	−32.28	**<0.001**
Construction2	−0.64	−0.71 to −0.57	−17.91	**<0.001**
Context × Construction1	0.03	−0.09–0.16	0.55	0.580
Context × Construction2	0.03	−0.11–0.17	0.42	0.677
Random effects				
σ^2				0.46
$\tau_{00\ item}$				0.02
ICC				0.04
$N_{\ item}$				30
Observations				2,159
Marginal R^2/Conditional R^2				0.378/0.403

3.3 Discussion

Like in Experiment 1, island gap constructions were rated as unacceptable and regular gap constructions were rated as acceptable. Compared to Experiment 1, however, the acceptability of parasitic gap constructions was substantially reduced, such that the average score is exactly in between the scores of island gap and regular gap constructions. Moreover, by-item acceptability scores show that for some items, a parasitic gap in a tensed adjunct clause is even completely unacceptable (see Figure A2 in the Appendix). This suggests that the tense of the adjunct clause, which was the only difference between Experiments 1 and 2, has an asymmetric effect on the acceptability of filler-gap constructions, in line with previous experimental observations in English (Boxell and Felser 2017; Kurtzman and Crawford 1991; Phillips 2006). Experiment 2 showed no effect of context, although the small difference in acceptability of sentences with an Invited Guest and sentences with an Uninvited Guest was similar to that in Experiment 1.

4 Comparing Experiments 1 and 2

4.1 Methods

Comparing the results of Experiments 1 and 2, it appears that the tense of the adjunct clause only affects the acceptability of parasitic gap constructions. To test this impression, we pooled the data from both experiments together and analyzed the three-way interaction between tense (a between-subjects variable), construction and context (both within-subjects variables) in a linear mixed-effects model. The factors CONSTRUCTION (island gap, parasitic gap, regular gap), TENSE (untensed, tensed) and CONTEXT (invited, uninvited (guest)) were entered as fixed effects, together with their interactions. As in Experiments 1 and 2, we used Helmert coding for CONSTRUCTION and deviation coding for CONTEXT. The two-level factor TENSE was also deviation coded (−0.5, 0.5). We initially included random intercepts for both items and participants. However, because these models led to singularity issues, the by-participant random intercept was removed and only the by-item random intercept was retained.

4.2 Results

The fixed and random effects of the model with the three-way interaction are presented in Table 4. Leaving aside the effects already present in the data from Experiments 1 and 2, two effects are worth discussing. First, there was a main effect of TENSE: constructions with untensed adjunct clauses (M = 44.0, SE = 0.70) were perceived as more acceptable than constructions with tensed adjuncts (M = 38.3, SE = 0.70), β = 0.11, SE = 0.02, p < 0.001. However, as is clear from Figure 6, the effect of TENSE is not consistently the same across the different constructions. Parasitic gap constructions are rated as substantially less acceptable when the parasitic gap is in a tensed clause than when it is in an untensed clause, but the effect of tense seems to go in the other direction for both island gap and regular gap constructions. Indeed, both interactions between TENSE and CONSTRUCTION were significant (Construction1 × Tense: β = −0.33, SE = 0.04, p < 0.001; Construction2 × Tense: β = 0.61, SE = 0.05, p < 0.001). Post-hoc pairwise comparisons (Tukey-corrected) confirm the pattern observed in Figure 6: parasitic gap constructions are rated as less acceptable when they are tensed (M = 41.5, SE = 1.18) than when they are untensed (M = 55.5, SE = 1.08), β = −0.52, SE = 0.03, z = −14.9, p < 0.001. In contrast, island gap constructions are rated as slightly more acceptable when they are tensed (M = 18.5, SE = 0.85) than when they are untensed (M = 11.3, SE = 0.83), β = 0.11, SE = 0.03, z = 3.29, p = 0.013 (BF_{10} = 260.07). The effect of tense on regular gap constructions was not significant, β = 0.09, SE = 0.03, z = 2.50, p = 0.125. The

Table 4: Results of the mixed-effects model analyzing Experiment 1 and 2. The effect of 'Construction1' corresponds to the comparison between the average of the grammatical conditions (regular and parasitic gap) and the ungrammatical condition (island gap). The effect of 'Construction2' corresponds to the comparison between regular gaps and parasitic gaps. *p*-Values lower than 0.05 are indicated in bold.

Predictors	Estimates	CI lower-upper	*t*-Statistic	*p*-Value
(Intercept)	−0.10	−0.15– to 0.05	−3.72	**<0.001**
Context	−0.07	−0.11 to −0.03	−3.32	**0.001**
Construction1	−1.16	−1.20 to −1.12	−54.40	**<0.001**
Construction2	−0.34	−0.39 to −0.29	−13.88	**<0.001**
Tense	0.11	0.07–0.15	5.26	**<0.001**
Context × Construction1	0.06	−0.03–0.14	1.32	0.186
Context × Construction2	0.03	−0.07–0.12	0.56	0.576
Context × Tense	−0.02	−0.10–0.05	−0.60	0.549
Construction1 × Tense	−0.33	−0.41 to −0.25	−7.75	**<0.001**
Construction2 × Tense	0.61	0.51–0.70	12.30	**<0.001**
Context × Construction1 × Tense	0.04	−0.13–0.20	0.43	0.664
Context × Construction2 × Tense	0.01	−0.18–0.21	0.12	0.901
Random effects				
σ^2	0.43			
$\tau_{00\ item}$	0.02			
ICC	0.04			
$N_{\ item}$	30			
Observations	4,289			
Marginal R^2/Conditional R^2	0.433/0.455			

latter two results likely reflect the fact that the two experiments tested different participants. The participants in Experiment 2 gave higher judgments overall, both for the island violations (on average, 7.2 points higher than in Experiment 1) as well as for the regular gap constructions (on average, 6.8 points higher than in Experiment 1).[6] The latter difference was probably not significant because of the larger within-subjects variance in the responses to regular gap constructions (indeed, there was only anecdotal evidence for the null, $BF_{01} = 1.21$). Given these methodological considerations, we do not think that the significant effect of tense on the acceptability of island violations is theoretically informative. However, because the effect of tense on the acceptability

6 In fact, even the acceptability scores of the fillers were significantly higher in Experiment 2 than in Experiment 1 ($\beta = 0.11$, $SE = 0.05$, $t = 2.46$, $p = 0.015$), despite the fact that these items were identical in the two experiments. This shows that the participants in Experiment 2 gave higher judgments in general, and indicates that any difference between the experiments in the same direction is difficult to interpret theoretically.

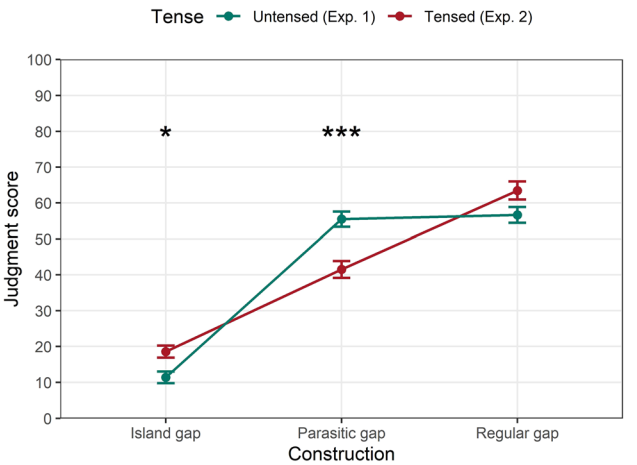

Figure 6: Acceptability judgment scores of Experiments 1 and 2 combined, collapsed over CONTEXT and grouped by CONSTRUCTION and TENSE. The error bars indicate 95 % confidence intervals around the mean. *$p < 0.05$, ***$p < 0.001$.

of parasitic gap constructions goes in the other direction, this difference cannot be explained by the fact that the participants in Experiment 2 gave higher judgments in general. Instead, it suggests that parasitic gaps are genuinely less acceptable when they are located in a tensed clause.

4.3 Discussion

A number of observations in the data of both experiments deserve discussion. To begin with, none of the experimental items were rated as highly acceptable. In Experiments 1 and 2, regular gap constructions were rated with an average acceptability of around 60, whereas the grammatical fillers received an acceptability score of around 80. Even though this difference is quite substantial, we do not think that it indicates that the regular filler-gap constructions were perceived as ill-formed. The order of the words in filler-gap dependencies deviates from the canonical word order, due to which these constructions are commonly perceived as complex and difficult to process (Gibson 1998; Hawkins 1999), and receive low acceptability judgments even if they are unquestionably grammatical (Kurtzman and Crawford 1991; Phillips 2006). By contrast, the grammatical fillers were short, simple, and transparently related to the discourse context, so these differences are likely due to the length and complexity of the experimental items.

In Experiment 1, the acceptability of the target sentences was modulated by the discourse context: sentences with an Invited Guest received higher ratings than sentences with an Uninvited Guest. While this main effect of context was not explicitly predicted (see Figure 1), it is not incompatible with either the Uninvited Guest Hypothesis or with Syntactic Theory. A regular gap construction like *the city, he rated without visiting the church* is more likely to follow a context in which a church has been introduced (Invited, see Table 1) than a context in which a football stadium has been introduced (Uninvited), in particular given the definiteness of *the church,* which implies givenness (Schoenmakers 2023). The effect of context also shows that the discourse manipulation successfully manipulated the discourse accessibility of the guest. Importantly, it did not affect the acceptability of island gap constructions more strongly than it affected regular gap and parasitic gap constructions. As we noted in Section 2.2, the absence of the predicted interaction is not a matter of statistical power, as the effect of context is numerically larger for both regular and parasitic gap constructions than it is for island gap constructions, and a Bayes Factor analysis showed strong evidence for the null hypothesis of no interaction.

The pattern of results observed in Experiment 2 was slightly different. There was no effect of context, and the acceptability of parasitic gap constructions was substantially reduced compared to Experiment 1. Pooling the data from both experiments together, we found an interaction between tense and construction, showing that the manipulation of tense affected the constructions differently: parasitic gap constructions are rated as substantially less acceptable when the parasitic gap is in a tensed clause as compared to when it is in an untensed clause, whereas island gap constructions are rated as slightly more acceptable when the gap is in a tensed clause. The fact that tense has a strongly asymmetrical effect on the acceptability of these constructions is inconsistent with the discourse-processing nature of the Uninvited Guest Hypothesis. Discourse-processing theories argue that the reduced acceptability of sentences with tensed clauses is due to the discourse requirements of tense, which indexes a new discourse referent and therefore incurs additional processing cost (Chaves 2013; Culicover and Winkler 2022; Gibson 1998, 2000; Hofmeister et al. 2013). According to this view, and contrary to what we observe, the effect of finite tense should apply to all three constructions alike, because the overt subject of the adjunct clause intervenes between the filler and the gap in all three constructions.

The effect of tense on parasitic gap constructions is in line with Syntactic Theory, which holds that tense hampers filler-gap dependency formation and therefore predicts reduced acceptability for constructions with parasitic gaps in tensed clauses. However, this predicted effect of tense is categorical: parasitic gap constructions with tensed clauses are thought to be ungrammatical (Bennis and Hoekstra 1985; Huybregts and van Riemsdijk 1985). The gradient effect of tense on the acceptability

of parasitic gap constructions (which has been observed previously; Boxell and Felser 2017; Kurtzman and Crawford 1991; Momma and Yoshida 2023; Phillips 2006) is therefore not entirely consistent with Syntactic Theory either. We discuss these results further in Section 5.1.

5 General discussion

Whether restrictions on filler-gap dependencies should be explained in terms of syntactic or non-syntactic factors has been a major debate in linguistics for over three decades. Here, we empirically evaluated a recent theory, the Uninvited Guest Hypothesis, which aims to explain the (un)acceptability of different kinds of filler-gap constructions in terms of demands on discourse processing (Culicover and Winkler 2022). In order to test the predictions of the Uninvited Guest Hypothesis, which we contrasted with the predictions of Syntactic Theory, we conducted two acceptability judgment experiments in Dutch. Participants were asked to rate three types of target sentences: regular gap constructions, parasitic gap constructions, and island gap constructions. These were preceded by a short context that manipulated the discourse accessibility of a referring argument in the target sentence. The two experiments differed in whether the adjunct clause in the target sentence was untensed (Experiment 1) or tensed (Experiment 2). As we discuss in the next section (Section 5.1), the overall pattern of results is not in line with the Uninvited Guest Hypothesis, but it is predicted by Syntactic Theory and therefore supports a syntactic origin of parasitic gap constructions. However, because Syntactic Theory does not fully account for the gradient effect of tense on parasitic gap constructions, we also evaluate the data against the predictions of alternative accounts of filler-gap dependencies (Section 5.2). In Section 5.3, we end with a brief discussion of remaining challenges for theories of parasitic gap constructions.

5.1 The Uninvited Guest Hypothesis versus Syntactic Theory

Experiment 1 showed that island gap constructions were judged as unacceptable, confirming the status of adjuncts as strong islands in Dutch. Regular gap and parasitic gap constructions instead received (equally) high acceptability scores. Moreover, the unacceptability of islands was not affected by supporting discourse; islands received low ratings, regardless of whether the referring argument was discourse-given or discourse-new. Neither the similar acceptability of regular gap and parasitic gap constructions, nor the absence of an effect of context on the acceptability of island gap constructions, is in line with the predictions of the Uninvited Guest

Hypothesis (Figure 1). Experiment 2 showed a very similar pattern of results, except that the acceptability of parasitic gap constructions with tensed adjuncts was now in between the acceptability of (unacceptable) island gap constructions and (acceptable) regular gap constructions. This construction-specific effect of tense on the acceptability of filler-gap dependencies was also not predicted by the Uninvited Guest Hypothesis. Discourse-processing accounts tend to explain effects of tense on the acceptability of filler-gap dependencies by noting that tensed clauses are referential; they introduce referents that are tracked in the discourse and thereby add a measurable cognitive load to processing (Chaves 2013; Culicover and Winkler 2022; Hofmeister et al. 2013; Kluender 1998). Filler-gap dependencies targeting tensed clauses are therefore both more difficult to process and less acceptable than filler-gap dependencies targeting untensed clauses, as shown by the contrast between examples (19a) and (19b).

(19) a. Which questions did he know [how to answer _]? >
b. Which questions did he know [how he should answer _]?
(Hofmeister et al. 2013: 45)

This account fails to explain our results, because the effect of finite tense on parasitic gap constructions was opposite to its effect on island gap constructions. If the discourse-processing demands imposed by tensed domains lead to a reduction in acceptability, we should have seen a similar effect in regular gap and island gap constructions.

The results of Experiment 1 are in line with Syntactic Theory in the sense that what is (deemed) grammatically licensed is judged as acceptable, and what violates a grammatical principle is judged as unacceptable. However, the gradient effect of tense on the acceptability of parasitic gap constructions in Experiment 2 was not predicted by Syntactic Theory. In Section 1.2.2 we discussed two syntactic accounts of parasitic gap constructions in Dutch. These accounts resort to different theoretical notions to explain differences in the distribution of parasitic gaps in Dutch and English. In particular, Huybregts and van Riemsdijk (1985) rely, among other things, on differences between the two languages in the government properties of prepositions to explain why Dutch does not have parasitic gaps of the type found in English. They analyze (what appear to be) parasitic gaps in Dutch as ATB extraction from coordinates. From this, it follows rather naturally that parasitic gaps in tensed clauses, which would involve subordination, are impossible. While Bennis and Hoekstra (1985) present a different analysis, they also rely on cross-linguistic differences in the government properties of prepositions in order to explain why parasitic gaps in tensed clauses are grammatical in English but not in Dutch. However, it is not so clear that Dutch and English actually differ in this respect. Experimental studies have shown that parasitic gaps in tensed clauses in English are judged

as degraded but not fully unacceptable (Boxell and Felser 2017; Kurtzman and Crawford 1991; Momma and Yoshida 2023; Phillips 2006), just like what we find for Dutch. Our Experiment 2 showed that although tensed parasitic gap constructions are less acceptable than their untensed counterparts, they are not rejected to the same extent as island violations.[7] This gradient effect of tense is not captured by formal accounts of either English or Dutch, and we suggest that it should not be explained in syntactic terms.

Indeed, a possible alternative can be found outside of syntax, by adopting Truswell's (2011) proposal, which concerns a semantic condition. That is, it might be the case that our participants attempted to coerce the separate event readings triggered by the sentences with a tensed adjunct clause into grouped event readings, so as to achieve a meaningful interpretation that complies with semantic conditions (cf. De Swart 1998); the Single Event Grouping Condition in particular (see (7) in Section 1.2.2). Such coercion processes are computationally costly (Paczynski et al. 2014; Piñango et al. 1999) and might lead to degraded acceptability ratings. The latter happens with parasitic gap constructions in particular, because the filler in those constructions is the semantic complement of the verb in both of the matrix clause and the adjunct clause. The predicates in both clauses are therefore more strongly related in parasitic gap constructions than in both island gap and real gap constructions, in which the complements of the matrix and adjunct verb are different. People might therefore be tempted more strongly to coerce the separate events of the two clauses in parasitic gap constructions, explaining why tense has an asymmetrically degrading effect on acceptability. We do note that the details of this non-syntactic proposal are to be worked out in future research, because the relationship between processing costs and acceptability judgments is not straightforward (Sprouse et al. 2012).

5.2 Alternative non-syntactic accounts of filler-gap dependencies

In this section, we evaluate how alternative non-syntactic theories of filler-gap constructions fare with respect to our results. Following Abeillé et al. (2020) and Liu et al. (2022), these non-structural proposals are grouped into discourse-pragmatic accounts and processing accounts. The accounts are different in spirit, but they share

7 At least, not all of them. Figure A2 in the Appendix shows that, for some items, constructions with a parasitic gap located in a tensed adjunct clause are judged as unacceptable as the corresponding island violation.

the underlying idea that island violations are not ungrammatical and that their low acceptability is due to non-grammatical factors.

5.2.1 Discourse-pragmatic accounts

5.2.1.1 Discourse clash

Proposals by Goldberg (Cuneo and Goldberg 2023; Goldberg 2006, 2013) and Abeillé et al. (2020) aim to explain constraints on filler-gap dependencies in terms of the information structure properties of the constructions involved. The idea is that when speakers combine multiple base constructions to form an utterance, they must try to ensure that the discourse functions of these constructions are compatible. Both proposals hold that constraints on extraction are the result of a clash between discourse functions. Specifically, they argue that it is infelicitous for a speaker to simultaneously foreground and background an element (for the original formulation of this idea, see Erteschik-Shir 1973). Thus, if a filler-gap dependency construction places an element (the filler) in focus, it should not be combined with another construction that backgrounds that same element (the gap). These accounts can explain, for instance, why it is easier to *wh*-extract from objects (20b) than from subjects (20a). The subject typically contains discourse-given information, whereas objects typically provide discourse-new information and therefore belong to the focus domain. Because the questioned element in *wh*-questions is focused, it can more easily be related to the object than to the subject argument.

(20) a. Which politician did [the article about _] surprise the journalists? <
b. Which politician did the journalist write [the article about _]? <
c. Which politician did the journalist write [an article about _]?

Discourse-clash accounts can also explain the observation, already noted in Chomsky (1973), that it is easier to extract from indefinite NPs (20c) than from definites (20b). Because indefinite NPs usually introduce discourse-new entities, they are more likely to belong to the focus domain, less likely to be considered backgrounded, and thus easier to combine with a fronting construction that makes the fronted element discourse-prominent.

Backgroundedness is a gradient notion, which might be operationalized via main clause negation. That is, a sentence part is backgrounded if the proposition conveyed by it is *not* negated by negation of the main clause (Cuneo and Goldberg 2023; Goldberg 2013; see also Erteschik-Shir's 1973 *lie test*). Supporting the idea that extraction from backgrounded constituents leads to island effects, Cuneo and Goldberg (2023) experimentally show that the extent to which a constituent is unaffected by main clause negation is inversely correlated with acceptability judgments of the corresponding *wh*-question. To determine the discourse status of the clausal

adjuncts in our stimuli, we can apply this negation test to the base sentence in (21a), from which the topicalization construction in (17c) is derived.[8] Main clause negation of (21a) yields (21b).[9]

(21) a. Hij heeft na de stad te hebben bezocht de kerk beoordeeld.
he has after the city to have visited the church rated
'He rated the church after visiting the city.'

b. Hij heeft na de stad te hebben bezocht de kerk niet beoordeeld.
he has after the city to have visited the church not rated
'He did not rate the church after visiting the city.'

To determine if (21b) implies that the proposition expressed in the adjunct is negated, we should ask the question *did he visit the city?*. Affirmative responses would indicate that the adjunct clause is considered backgrounded. It seems to us that this kind of adjunct clause is unaffected by main clause negation, making it a backgrounded constituent (Cuneo and Goldberg 2023).

Discourse-clash accounts hold that the backgrounded status of clausal adjuncts is incompatible with a fronting operation that foregrounds an element. Abeillé et al.'s (2020) *Focus-Background Conflict* limits this constraint to fronting dependencies that place the filler in focus, i.e. to *wh*-dependencies. Our stimuli made use of topicalization, however, which is a non-focus type of fronting; the fronted element is a topic, given with respect to the preceding discourse. There is consequently no clash between the backgrounded discourse status of the adjuncts and the non-focused status of topicalization, at least on Abeillé et al.'s (2020) account.[10] This analysis would

8 In examples (21a) and (21b), the adjunct is introduced by *na* 'after' rather than *zonder* 'without', which we used in the experiments. The reason that we chose a different preposition to illustrate the effect of main clause negation is that adjuncts introduced by *zonder* 'without' involve negation already, making them not ideal for the negation test. The double negation in *Hij heeft zonder de stad te bezoeken de kerk niet beoordeeld* 'he did not rate the church without visiting the city' might yield the pragmatic implicature that the proposition in the main clause is *not* negated; that is, it might actually imply that he *did* rate the church (and that he *did* visit the city). The example in (21b) shows that the backgrounded status of clausal adjuncts in our stimuli is better illustrated with temporal adjuncts introduced by *na* 'after', because these do not involve negation.

9 The main clause in (21a) can also be negated by inserting *niet* 'not' at a higher syntactic position, as in *Hij heeft na de stad te hebben bezocht* ***niet*** *de kerk beoordeeld*, but this is less natural and more marked (Schoenmakers 2020). In any case, what is important is that this sentence also does not imply that the proposition in the adjunct is negated, so it similarly suggests that adjuncts introduced by prepositions like *na* 'after' are backgrounded constituents.

10 Topicalized elements can be considered as foregrounded or prominent within the domain of the dependency on Goldberg's (2006, 2013) account, although the degree of foregrounding may be different between dependency types. This is a crucial difference with Abeillé et al.'s (2020) *Focus-Background Conflict*, which only applies to dependencies that place the filler in focus (see Cuneo and Goldberg 2023 for discussion).

therefore predict that the island gap constructions we tested are acceptable, contrary to what we observe. In fact, discourse-clash accounts would predict that the information structural clash is *enhanced* in parasitic gap constructions because of the additional gap in the main clause predicate. This gap is located in a foregrounded domain (cf. Cuneo and Goldberg 2023), which clashes with the backgrounded status of the gap located inside the adjunct clause, and, on Abeillé et al.'s (2020) account, also with the non-focused status of the topicalized filler. Parasitic gap configurations should thus lead to reduced acceptability, which is not the case. Indeed, Cuneo and Goldberg (2023: 16) conclude that parasitic gaps "require some additional machinery since they appear in subordinate clauses [which are considered backgrounded constituents] and yet are judged relatively acceptable."

In sum, our findings for island constructions pose a challenge to Abeillé et al.'s (2020) discourse-clash account, because topicalization should not trigger a Focus-Background Conflict. Yet, such sentences received fully unacceptable ratings. Moreover, parasitic gap constructions pose a challenge to discourse-clash accounts more generally, because the filler, the regular gap, and the parasitic gap are associated with different discourse functions, which inevitably leads to an information structural clash. Because parasitic gap constructions received acceptable ratings (in Experiment 1), our findings do not corroborate discourse-clash accounts.

5.2.1.2 Relevance

A second discourse-pragmatic account aims to explain island effects in terms of the pragmatic felicity of the proposition expressed by the filler-gap construction (Chaves and Putnam 2020). It holds that the filler must be important for the action conveyed by the main predicate, otherwise it does not make sense to draw attention to that element. Building on the work of Deane (1991), Erteschik-Shir and Lappin (1979), and Kuno (1987), Chaves and Putnam (2020) formulate this pragmatic constraint in their Relevance Presupposition Condition.

(22) **Relevance Presupposition Condition**
The referent that is singled out for extraction in a[n Unbounded Dependency Construction] must be highly relevant (e.g. part of the evoked conventionalized world knowledge) relative to the main action that the sentence describes. Otherwise, extraction makes no sense from a Gricean perspective, as there is no reason for the speaker to draw attention to a referent that is irrelevant for the main contribution of the sentence to the discourse.

(Chaves and Putnam 2020: 206)

This condition states that if the extracted referent, the filler, has little relevance for the main action of the utterance – that is, the assertion of the utterance is not *about*

the extracted referent (Kuno 1987) – the filler-gap dependency describes a pragmatically unusual situation. To illustrate the idea, consider the *wh*-questions in (23). The two examples are structurally identical, both containing extraction from a complex NP, but there appears to be a difference in acceptability: (23a) is commonly judged to be more acceptable than (23b).

(23) a. Who did you read [a book about _]? >
b. Who did you drop [a book about _]?

Because people usually read books because of their content, the topic of *the book* is more relevant for the act of reading a book than it is for the act of dropping a book. The extracted referent is part of common world knowledge evoked by the verb – it is *relevant* – and can therefore be extracted more easily in (23a) than in (23b). This difference is not specific to extraction; the corresponding declaratives show a similar acceptability contrast, as revealed by Kuno's (1987) *speaking of X*-test in (24).

(24) a. Speaking of Chomsky, I just read a book about him. >
b. Speaking of Chomsky, I just dropped a book about him.

Chaves and King (2019) tested the effect of relevance on extractability experimentally. In their study, one group of participants was asked to indicate for each sentence how relevant the referent is for the main proposition expressed by the utterance, answering questions like: *how much does the topic of a book matter when reading a book?* and *how much does the topic of a book matter when dropping a book?*. Higher scores on these questions indicate that the referent is more relevant for the overall proposition. Another group of participants was asked to rate the acceptability of the corresponding interrogatives, like those in (23). Correlation analyses revealed a positive relationship between the relevance of each referent and the acceptability of extracting that referent, showing that relevance predicts the possibility of extracting from a complex NP.

Chaves and Putnam (2020) suggest that this account can also explain the possibility of extracting from adjuncts. The event described by an adjunct is usually disjoint from the event described by the main verb, in which case it makes little sense to emphasize someone or something in the adjunct by means of extraction. For instance, consider the adjunct island violation in (25).

(25) *Which concert did Tom drink beer [during _]?

It is unclear why a particular concert is relevant for the proposition of the main predicate. The concert bears no obvious relation to Tom's act of drinking beer, so it is infelicitous to bring that concert into focus via extraction. According to Chaves and Putnam (2020), extraction from adjuncts is constrained by the semantic-pragmatic relationship between the adjunct and the main clause predicate.

To evaluate whether relevance can explain the unacceptability of our island gap constructions, we should first determine whether the relevance of the filler differs across the three filler-gap constructions. As this relationship is not specific to extraction, we can evaluate whether the propositions underlying the corresponding declaratives are equally plausible. The declarative counterparts to the filler-gap constructions in (17) are shown in (26), in which the filler is indicated in bold. Clearly, the filler is relevant for the main clause predicate in the declarative counterpart to both the regular gap construction (26a) and the parasitic gap construction (26b), because it is the direct object of the verb in the main clause. The proposition in (26c), however, is somewhat odd; it is not immediately clear in what sense the fact that Tim did not visit the city has anything to do with him rating the church.

(26) a. Tim heeft zonder de kerk te bezoeken **de stad** beoordeeld.
Tim has without the church to visit the city rated
'Tim rated the city without visiting the church.'
b. Tim heeft zonder de stad te bezoeken **de stad** beoordeeld.
Tim has without the city to visit the city rated
'Tim rated the city without visiting the city.'
c. Tim heeft zonder **de stad** te bezoeken de kerk beoordeeld.
Tim has without the city to visit the church rated
'Tim rated the church without visiting the city.'

Without context, *the city* seems irrelevant for the proposition expressed by the main clause predicate, in line with the fact that the corresponding island gap constructions in (17c) and (18c) were judged as unacceptable. However, the target sentences were not presented without context. Each sentence was preceded by a short preamble that contextualizes the target proposition. The context for these target sentences describes a situation in which someone gave an online rating of a city and/or church, without visiting either (see Table 1). This information allows both the island gap constructions in (17c) and (18c), as well as the corresponding declarative in (26c), to be felicitously interpreted as stating that Tim rated the church without even actually visiting the city. In other words, when embedded in a supporting discourse context, the referent extracted from the adjunct clause (*the city*) becomes relevant for the situation described by the main predication (*he rated the church*). The discourse thus justifies the mentioning of the clausal adjunct and makes the proposition of the target sentence plausible (Chaves and King 2019). This is not in line with the unacceptability of the adjunct island violations in Experiments 1 and 2, suggesting that (ir)relevance is not the right explanation for the observed (un)acceptability of these constructions.

5.2.2 Processing accounts

Processing accounts hold that variation in the acceptability of different kinds of filler-gap dependencies can be explained by appealing to non-syntactic constraints on language processing (Deane 1991; Hofmeister 2011; Hofmeister and Sag 2010; Kluender 1991, 1998, 2004). The key idea is that the processing of a filler-gap dependency can be disrupted by intervening material that demands cognitive resources, including the processing-heavy boundaries of island constituents. Putative island effects then result from an interactive (non-linear, non-additive) combination of multiple processing burdens.

In an influential study, Hofmeister and Sag (2010) argued that the severity of certain island phenomena can be explained in terms of the semantic and syntactic complexity of the filler. It is commonly observed that island effects in *wh*-questions are significantly attenuated if the *wh*-phrase is a complex *which*-N phrase (27a) compared to when it is a bare *wh*-item (27b). This attenuation effect for sentences with a complex *wh*-phrase is reflected both in higher acceptability judgments and in faster reading times at and after the gap site (Hofmeister and Sag 2010; Hofmeister et al. 2013).

(27) a. Which questions did he know [how to answer _]? >
b. What did he know [how to answer _]?

Hofmeister and Sag (2010) stated that linguistic expressions that contain more syntactic and semantic features are more strongly activated and less resistant to interference from intervening material. As a result, they are more accessible and therefore more easily retrieved from memory at the gap site (see also Hofmeister 2011). Because the retrieval of complex fillers is facilitated even if the corresponding gap resides inside an island, they argued that the variable cost of retrieval can explain the processing difficulty of certain island configurations.

While processing factors undoubtedly play a role in the acceptability of filler-gap dependencies, this specific account does not explain our results. First, the topicalized filler and the gap in the adjunct island are linearly extremely close. They are separated by only three words in Experiment 1 and by five words in Experiment 2. But more importantly, they are not separated by any referential NPs that could interfere with the activation of the filler. In both experiments, the only intervening referents are third-person pronouns (*de stad* ***heeft hij zonder*** *_ te bezoeken …*, lit. 'the city has he without to visit …' and *de stad* ***heeft hij zonder dat hij*** *_ bezocht …*, lit. 'the city has he without that he visited …'). These should not lead to similarity-based interference because they do not share any semantic or syntactic features with the filler (Gordon et al. 2001; Villata et al. 2016). Second, the filler is always a discourse-accessible referent, which is semantically rich (or 'specific') by virtue of being linked

to a preceding discourse context. Because of the specificity of the filler in our stimuli, it is unlikely that the acceptability of island violations would improve if the complexity of the filler were enhanced even more. Indeed, the adjunct island violation in (28) has low acceptability, despite the fact that the filler is syntactically complex and semantically rich (compare this to the corresponding canonical (gap-less) sentence in (29)).

(28) *De stad met de bekende kathedraal heeft hij [zonder _ te bezoeken]
the city with the famous cathedral has he without to visit
een geweldige vakantie gehad.
a wonderful holiday had
'The city with the famous cathedral, he had a wonderful holiday without visiting _.'

(29) Hij heeft [zonder de stad met de bekende kathedraal te bezoeken]
he has without the city with the famous cathedral to visit
een geweldige vakantie gehad.
a wonderful holiday had
'He had a wonderful holiday without visiting the city with the famous cathedral.'

Hofmeister and colleagues' processing account does not explain why topicalization out of adjunct islands leads to a strong reduction in acceptability. Another problem with this and similar accounts is that "phenomena like parasitic gaps are currently without a detailed explanation" (Hofmeister et al. 2013: 61). Psycholinguistic experiments with subject islands have shown that people posit gaps only in untensed subject islands, which can be rescued via a parasitic gap configuration, but not in tensed subject islands, which do not allow parasitic gaps (Boxell and Felser 2017; Phillips 2006). The fact that people can posit gaps in island environments is problematic for processing accounts, which attribute people's failure to construct filler-gap dependencies into islands to non-syntactic limitations of sentence-processing mechanisms. If dependency formation does not occur in island constituents because islands are difficult to process, then it should not occur in island constituents that are potential parasitic gap environments either (Phillips 2006, 2013). It turns out that people can posit gaps inside islands, but only when that is allowed by the grammar of parasitic gaps.

5.3 Conclusion and outlook: multiple gap constructions

In the preceding sections we noted that non-syntactic accounts cannot readily explain why parasitic gap constructions are acceptable, even if these accounts can

explain variation in the acceptability of certain types of island constructions. This suggests that an analysis of parasitic gap constructions minimally requires a syntactic base. However, a final challenge to such syntactic accounts is the existence of acceptable constructions that contain multiple gaps, none of which are parasitic. These constructions have recently been used to argue in favor of a non-syntactic account of the dependencies that are classically labeled as parasitic gaps (Chaves 2013; Chaves and Putnam 2020). In this section, we explain why the existence of such non-parasitic multiple gap constructions does not provide a compelling argument against syntactic accounts of parasitic gaps.

To explain why parasitic gap constructions are relatively acceptable even though they contain a gap inside an island, it has been suggested that when the comprehender has reactivated the filler at the first gap, processing of the second gap is facilitated (Chaves 2013; Liu et al. 2022). Evidence in favor of this idea is that island constructions improve not only when a regular, licit gap is added, but also when an additional illicit gap inside an island is added. For instance, (30) and (31) are thought to be acceptable, even though they contain two illicit gaps. In both cases, the two gaps are linked to the same filler, but these are not parasitic gap constructions, because both gaps are located inside an island (Chaves and Putnam 2020; Culicover 2013).

(30) a man [who $]_i$ [friends of $\__i$] think that [enemies of $\__i$] are everywhere

(31) a man [who $]_i$ [everyone [who knows $\__i$]] thinks that [everyone [who dislikes $\__i$]] is misguided

(Culicover 2013: 161–162)

This processing account of parasitic gaps is also supported by examples like (32), in which the filler phrase corresponding to one gap itself contains a gap, which is linked to another filler (Chaves 2013; Pollard and Sag 1994). One of the gaps in (32) is illicit, the other is licit. Yet, (32) is not a parasitic gap construction, because the two gaps are not linked to the same filler.

(32) There are certain heroes$_i$ that [long stories about $\__i$ $]_j$ are always very easy to listen to $\__j$.

(Pollard and Sag 1994: 199)

The acceptability of these examples seems to support the idea that processing one gap makes it easier to process another gap, even when there is no obvious syntactic relation between the two gaps. Indeed, based on examples such as these, Chaves and Putnam (2020: 84) concluded that "there is no grammatical distinction between 'parasitic' and 'real' gaps."

However, the existence of non-parasitic multiple gap constructions such as (30)–(32) does not provide an argument in favor of a processing account of parasitic

gaps, because not all multiple gap constructions are processed in the same way. For instance, comprehension experiments by Wagers and Phillips (2009) show that when people read sentences with *wh*-extraction, they actively search for a second gap in ATB extraction from coordinated VPs, but they do not search for a gap in postverbal adjunct clauses. The two gaps in ATB constructions are governed by the Coordinate Structure Constraint (Ross 1967), which states that one gap must occur in each coordinated phrase, so the second gap is obligatory (e.g. *which computer did you test _ and repair _/*it?*). The second gap in postverbal adjuncts, which are a potential parasitic gap environment, is however optional (e.g. *which computer did you test _ before repairing _/it?*). It thus seems that processing a second gap is easier only when that second gap is mandatorily required by the grammar (here, the Coordinate Structure Constraint). On the production side, Momma and Yoshida (2023) showed that when speakers have to produce *wh*-questions, they plan the verb before sentence onset only if the verb and the *wh*-phrase engage in a direct syntactic relationship. More specifically, speakers plan the verb of a secondary clause before producing the sentence-initial *wh*-phrase when that *wh*-phrase is a syntactic complement of the verb, as is the case in ATB constructions (e.g. *[which computer]$_i$ did you test and repair _$_i$?*), but not when it is a constituent that bears a theme/patient role but is not a syntactic complement, as in parasitic gap constructions (e.g. *[which computer]$_i$ did you test before repairing _$_i$?*). These results provide experimental evidence against the idea that the syntactic relationship between filler and gap is shared between ATB and parasitic gap constructions (see also Postal 1993).

Psycholinguistic data such as these show that not all multiple gap constructions are alike, and that the acceptability of non-parasitic multiple gap constructions by itself is not an argument against a syntactic account of parasitic gaps. It must first be shown that constructions like (30)–(32) are processed in the same way as regular parasitic gap constructions, which need not be the case. For instance, the relative acceptability of (30) and (31) could be due to a preference for parallel extraction (Parker 2017).[11] Likewise, the acceptability of (32) could be explained by the fact that it suggests a possible second reading, in which both gaps are linked to *heroes*, as if it is a parasitic gap configuration. The seeming availability of this co-referential

11 Taking away the parallelism, for instance by placing the second gap in an object, as in (i) and (iii), indeed seems to reduce the acceptability.

(i) a man [who]$_i$ [friends of _$_i$] do not like [enemies of _$_i$] at all <
(ii) a man [who]$_i$ [friends of _$_i$] think that [enemies of _$_i$] are everywhere

(iii) a man [who]$_i$ [everyone [who knows _$_i$]] hates [everyone [who dislikes _$_i$]] a lot <
(iv) a man [who]$_i$ [everyone [who knows _$_i$]] thinks that [everyone [who dislikes _$_i$]] is misguided

interpretation might interfere with people's judgment about the acceptability of the sentence under the correct reading indicated in (32), a kind of grammatical illusion (Phillips et al. 2011).[12] Thus, before the acceptability of these examples can be used to support a non-syntactic account of parasitic gaps, alternative processing accounts of the corresponding judgments must first be ruled out (e.g. based on parallelism). Furthermore, it must be shown that non-parasitic multiple gap constructions exhibit the same properties as regular parasitic gap constructions, which are licensed under specific conditions (Section 1.2.1; see also Chomsky 1986; Culicover 2001; Engdahl 1983; Taraldsen 1981). For instance, parasitic gaps show typical island effects, as shown in (33a). This sentence is unacceptable, arguably because the parasitic gap is embedded in not one but two adjunct clauses. As such, (33a) violates a locality restriction on extraction, as does the adjunct island violation in (33b).

(33) a. *a book that people buy _ [without understanding linguistics [after reading _]]
b. *a book that people understand linguistics [after reading _]
(Manzini 1994: 489)

The unacceptability of (33a) suggests that reactivation of the filler at the first gap does not necessarily lead to facilitated processing of the second gap, at least not to the extent that the latter becomes acceptable (compared to the gap in (33b)). It again seems that it is only easier to process a second gap when it is licensed by the grammar. In all, the distribution of parasitic gaps is constrained, and not identical to the distribution of other multiple gap constructions, like those generated by ATB movement (Postal 1993). These empirical generalizations are the explanandum for any account of multiple gap constructions, be it a syntactic theory of parasitic gaps in particular or a non-syntactic theory of multiple gap constructions in general.

In conclusion, we empirically evaluated a recent account of constraints on filler-gap dependencies, which holds that the (un)acceptability of extraction from islands can be explained in terms of demands on discourse processing. The results of two acceptability judgment experiments are inconsistent with this proposal, suggesting that the difference between islands and parasitic gap constructions is not a matter of discourse-processing complexity. The data are instead most consistent with a syntactic account of parasitic gaps, though the empirical basis of such an account would

12 The co-referential interpretation might seem possible because *heroes* is a plausible semantic complement of both *story* and *listen to*, which could lead to confusion. Tentatively supporting this idea, the sentence seems to be less acceptable if we replace *heroes* by *wars,* which is not a plausible complement for the second predicate.

(v) ?There are certain wars$_i$ that [long stories about _$_i$]$_j$ are always very easy to listen to _$_j$.

be further strengthened if it is even more directly supported by the results of both linguistic and psycholinguistic experimentation.

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Appendix

Grouping the average acceptability scores in Experiment 1 by item (Figure A1), we see that island gap constructions were consistently rated as unacceptable. Yet, no matter how unacceptable they are, replacing the Guest by a true gap strongly improves acceptability. For each individual item it is the case that its acceptability is substantially improved by a parasitic gap configuration.

Figure A2 shows the average acceptability scores in Experiment 2, grouped by item. It reveals that the parasitic gap version of certain items is seen as equally unacceptable as, or even more unacceptable than, the island gap version. This is clearly not the case for any of the untensed items (see Figure A1). On average, the manipulation of tense reduces the acceptability of parasitic gap constructions (see Section 4.2), but for some items, it makes the parasitic gap version even completely unacceptable.

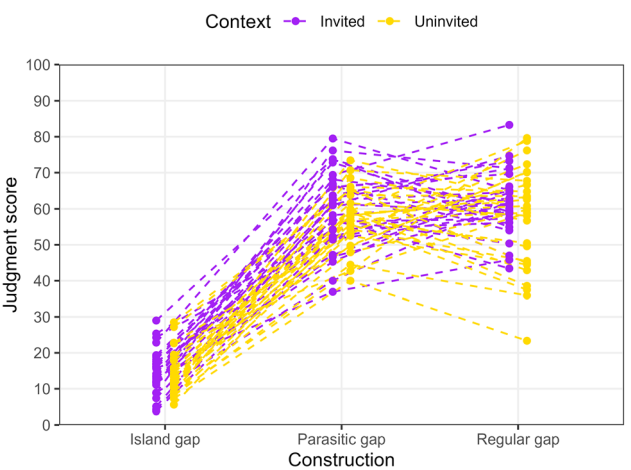

Figure A1: Acceptability judgments in Experiment 1, grouped by item.

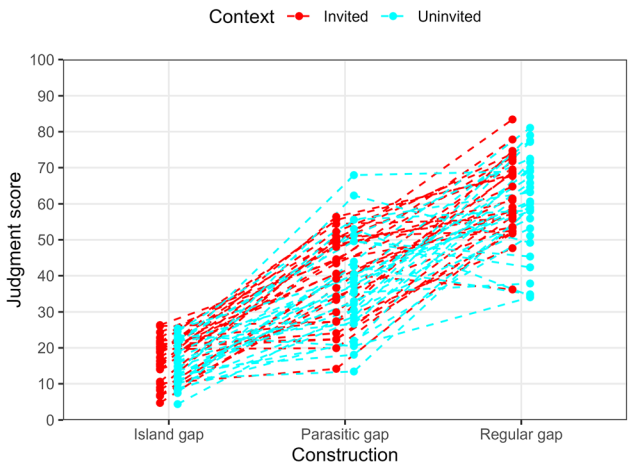

Figure A2: Acceptability judgments in Experiment 2, grouped by item.

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