

FINITENESS AND THE NATURE OF ISLAND CONSTRAINTS*

Dan Michel and Grant Goodall
University of California, San Diego

1. Introduction

Two competing views of island constraints have emerged in recent work. In one, which we will call the *accumulation* view, islands result from the accumulation of several independently documented processing difficulties, such as the presence of a filler-gap dependency and an especially complex syntactic structure (cf. Kluender (1998, 2004), Hofmeister and Sag (2010)). In a sentence with an island violation, these difficulties are claimed to exceed the processor's capacity and the sentence is perceived as unacceptable. In the second view, which we will call the *disruption* view, islands result from an otherwise unproblematic element that may disrupt a filler-gap dependency and render it illicit (cf. Ross (1967), Chomsky (1986), Rizzi (2004)). Bounding nodes and certain syntactic features, for instance, have been claimed to be of this type; they are not inherently bad, but they lead to unacceptability when they intervene in dependencies of certain types.

Though typically seen as competitors, these two approaches to island constraints are not in principle mutually exclusive. It could turn out to be the case that certain island phenomena are due to one and that others are due to the other, or even that a single island constraint stems both from the accumulation of difficulties that overtax the processor and from some element that is disruptive only when it intervenes in a dependency. It is also worth keeping in mind that although the accumulation view is typically associated with processing accounts and the disruption view with grammatical accounts, these associations are not logically necessary. It is not difficult to imagine small grammatical violations accumulating to result in very low acceptability or some element that disrupts the processing of a filler-gap dependency but does not produce any special processing burden on its own.

In this paper, we use the above two views of islands as a backdrop as we explore the role of finiteness in island constraints. Ross (1967) first noted that finiteness seems to make island domains even more resistant to extraction, particularly in the case of *wh*-islands, as in (1).

- (1) This is a book which I can't figure out
 - a. ? [what **to do** about ___]
 - b. ?*[what I **should do** about ___]

There is barely any perception of unacceptability in (1a), but there is much more in its finite counterpart in (1b). A similar phenomenon has been noted in subject islands, as in (2)

* We would like to thank the audience at GLOW in Asia IX for their many very useful comments on our oral presentation. The present work is part of an ongoing project on the role of finiteness in extraction. Earlier versions were presented at the Islands in Contemporary Linguistic Theory conference (Vitoria-Gasteiz) and the CUNY Sentence Processing conference (New York). We are grateful to the audiences there, as well as to Chris Barkley, Ivano Caponigro, Gabe Doyle, Simone Gieselman, Boyoung Kim, Robert Kluender, Roger Levy, Emily Morgan, and other members of the UCSD Experimental Syntax Lab. This work benefitted also from the invaluable help of research assistants Adrienne LeFevre and Michelle McCadden in the UCSD Experimental Syntax Lab.

(adapted from Phillips (2006)).

- (2) We investigated what [the campaign
 - a. ?* **to preserve** __] had harmed the forest.
 - b. * that **preserved** __] had harmed the forest.

Overall acceptability here drops considerably compared to (1), but the contrast between non-finite (a) and finite (b) is maintained. Finiteness in adjunct islands is less often discussed, but the same contrast appears to obtain (Szabolcsi (2006), Truswell (2011)).

- (3) I wonder who John went home
 - a. ?? [after **kissing** __]
 - b. * [after he **kissed** __]

The accumulation and disruption views of islandhood make very different predictions with regard to where we should see effects of finiteness on acceptability. Under the accumulation view, the fact that finiteness appears to lower acceptability in (1)-(3) would suggest that finiteness is one of the several factors, each intrinsically difficult for processing on its own, that contribute to the unacceptability of island violations (cf. Kluender (2004) and Hofmeister (2007)). We should then expect to see a finiteness effect very generally across syntactic contexts. Under the disruption view, on the other hand, there is no reason to think that finiteness is intrinsically difficult and we thus expect to see a finiteness effect when finiteness intervenes in some dependencies, but not more generally (cf. Cinque (1990), Manzini (1992) and Truswell (2011)).

The extent of the finiteness effect can therefore play a crucial role in determining whether island phenomena are best viewed in terms of accumulation or disruption. Being certain of the extent of the effect is problematic, however, since finiteness effects are notoriously subtle. We should anticipate, then, that whatever effects we may find will almost certainly be small, but we also want to be sure that they are real. Approaching this empirical challenge experimentally thus seems prudent, since this will allow us to detect small differences in acceptability with some confidence (cf. Cowart (1997), Myers (2009)).

The rest of this paper presents the results of six sentence acceptability experiments designed to address this question of the extent of the finiteness effect. The experiments themselves are discussed in section 2. Experiment 1 probes the existence of a finiteness effect in adjunct islands, Experiments 2-5 explore whether the effect is ultimately due to finiteness itself or simply to the presence of an overt argument that typically accompanies finiteness, and Experiment 6 looks for a finiteness effect in non-island complement clauses. General conclusions about these experiments and what they tell us about the accumulation and disruption views of islandhood are presented in section 3.

2. The Experiments

2.1. Experiment 1: Finiteness and Adjunct Islands

To begin, we must first make certain that our experimental method is sensitive enough to detect the often slight degradation in acceptability that has been claimed for finiteness in some environments. We choose adjunct islands for Experiment 1, since finiteness in this island type has not been extensively documented in the literature, so beyond anything else, our results here can serve a useful descriptive function.

Participants (N = 220) in this experiment judged the acceptability of sentences using a 7-

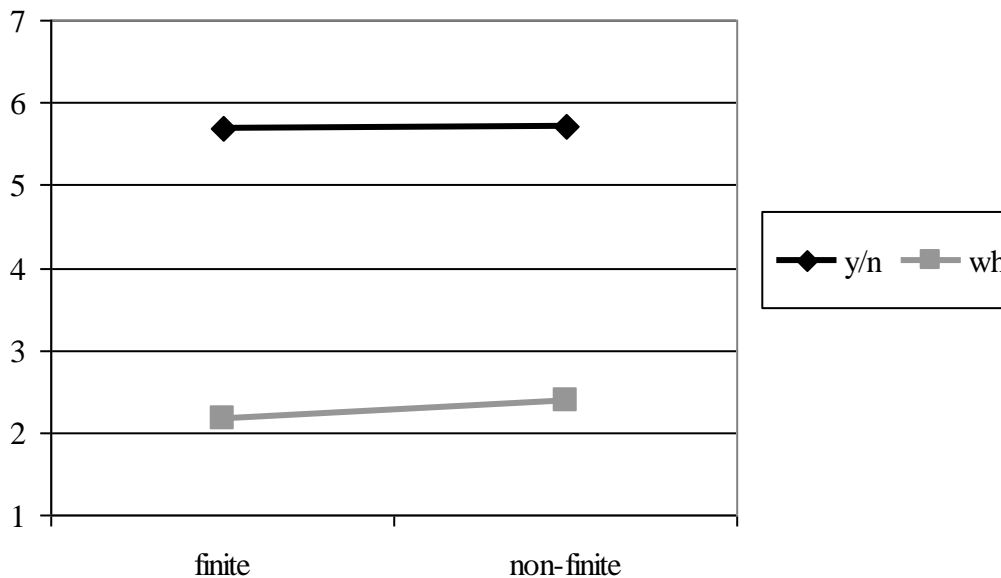
point scale, with 7 representing the highest acceptability and 1 the lowest.¹ Experimental items were all questions containing an adjunct clause, using a 2x2 design that crossed question-type (*yes/no* vs. *wh*-) and finiteness of the adjunct clause (finite vs. non-finite). Sample stimuli are given in (4).

- (4) a. Did the carpenter restore the table [after **negotiating / he negotiated** with the buyer]?
 b. Who did the carpenter restore the table [after **negotiating / he negotiated** with ___]?

Participants saw 6 tokens of each type, counterbalanced following a Latin square design. In addition to the 24 experimental stimuli, each participant saw 40 filler items. Materials were presented in pseudo-randomized order.

The results from this experiment are displayed in (5).

(5) Results from Experiment 1



There was a highly significant main effect for question-type ($p < 0.001$), with a mean rating of 5.70 for *yes/no* questions and 2.27 for *wh*-questions, reflecting the fact that the latter case involves extraction out of an adjunct island. Analysis of question type and finiteness reveals no significant effect for finiteness in *yes/no* questions (non-finite mean = 5.72, finite mean = 5.69, $p = 0.68$), but a highly significant effect in *wh*-questions (non-finite mean = 2.38, finite mean = 2.16, $p < 0.001$).

These results show that we were able to capture a finiteness effect in adjunct islands. Finiteness in the adjunct clause leads to a significant degradation in acceptability with extraction, as expected. Moreover, these results begin to cast doubt on an accumulation account of the finiteness effect, in that finiteness degrades only the extraction (*wh*-question) case, and not the *yes/no* question case.

¹ The recent literature suggests that an n -point response method such as this is advisable for studies attempting to capture fine gradations in acceptability. See Bader and Häussler (2010), Fukuda, Goodall, Michel and Beecher (2012), Sprouse (2011), and Wescott and Fanselow (2008, 2011) for discussion.

2.2. Experiment 2: Overt Arguments and CNPC

The results of Experiment 1 are highly suggestive, but there is a confound that prevents us from attributing the finiteness effect in extraction cases to finiteness *per se*. That is, finiteness always co-occurs in our stimuli with the presence of an overt argument (e.g. *he* in the finite case in (4b)), as it does very generally in English, and this leaves open the possibility that what we are calling a finiteness effect is actually due to this overt argument. In fact, this possibility has some plausibility, since processing referents is known to pose a burden to the processor (Gibson (1998), Warren and Gibson (2002)) and this increased processing cost could reasonably be expected to depress acceptability.

In order to eliminate this confound, Experiments 2-4 hold finiteness constant while manipulating the presence/absence of the additional argument. We begin here with Experiment 2, which does this within the realm of the Complex Noun Phrase Constraint (CNPC).

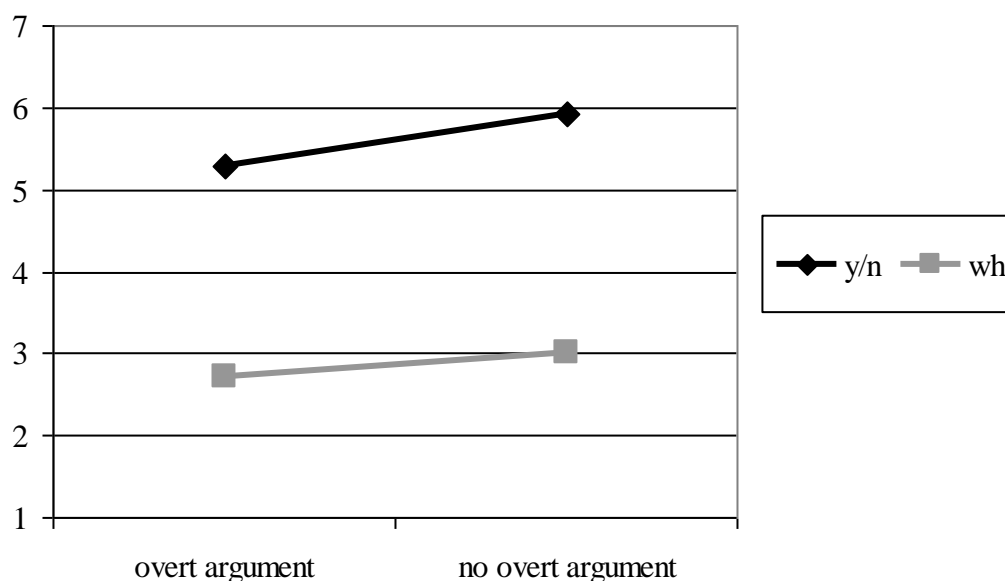
Experimental items in this experiment were all questions containing a complex noun phrase, using a 2x2 design that crossed question-type (yes/no vs. *wh*-) and an additional overt argument in the embedded clause (presence vs. absence). The embedded clauses were all non-finite. Sample stimuli are given in (6).

- (6) a. Does the principal like [the thought of (**the children**) learning subtraction]?
 b. What does the principal like [the thought of (**the children**) learning ___]?

Participants (N = 209) saw 4 tokens of each type. In addition to the 16 experimental stimuli, each participant saw 94 filler items. Experiments 3 through 5, below, served as some of these fillers (the same participants participated in experiments 2 through 5). All other aspects of this experiment were as in Experiment 1.

The results from this experiment are displayed in (7).

(7) Results from Experiment 2



As expected, there was a highly significant main effect for question-type ($p < 0.001$), with a mean rating of 5.61 for *yes/no* questions and 2.85 for *wh*-questions, reflecting the CNPC violation in the latter case. There was also a significant main effect for presence/absence of an additional overt argument ($p < 0.001$). There was, however, no interaction between question-

type and the additional overt argument ($p=0.21$).

Recall that within the complex noun phrases in these stimuli, finiteness is held constant (always non-finite), so the effect that we are seeing here must be due entirely to the presence of an overt argument. Note, however, that unlike the pattern seen in Experiment 1, the degrading effect here (i.e. that of the overt argument) is not specific to *wh*-dependencies.

2.3. Experiment 3: Overt Arguments and Subject Islands

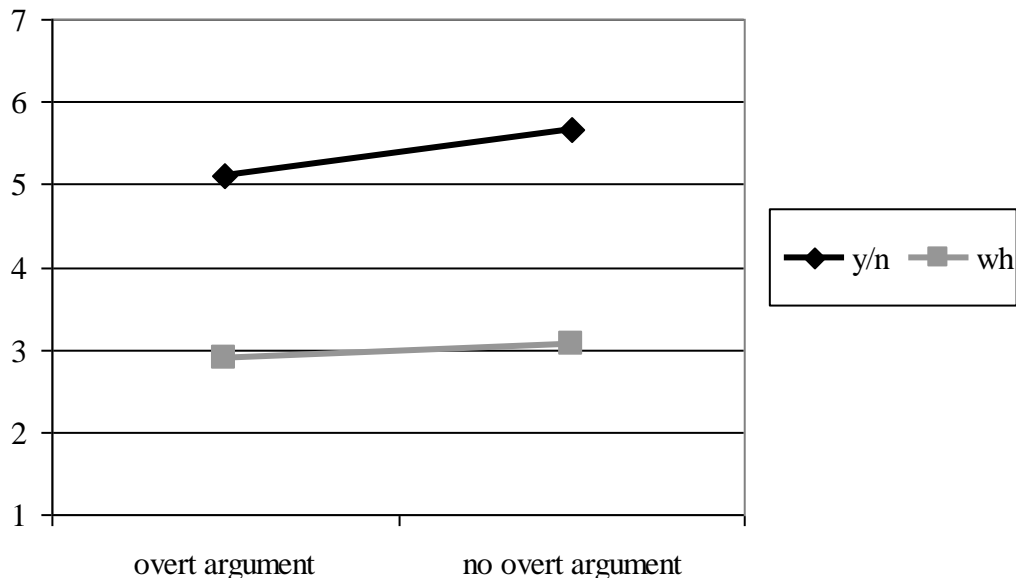
Experiment 3 is the same as Experiment 2 but with subject islands instead of CNPC. The 2x2 design crosses question-type (yes/no vs. *wh*-) and the additional overt argument in the embedded clause (presence vs. absence). The embedded subject clauses were all non-finite. Sample stimuli are given in (8).

- (8) a. Does the lawyer know that [(**the boy**) presenting the testimony] will convince the jury?
 b. What does the lawyer know that [(**the boy**) presenting ___] will convince the jury?

All other aspects of the experiment are the same as in Experiment 2.

The results from this experiment are displayed in (9).

(9) Results from Experiment 3



As before, there was a highly significant main effect for question-type ($p<0.001$), with a mean rating of 5.38 for *yes/no* questions and 2.98 for *wh*-questions, reflecting the subject island violation in the latter case. There was, however, no significant main effect for presence/absence of an additional overt argument ($p=0.27$), although numerically, the pattern is the same as in Experiment 2, with those conditions with overt arguments less acceptable (mean rating: 3.99) than those without (mean rating: 4.36). There was also no significant interaction between question-type and the additional overt argument ($p=0.62$).

Importantly, there is no effect here that is specific to the *wh*-questions. In this way, the results above are like Experiment 2, where the additional overt argument had an overall effect, but unlike Experiment 1, where finiteness affected only the *wh*-questions.

2.4. Experiment 4: Overt Arguments and Complement Clauses

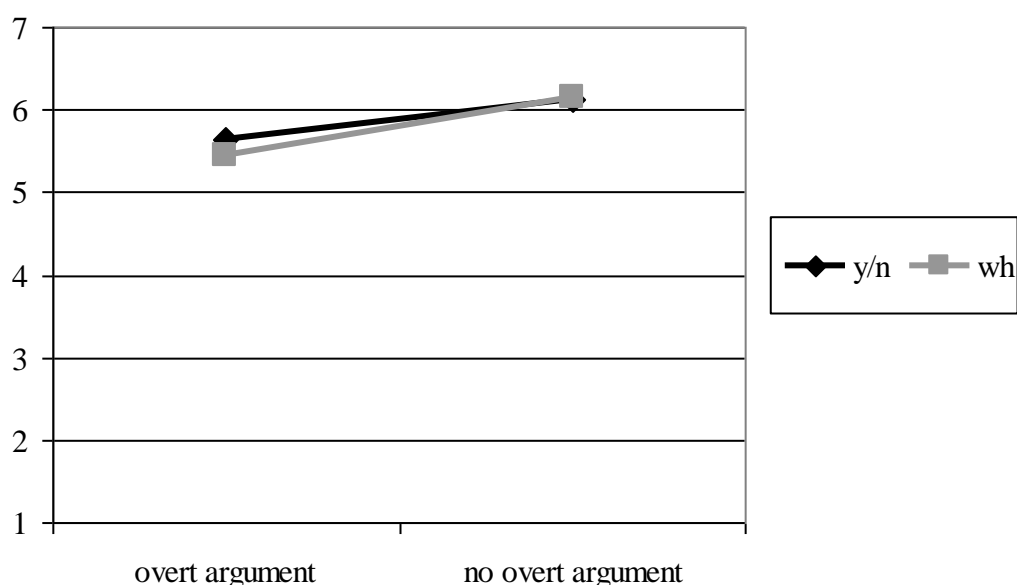
Experiment 4 has the same design as Experiments 2 and 3 but with non-island complement clauses in place of complex noun phrases and subject islands. The 2x2 design crosses question-type (yes/no vs. *wh*-) and the additional overt argument in the complement clause (presence vs. absence). The complement clauses were all non-finite. Sample stimuli are given in (10).

- (10) a. Does the architect want [(**the contractor**) to see the plans before Monday]?
 b. What does the architect want [(**the contractor**) to see __ before Monday]?

All other aspects of the experiment are the same as in Experiments 2 and 3.

The results from this experiment are displayed in (11).

(11) Results from Experiment 4



There is no main effect for question-type here; the results for *yes/no* and *wh*-questions are virtually identical. This is as expected, given that complement clauses are not islands. There is, however, a highly significant main effect for the additional overt argument ($p < 0.001$), with a mean rating of 5.54 for sentences with the overt argument and 6.14 for sentences without. There is no interaction between question-type and overt argument, which reflects the fact that the absence of an overt argument has a significant ameliorating effect on both question-types and does not seem to target *wh*-dependencies in particular.

We are now in a position to evaluate the results of Experiments 2-4 as a group. Recall that the purpose of these three experiments was to begin to disentangle the confound in Experiment 1, where we found significant degradation in sentences with *wh*-extraction out of adjunct clauses that had two properties: they were finite and they had an additional overt argument. Since it was not possible in that experiment to see which of these properties was driving the effect, Experiments 2-4 held finiteness constant and manipulated only the presence/absence of the overt argument. In Experiments 2 and 4, there was significant degradation when the overt argument was present, but this affected all question-types, not just *wh*-questions. In fact, in none of these three experiments did the overt argument effect distinguish between *yes/no* and *wh*-questions. It thus appears unlikely that this effect is responsible for the primary results in Experiment 1, where there is a significant difference

between the two *wh*-question conditions, but not between the two *yes/no* question conditions.

2.5 Experiment 5: Finiteness and CNPC

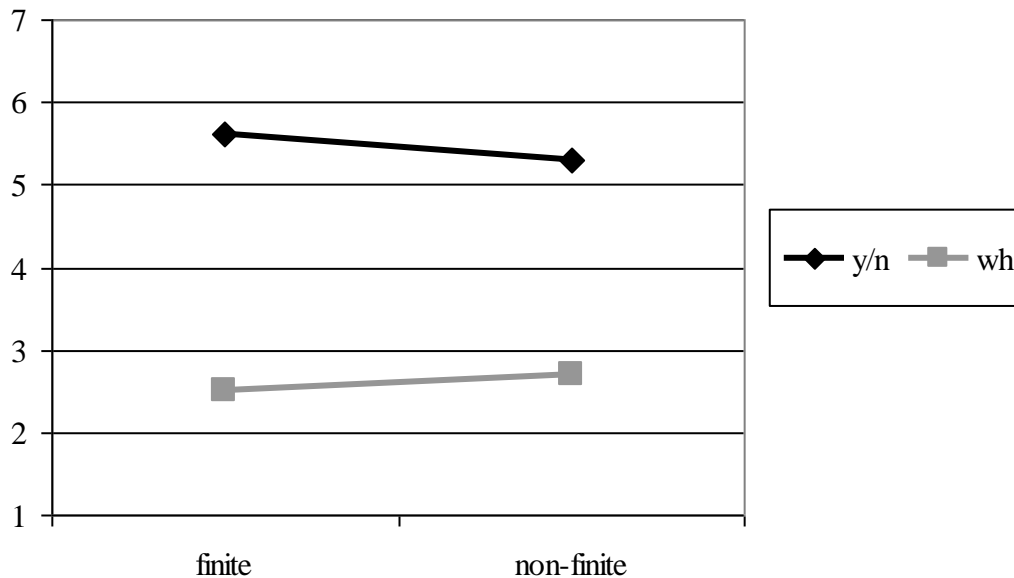
Given the results of Experiments 2-4, we now predict that if we hold the additional overt argument constant and manipulate finiteness, we will get an effect that is specific to *wh*-dependencies. In Experiment 5, we thus use a 2x2 design that crosses question-type (*yes/no* vs. *wh*-) and finiteness (finite vs. non-finite) with complex noun phrases. The clauses within the complex noun phrases all contain an overt subject. Sample stimuli are given in (12).

- (12) a. Do many people believe [the idea **that the squirrels buried / of the squirrels burying** extra food under bushes]?
 b. What do many people believe the idea [**that the squirrels buried / of the squirrels burying** ___]under bushes?

All other aspects of this experiment were as in Experiments 2-4.

The results from this experiment are displayed in (13).

(13) Results from Experiment 5



As expected, there was a highly significant main effect for question-type ($p < 0.001$), with a mean rating of 5.46 for *yes/no* questions and 2.61 for *wh*-questions. This makes sense, given the CNPC violation in the latter case, just as was seen earlier in Experiment 2. There is also an interaction between question-type and finiteness ($p = 0.02$), and further analysis reveals a significant preference for non-finiteness only in the *wh*-questions, with a mean rating of 2.5 in the finite condition and 2.71 in the non-finite condition ($p = 0.003$). In the *yes/no* questions, the preference goes the other way, with a mean rating of 5.62 in the finite condition and 5.29 in the non-finite condition ($p < 0.001$).

For present purposes, the most important finding here is the preference for non-finiteness among the *wh*-questions. This result conforms to our expectations, given what we saw in Experiments 1-4, and it confirms the earlier conclusion that what appeared to be a finiteness effect in Experiment 1 truly was a finiteness effect. That is, Experiment 5 provides evidence, along with Experiments 2-4, that the confound in Experiment 1 can be disentangled and that it is finiteness, not the additional overt argument, which specifically affects *wh*-dependencies.

2.6 Experiment 6: Finiteness and Complement Clauses

Now that we have established that the finiteness effect is detectable experimentally (Experiment 1) and that it is due in fact to finiteness, and not to the overt argument that often accompanies finiteness (Experiments 2-5), let us return to the question raised in section 1 regarding the accumulation and disruption views of island constraints. Under the accumulation view, we expect finiteness to have a general degrading effect on acceptability, while under the disruption view, we expect it to have no particular effect normally, but to reduce acceptability specifically when it intervenes in a *wh*-dependency. The evidence that we have seen here so far very clearly supports the disruption view. As seen particularly in Experiments 1 and 5, finiteness degrades acceptability in *wh*-questions that violate island constraints, but not elsewhere. This result would be surprising if finiteness were simply one of many degrading factors that result in an island violation when they accumulate, since in that case, the finiteness effect should be detectable independently of the island environment.

To say that the disruption view of the finiteness effect appears to be on the right track leads immediately to the question of why finiteness would affect *wh*-dependencies in this way. One promising recent analysis is given by Truswell (2011), who proposes the Event Locality Condition shown in (14).

(14) The Event Locality Condition: Events form locality domains for *wh*-movement.

That is, *wh*-movement is felicitous only if the domain containing both the head and foot of the movement can be construed as a single event. This condition is relevant to our concerns here because finiteness often influences how events are structured within a sentence. Truswell notes, for instance, that finite adjunct clauses are normally interpreted as independent events, while non-finite adjunct clauses may allow for the possibility of being interpreted as part of the main clause event. Under this view, the finiteness effect in adjunct clauses that we observed in Experiment 1 derives from the idea that the entire sentence is more easily interpreted as a single event when the adjunct clause is non-finite. This event structure has no effect on acceptability in most cases, but it does when *wh*-movement is involved, given (14).

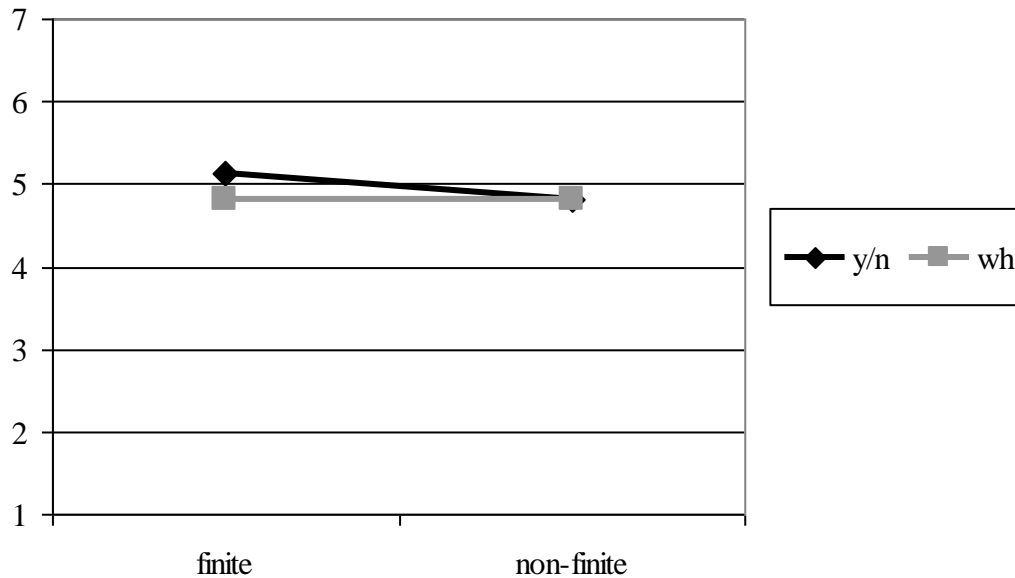
Truswell also notes that finiteness has no effect on the event structure of complement clauses (of bridge verbs). These clauses are interpreted as part of the main-clause event regardless of whether they are finite or non-finite. This then predicts that we will not observe a finiteness effect with *wh*-extraction out of complement clauses. We test this prediction in Experiment 6, where we use a 2x2 design crossing question-type (yes/no vs. *wh*-) and finiteness (finite vs. non-finite) with complement clauses of bridge verbs. Participants (N=220) saw 3 tokens of each type, counterbalanced following a Latin square design. In addition to the 12 experimental stimuli, each participant saw 52 filler items. All of the sentences contain an additional overt argument as in Experiments 1 and 5. Sample stimuli are given in (15).

- (15) a. Did the children believe [the guest **was** / **to be** bringing a cake]?
 b. What did the children believe [the guest **was** / **to be** bringing ___]?

Participants used the same 7-point acceptability scale as in the other experiments.

The results from this experiment are displayed in (16).

(16) Results from Experiment 6



As is expected here, given the fact that this is a non-island environment, there was no main effect for question-type ($p=0.11$). There was, however, a significant main effect for finiteness ($p=.01$), with a mean rating of 4.96 for finite and 4.82 for non-finite. There was no significant interaction between question-type and finiteness ($p=0.14$).

Notice that although there is a main effect for finiteness in these results, it is the finite cases that are more acceptable than the non-finite ones. This is the opposite of what we have seen elsewhere, and moreover, the preference is not specific to *wh*-questions. We thus do not find here the finiteness effect seen in island environments in Experiments 1 and 5.

This lack of a canonical finiteness effect is exactly what is predicted under Truswell's (2011) analysis. Since complement clauses under bridge verbs always form a single event with the main clause, regardless of the finiteness of the complement clause, non-finite embedded clauses have no ameliorating effect on *wh*-extraction. This contrasts with adjunct clauses (and presumably with clauses embedded in complex noun phrases), where finiteness encourages an interpretation in which the clause is an independent event. Under this interpretation, *wh*-extraction violates the Event Locality Condition in (14).

3. Conclusion

We began this paper by contrasting the accumulation view of island effects, in which islands result from the co-occurrence of independently motivated processing difficulties, with the disruption view, in which islands result from an otherwise unproblematic element that disrupts the filler-gap dependency. We have seen that the finiteness effect in islands appears to be most consistent with the disruption view. Outside of *wh*-extraction environments, finiteness does not have a uniformly degrading effect on acceptability, but within (island) *wh*-extraction environments, it has a clear degrading effect. Moreover, this degrading effect occurs in exactly those environments predicted by Truswell's Event Locality Condition. That is, the effect occurs in islands, but not in non-island complement clauses.

The accumulation view also receives support from some of the findings in this paper, however. Specifically, we have seen that adding an overt argument to a sentence consistently leads to a small decrease in acceptability and that this decrease obtains in *wh*-questions as

well. The fact that this additional overt argument effect occurs in a variety of environments is most consistent with the accumulation view.

As discussed earlier, the accumulation view is typically associated with processing accounts, and the disruption view is typically associated with grammatical accounts. If we accept these associations, we then conclude that the additional overt argument effect is a processing effect and that the finiteness effect is a grammatical effect. This conclusion is especially tempting given that there are plausible analyses on each side: Warren and Gibson's (2002) analysis of the processing of referents predicts the overt argument effect seen here, and Truswell's (2011) analysis of event structure and *wh*-extraction predicts the finiteness effect in just the environments where we have observed it.

If this approach is on the right track, then island phenomena are at least partly a grammatical effect. This does not preclude the influence of processing factors as well, though it does suggest that islands are not reducible to such factors. In terms of the concrete phenomena explored here, the behavior of finiteness seems to require a grammatical account, but the addition of an overt argument may add a processing burden that further depresses acceptability. A full account of island phenomena, therefore, is likely to include both grammatical and processing factors that underlie the decrease in acceptability.

References

- Bader, M. and J. Häussler (2010) "Toward a model of grammatical judgments," *Journal of Linguistics* 46, 273-330.
- Chomsky, N. (1986) *Barriers*, MIT Press, Cambridge, Massachusetts.
- Cinque, G. (1990) *Types of A'-dependencies*, MIT Press, Cambridge, Massachusetts.
- Cowart, W. (1997) *Experimental syntax: Applying objective methods to sentence judgments*, Sage Publications.
- Fukuda, S., G. Goodall, D. Michel and H. Beecher (2012) "Is Magnitude Estimation Worth the Trouble?" In J. Choi, E. A. Hogue, J. Punske, D. Tat, J. Schertz, and A. Trueman, eds., *Proceedings of the West Coast Conference on Formal Linguistics* 29, 328-336.
- Gibson, E. (1998) "Linguistic complexity: Locality of syntactic dependencies," *Cognition* 68, 1-76.
- Hofmeister, P. (2007) *Representational Complexity and Memory Retrieval in Language Comprehension*, Ph.D. dissertation, Stanford University.
- Hofmeister, P. and I. Sag (2010) "Cognitive constraints and island effects," *Language* 86, 366-415.
- Kluender, R. (1998) "On the distinction between strong and weak islands: A processing perspective," *Syntax and Semantics*, 241-280.
- Kluender, R. (2004) "Are subject islands subject to a processing account?" *Proceedings of the West Coast Conference on Formal Linguistics* 23, 475-499.
- Manzini, R. (1992) *Locality: A theory and some of its empirical consequence*, MIT Press, Cambridge, Massachusetts.
- Myers, J. (2009) "Syntactic judgment experiments," *Language and Linguistics Compass* 3, 406-423.
- Phillips, C. (2006) "The real-time status of island phenomena," *Language* 82, 795-823.
- Rizzi, L. (2004) "Locality and left periphery." In A. Belletti, ed., *Structures and Beyond. The cartography of syntactic structures*, vol. 3, Oxford University Press, New York, 223-251.
- Ross, J. R. (1967) *Constraints on Variables in Syntax*, Ph.D. dissertation, MIT.
- Sprouse, J. (2011) "A test of the cognitive assumptions of magnitude estimation: Commutativity does not hold for acceptability judgments," *Language* 87, 274-288.
- Szabolcsi, A. (2006) "Strong vs. weak islands." In M. Everaert and H. van Riemsdijk, eds., *The Blackwell Companion to Syntax*, vol. 4, Blackwell, Malden, Massachusetts, 479-531.
- Truswell, R. (2011) *Events, Phrases, and Questions*, Oxford University Press, Oxford.
- Warren, T. and E. Gibson (2002) "The influence of referential processing on sentence complexity," *Cognition* 85, 79-112.

- Wescott, T. and G. Fanselow (2008) "Variance and informativity in different measures of linguistic acceptability," *Proceedings of the West Coast Conference on Formal Linguistics* 27, 431-439.
- Wescott, T. and G. Fanselow (2011) "On the informativity of different measures of linguistic acceptability," *Language* 87, 249-73.