

Early Knowledge of Relative Clause Islands and Island Repair

Michael Fetters and Jeffrey Lidz

1. Introduction

Natural language syntax allows for displacement, the phenomenon by which a phrase occurs in a position other than the one in which it is canonically licensed. For example, in (1) the indefinite *someone* is interpreted as the patient of the verb *clean*, satisfying the verb's requirement for an object. In (2), this requirement is satisfied by the question word *who*, despite its not appearing adjacent to *clean*.

- (1) Smurfette cleaned someone.
- (2) Who did Smurfette clean?

Additionally, these sorts of relations can be stretched across an indefinite amount of linguistic material:

- (3) Who did Smurfette see the bunny clean?
- (4) Who did Daisy claim that Smurfette saw the bunny clean?

These seemingly unbounded relations, called *long distance dependencies*, are not without restrictions on their distribution, however. In some linguistic contexts, these dependencies are illicit:

- (5) Smurfette moved the bunny who cleaned the log.
- (6) *What did Smurfette move the bunny who cleaned?

These constraints, called *island constraints*, have been a central focus of the syntax literature for several decades (Ross 1967, Chomsky 1973, Huang 1982, Chomsky 2001, *inter alia*). The diversity and abstract similarities of island constraints present a challenge for the language learner: how can one come to learn the accurate prohibition on a certain set of utterances from an already sparse set of relevant data points? This learnability question, in tandem with the cross-linguistic prevalence of island constraints, has led many researchers to suggest these constraints as a prime candidate for inclusion in the class of

*Michael Fetters, University of Maryland, mfetters@umd.edu. Jeffrey Lidz, University of Maryland, jlidz@umd.edu.

Universal Grammar content. Components of Universal Grammar (UG) are those features of the linguistic system that do not require environmental exposure to be attained, but rather are predetermined by the nature of the system itself (Chomsky 1965).

The goal of this work is to further explore preschool-aged children's knowledge of the relative clause island constraint. Though previous work has demonstrated apparent sensitivity to this constraint, it's an open question as to whether these results are a true reflection of narrow grammatical knowledge. It is entirely possible, and in fact necessary for a UG account of island constraints, that islandhood is present in the preschooler's grammar; alternatively, it could be that previous behavior reflects an interpretive heuristic deployed by the child that mimics the behavior predicted by grammatical knowledge.

2. Previous Work

If island constraints derive from Universal Grammar, we predict that children should be able to demonstrate such knowledge as soon as they have command over the relevant linguistic structures (Otsu 1981). The work reported in the current paper suggests that young, English-speaking four-year-olds do have access to the constraint on forming long distance dependencies into relative clauses. The key finding is that, holding semantics and pragmatics constant, four-years-old differentially interpret *wh*-words inside relative clauses in sluiced vs. overt questions. This work will also investigate the possibility that children's apparently island-violating answers to the island-relevant questions stem not from a non-adult grammar, but a conflict between an adult-like grammar and non-adult-like parsing priorities. This hypothesis will be the basis of several follow up studies.

Otsu 1981 was the first to explore children's island sensitivity. In one test trial, a girl would be drawing a monkey with a crayon, and the monkey would be drinking milk with a straw. The children would then be asked the following:

(7) What is Jane drawing a monkey that is drinking milk with?

In (7), there are two potential sites of interpretation for *what*, due to the possible structural ambiguity illustrated in (8-9):

- (8) *What is Jane drawing [a monkey that is drinking milk with ____]?
 (9) What is Jane [drawing [a monkey that is drinking milk] with ____]?

In (8), the instrumental PP occurs inside the relative clause, and thus the question is about the instrument of the milk drinking action. However, the relative clause island blocks this analysis. The dependency illustrated in (9) is perfectly licit from the perspective of the grammar, and is the interpretation that speakers generate for (7), with the instrumental PP referring to the instrument of drawing. The presence of two potential parses, with only one licensed by the

grammar of dependency formation, is key to Otsu's experiment. If preschool-age children who have sufficient mastery of relative clause and question formation syntax also know the constraints on dependency formation, they should only allow (9) as a representation for (7). Thus, they should answer only about the instrument of drawing. However, if they lack knowledge of constraints on dependency formation, they should be able to access either structure and interpretation. Otsu found a higher proportion of matrix responses in seven-year-olds as compared to the three-year-old children, suggesting that by age 7, children did know the island constraints.

de Villiers and Roeper (1995) followed a similar design, but with adjunct *wh*-phrases (10-12), and also found that 4- to 5-year-old children's interpretations were generally restricted to non-island-violating interpretations.

(10) SUBJECT: How did the man who hurt his leg get home?

(11) OBJECT: How did the man rescue the cat who broke her leg?

(12) EXTRAPOSED: When did the man go home who hurt his leg?

Together, these results suggest that preschool age children possess knowledge of island constraints, which is a necessary component of the view that this knowledge is available from birth.

The inference from behavioral profile to grammatical knowledge, however, is not so clear-cut. Just as island-violating interpretations on the part of the child could be taken as evidence of a grammar still in a state of development, a strong preference for island-respecting interpretations could be traced back to developing extralinguistic factors such as a reliance on Local Attachment parsing heuristics (Phillips and Gibson 1996), lexico-semantic biases in resolving local syntactic ambiguities (Snedeker and Trueswell 2004), or (in)sensitivity to contextual features associated with the experimental material. The experiments we now report aim to eliminate these potential explanations for children's island-sensitivity.

3. Experiment 1: Islands and Island Repair

There are two related questions lingering from the experiments discussed in the previous section: i) what is the source of younger children's poor performance on Otsu's test of relative clause islands with argument extraction, and ii) can the accuracy of the children's performance in the de Villiers and Roeper study be attributed to some extragrammatical influence in the experimental design, independent of the features of the child's grammar? The goal of the current study is to provide a groundwork for further investigation of these two open questions, and answers will lead towards an understanding not just of what children know about relative clause islands, but also about how they parse long distance dependencies with relative clause structures more generally.

To determine whether the results in a developmental linguistics experiment are wholly attributable to a particular grammatical knowledge state, it is

necessary to first identify how children would have behaved without that knowledge. Specific to the work of de Villiers and Roeper 1995, was the island-violating interpretation was even under consideration pragmatically. If not, then their island-respecting interpretations may not be evidence of anything about their syntactic representations. Thus, it is important to show that the relevant interpretation is pragmatically available when the syntactic constraint is inapplicable.

Ross 1969 gave an extensive introduction to a different sort of wh-dependency in which the majority of the clause supporting the question goes unpronounced. This is shown in (13), with the analogous full question in (14).

(13) Smurfette will clean someone, but I don't know who.

(14) Smurfette will clean someone, but I don't know who Smurfette will clean.

Despite the synonymy of the above sentences, in addition to a number of syntactic similarities between sluiced and non-sluiced questions (Ross 1969, Merchant 2001), there's a very striking (and important, for the purposes of this paper) way in which sluiced and non-sluiced sentences diverge: island effects are much less severe in a sluiced question than its non-sluiced counterpart.

(15) *Smurfette will move the bunny that cleaned something, but I don't know what Smurfette will move the bunny that cleaned.

(16) ?Smurfette will move the bunny that cleaned something, but I don't know what.

Whether this difference in acceptability between (15) and (16) is indicative of differing underlying structures (Erteschik 1973, Chung, Ladusaw, and McCloskey 1995) or the necessity nonlocal constraints on derivation in the grammar (Ross 1969) is not of particular relevance at this point of the current line of work. What does matter is that (16) is acceptable even with a wh-dependency being formed into the relative clause, though the relative clause hosting the interpretive site of the wh-word is not itself pronounced. In the context of this study, then, we have a construction that is synonymous with non-sluiced wh-dependencies, but has the additional property of permitting relative clause-internal interpretations. Though the research on children's knowledge of sluicing construction is certainly sparse, some initial results point to preschool-aged Dutch children's ability to reliably interpret sluiced sentences as adults do (Lindbergh et al. 2015).

If children can interpret sluiced sentences, and also have the additional grammatical knowledge that sluicing ameliorates island effects, then there is an initial path towards clarifying how the availability of island-violating interpretations could have been affected by extragrammatical factors. By including a sluicing condition alongside the island condition but using the exact same experimental materials in both cases, we can ask whether or not the dependency formation into the island is something the child can access even

when island constraints presumably have no leverage. That is, when kids show island sensitivity, is it because of some property of the discourse established by the experimental design that prohibits children from questioning into island structures, or is this restriction driven by the grammar?

Consider the two following sentences, modeled Otsu 1981:

- (17) Can you tell me what Smurfette moved the bunny that cleaned the log with?
 (18) Smurfette moved the bunny that cleaned the log with something. Can you tell me what?

As in Otsu's study, (17) allows only one interpretation from the perspective of the adult grammar, which is that the question refers to the instrument of the moving event. However, the attachment ambiguity of the prepositional phrase *with something* in (18) allows for an interpretation of the question in (18) in which the wh-word refers to the instrument of the cleaning event.

Given a construction that permits an otherwise ungrammatical interpretation, there is also a way to bias towards that interpretation using the probability of certain predicates to take instrumental modifiers. Snedeker and Trueswell 2004 demonstrated that five-year-old children's PP-attachment preferences in sentences like (19) are highly sensitive to the probability of the verb taking an instrumental modifier.

- (19) Grover ticked the teddy bear with the feather.

Thus, a set of instrument-biased predicates paired with children's bias to actively use this information in sentence comprehension, makes it possible to introduce a bias for a relative clause-internal interpretation in sentences like (17) and (18). With this design feature of the study, and the removal of the linguistic constraint in the case of sluicing, children should have a preference for interpreting the wh-item internal to the relative clause. In the non-sluiced cases, children's interpretations should be forced to the matrix predicate interpretation, though then the grammar and parsing preferences will be in conflict.

All test sentences contained both a matrix and relative clause-embedded verb. Data from Snedeker & Trueswell (2004) allowed us to determine which verbs would be matrix predicates due to their low instrument bias, and which would be embedded in a relative clause for their high instrument bias. The verb pairs, along with their instrument modifier biases, are given in the table below.

Matrix Verb (Low Bias)	Embedded Verb (High Bias)
Move (0%)	Clean (89%)
Throw (33%)	Cover (100%)
Grab (0%)	Feed (100%)
Find (17%)	Poke (100%)

Table 1.

Sluicing

- (20) Smurfette moved the bunny that cleaned the log with something. Can you tell me what?
- (21) Crab threw the turtle that covered the strawberry with something. Can you tell me what?
- (22) Mickey grabbed the dragon that fed Grumpy with something. Can you tell me what?
- (23) Daisy found the cat that poked the mouse with something. Can you tell me what?

Island

- (24) Can you tell me what Smurfette moved the bunny that cleaned the log with?
- (25) Can you tell me what Crab threw the turtle that covered the strawberry with?
- (26) Can you tell me what Mickey grabbed the dragon that fed Grumpy with?
- (27) Can you tell me what Daisy found the cat that poked the mouse with?

Each of the sentences above was presented at the end of a short video (less than three minutes in length). Each video followed the same basic format, in which the Central Character independently acts on two Side Characters, using a different instrument to act out what will ultimately be the event described by the matrix verb for each Side Character. Then, one Side Character attempts to act out the event described by the embedded verb using a new instrument, but fails to do so. Then, the second Side Character attempts the same action but with a new instrument, and successfully completes the action.

The goal of having two Side Characters involved in both of the actions is to satisfy the felicity conditions on the use of relative clauses revealed in Hamburger and Crain 1982. The use of a restrictive relative clause is to pick out a certain member of a set of similar individuals. Thus, in a sentence like (17) the phrase *the bunny that cleaned the log...* is only felicitously used if there are multiple bunnies present with the relative clause serving to differentiate between them. This is why the Side Characters in each story are always of the same basic animal type (bunny, turtle, dragon, or cat) differentiated by whether or not they complete the action described by the embedded predicate. The Central Character performs the action described by the matrix event with two different instruments to allow for alternatives to motivate the use of the question. One purpose of having one Side Character perform the embedded verb action and the other fail is to generate the same sort of uncertainty that motivates the question on an embedded instrument interpretation; however, if both Side Characters were to

successfully complete the action, then the relative clause would no longer be felicitous **unless the instrument modifier is interpreted internal to the relative clause predicate**, since they characters would be differentiated by the instrument they used to complete the action. To avoid this pragmatic factor, only one Side Character performs the action described by the embedded verb, but both characters attempt that action, albeit with different instruments. At the end of each video, all characters and instruments are left in an array onscreen, with the two side characters on either side of the screen, and the instruments either used on them or by them are also on that side of the screen. The participant then heard one of the two following test questions, depending on condition.

(28) Can you tell me what Smurfette moved the bunny that cleaned the log with?

(29) Smurfette moved the bunny that cleaned the log with something. Can you tell me what?

A statement that the participant is asked to judge as true or false followed each test question. This statement is to ensure comprehension of the events of the story, while using simpler relative clause syntax. These statements were of the following form.

(30) The bunny that cleaned the log was grey.

Participants who answered the declarative sentence incorrectly in at least half of the trials were excluded from the data set. Four participants were excluded in total, all for failing to answer the declaratives appropriately. Prior to the four test trials, there were two warm-up trials to familiarize the participants with the task. These two warm-up trials were of less complexity both in the events of the movie and the syntax present in the test questions. In each, a character has an object they want to perform an action on (either bouncing or hiding), and a series of three other objects that serve as a locative base for the action (bounce over or hide behind). Following each video, the participants would hear a sentence like the following, depending on condition.

(31) Can you tell me what Homer hid the cake behind?

(32) Homer hid the cake behind something. Can you tell me what?

Each of the warm-up trials also had a statement following the test questions, as in the test trials. The first test statement was always obviously true, and the second was always obviously false. This was to introduce the notion that the statements could vary in their truth. Including the post-question statements of the warm-up trials, participants had to answer at least four of the statements in the experiment correctly in order to be included. Three statements were true, while three were false, ensuring that individuals who either answered “true” or “false” across the board would be excluded by this criterion.

The Adult condition was conducted with 21 undergraduates recruited from the University of Maryland – College Park. All were native English speakers. Students were enrolled in introductory linguistics courses at the university and were compensated with course credit. Adult subjects were divided between the Island and Sluicing conditions. Both conditions will be run on 12 adults each, with 12 subjects currently having been run in the Sluicing condition and nine in the Island condition. Additionally, each condition had two orders, with Order 2 being a reversal of the test trials of Order 1. The two warm-up trials were always presented in the same order.

The Child condition was conducted with 33 children ages 4;1-5;2. All children were native English speakers, recruited through the University of Maryland Infant and Child Studies database or from local preschools. The procedure for the child participants was the same as for the adults. Video recordings were made for most child participants on the experimental laptop, and children recruited through the Infant and Child Studies Database and run at the University of Maryland were also recorded on a secondary camera in the testing room. Subjects were again divided between the Island and Sluicing conditions, with 16 in the Sluicing condition and 17 in the Island condition. Each condition had two orders, with Order 2 being a reversal of the test trials of Order 1. The two warm-up trials were always presented in the same order. The bar plot in Figure 1 below shows the proportion of Matrix responses in each condition for child and adult participants.

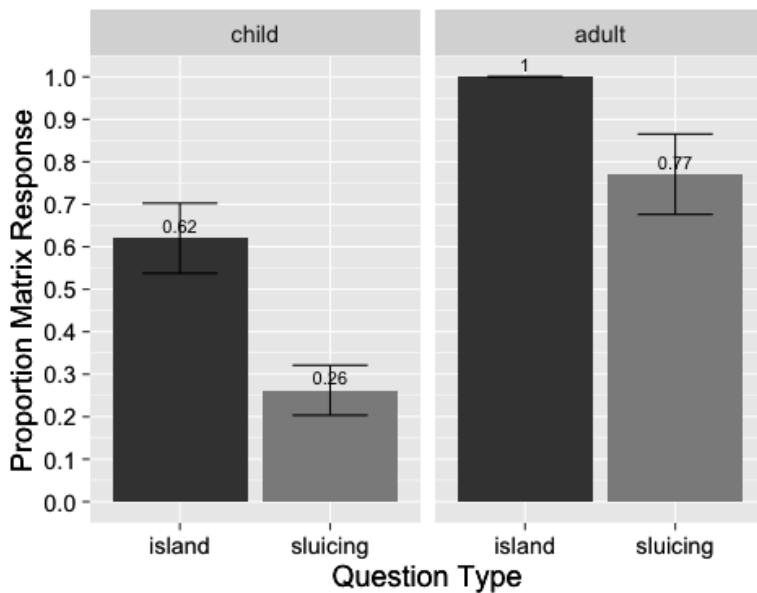


Figure 1. Proportion of Matrix responses for island and sluiced questions across both child and adult subjects.

To analyze the effect of Question Type on the proportion of Matrix responses given by children after excluding Irrelevant responses, we conducted a one-way between-subjects ANOVA¹ with proportion of Matrix responses as the dependent variable. In line with the differences seen in Figure 7, this analysis revealed a significant main effect of Question Type ($F(1,29) = 10.7, p < 0.01$) for children.

In the Island condition, adult Matrix responses were at ceiling. However, the lack of any variance in that condition prohibits the use of ANOVAs or linear models in describing the adult data. A 95% confidence interval for the Matrix responses in the Child/Island condition does not cross 1, indicating a significant difference in Matrix response rates between adults and children in the Island condition.

We also use a 95% confidence interval to compare the Adult/Island and Adult/Sluicing condition. The 95% confidence interval for Matrix responses in the Adult/Sluicing condition (0.56 – 0.96) does not cross 1, indicating a significant difference in Matrix response rates between Adult/Island and Adult/Sluicing conditions. Though the proportion of Matrix responses across the two conditions is different, Matrix responses are still the predominant response even in the Sluicing condition. This is despite the embedded verb having a much stronger bias than the matrix verb to take an instrumental modifier. One reason for this could have to do with pragmatic sensitivities of the adult parser and the incremental nature of parsing. Specifically, adults don't extend the relative clause to include the instrumental modifier because the relative clause already uniquely identifies a character in the story prior to the modifier being heard. This will be detailed further in the general discussion section, with a proposal about how to test a particular hypothesis in this line.

The pattern of Matrix responses across the two Child conditions has a similar profile to that of the Adult pattern. That is, there is a significant decrease from the Child/Sluicing condition to the Child/Island condition in the proportion of Matrix responses given by the subjects. This is in line with the predictions of the hypothesis that children have an adult-like grammar of constraints on wh-dependencies, though it's not possible to claim that this difference is derived from the same source in both groups.

This is certainly not the level of matrix response accuracy seen in the results from de Villiers and Roeper 1995, and is in fact much more similar to the more varied performance of the children in the original Otsu 1981 study. But unlike the study designed by de Villiers and Roeper, the design of the study reported in this paper allows us to tell whether the embedded reading was made accessible by the experimental context. The high rate of Embedded responses in the

¹Generally, ANOVAs are not particularly well suited for proportion data, or categorical data analysis more generally (Jaeger 2008). However, the issues inherent in ANOVAs for proportional data should not manifest for data not approaching 0 or 1. Further, more mathematically appropriate models are not expected to reveal anything more than what can be found with the ANOVA approach.

Child/Sluicing condition reveals that this interpretation is highly salient to the children. The fact that children gave this interpretation so much less often in the Child/Island condition reveals sensitivity to the island. However, the fact that they gave Embedded responses nearly 40% of the time in the Child/Island may indicate either a weaker grammatical sensitivity to the island or an independent bias for low modifier attachment that is too strong to be overridden when in conflict with the island constraint.

4. Experiment 2: Verb Switch

It's important to ask what the contribution of lexical bias could be in building towards this conflict between parsing and grammatical constraints. The relative clause verbs used in this paper's experiment were all verbs with a high bias to take instrument modifiers from the completion task in Snedeker and Trueswell 2004. Their work showed that children were sensitive to this type of lexical bias in making temporarily ambiguous parsing decisions. If the bias to give a verb like *clean* an instrumental modifier over a verb like *move* is causing the tension with the grammar, swapping the matrix and embedded verbs in the target questions, along with an altered experimental context, can reveal this.

Context 1:

- Smurfette cleans Brown Bunny with a sponge.
- Smurfette cleans Grey Bunny with a towel.
- Brown Bunny tries to move the log with a rope.
- Grey Bunny moves the log with a wagon.

(33) Smurfette moved the bunny that cleaned the log with something red. Can you tell me what?

If the parsing preference at issue is responsible for the spread of responses on the part of the subjects in Child/Island condition, changing the relevant feature that triggers the parsing procedure (in this case, the instrument bias of the verb) should change the responses that indicate a move towards matrix modification. This would indirectly suggest that the relevant grammatical knowledge is present in the child's grammar, but that it is obscured in these behavioral tasks by the child's serious committal to and inability to revise initial guesses about temporarily ambiguous prepositional modification structures.

To test the possible effect of lexical bias on children's Embedded response rates, particularly the Embedded response rate for the Child/Island condition, we conducted a manipulation of the first experiment in which the embedded verbs and the matrix verbs in the test questions were swapped.

Matrix Verb (High Bias)	Embedded Verb (Low Bias)
Clean (89%)	Move (0%)
Cover (100%)	Throw (33%)
Feed (100%)	Grab (0%)
Poke (100%)	Find (17%)

Table 2.

Sluicing

- (34) Smurfette cleaned the bunny that moved the log with something. Can you tell me what?
- (35) Crab covered the turtle that threw the strawberry with something. Can you tell me what?
- (36) Mickey fed the dragon that grabbed Grumpy with something. Can you tell me what?
- (37) Daisy poked the cat that found the mouse with something. Can you tell me what?

Island

- (38) Can you tell me what Smurfette cleaned the bunny that moved the log with?
- (39) Can you tell me what Crab covered the turtle that threw the strawberry with?
- (40) Can you tell me what Mickey fed the dragon that grabbed Grumpy with?
- (41) Can you tell me what Daisy poked the cat that found the mouse with?

Because test questions are different, they require a different accompanying story. The stories for Experiment 2 are maximally similar to the stories used in Experiment 1. All other aspects of the experimental design and methodology are the same as in Experiment 1.

Experiment 2 was conducted with 32 children ages 4;1-5;1. All children were native English speakers. The children were either recruited through the University of Maryland Infant and Child Studies database, or were run at local preschools. The procedure for the child participants was the same as in Experiment 1. Video recordings were made for most child participants on the experimental laptop, and children recruited through the Infant and Child Studies Database and run at the University of Maryland were also recorded on a secondary camera in the testing room.

Subjects were again divided between the Island and Sluicing conditions, with 16 in the Sluicing condition and 16 in the Island condition. And each condition had two orders, with Order 2 being a reversal of the test trials of Order

1. The two warm-up trials were always presented in the same order. Figure 2 shows the proportions of Matrix and Embedded responses out of all relevant responses for the HM Child/Island and HighMatrix Child/Sluicing conditions, along with the LowMatrix child data from Experiment 1.

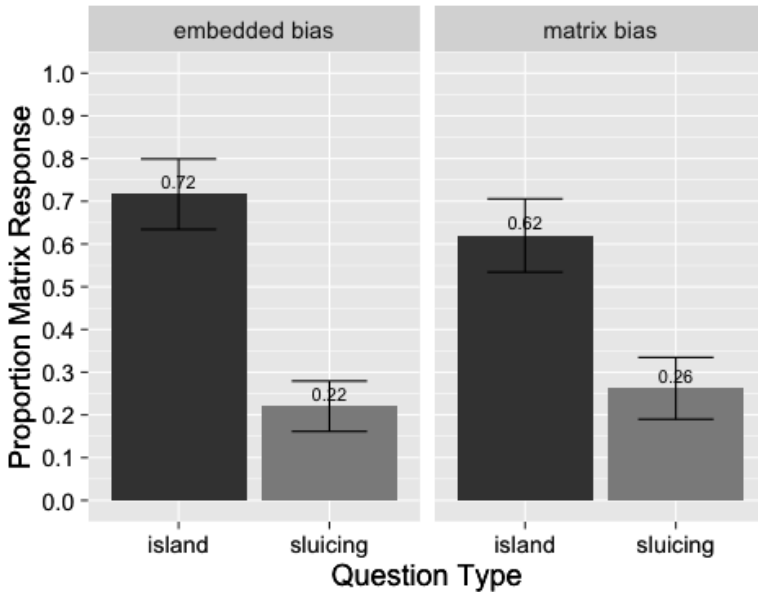


Figure 2. Proportion of Matrix responses for island and sluiced questions across both embedded and matrix bias conditions.

To analyze the effect of Question Type on the proportion of Matrix responses given by children after excluding Irrelevant responses, in addition to the effect of the Verb Switch manipulation, and any potential interaction between these two factors, we conducted a two-way between-subjects ANOVA with proportion of Matrix responses as the dependent variable. This analysis revealed significant main effects of Question Type ($F(1,59) = 27.853$, $p < 0.001$). This analysis revealed no effect of Verb Switch ($F(1,59) = 0.631$, $p = 0.430$), and interaction ($F(1,59) = 0.808$, $p = 0.372$).

The results from Experiment 2 replicate the finding from Experiment 1 that children are significantly more likely to provide Matrix responses in response to Island questions as opposed to Sluiced questions. This is consistent with a similar pattern found in adults, and predicted by children having knowledge of the islandhood of relative clauses. However, we still find a proportion of apparently island-violating responses in the High Matrix similar to what was seen in the Experiment 1 child data. The lack of an effect of Verb Switch, particularly the lack of a decrease in Embedded responses, in the Island

conditions suggests that a predicate's likelihood to take a PP modifier is not driving this behavior in children.

In hindsight, this result may not be too surprising. Whether a verb was considered High or Low Bias in this experiment was based on the norming study from Snedeker & Trueswell 2004. In that study, participants were given a partial utterance that cut off after the target verb, and then were asked for an appropriate continuation. The task for the subject was to provide one of a number of potential continuations that a particular verb could take. Thus, the bias established for each verb refers to a bias to take a PP continuation as opposed to other possible continuations for that verb. In Experiment 1 and 2, however, children are given two predicates and a PP that could, in principle, modify either. The comparison, then, is not between multiple structures for a single predicate, but rather a single structure being considered for two different predicates. It's unlikely that whether a predicate is likely to take an instrumental PP modifier at all is unrelated to whether it is more or less likely than some other predicate to take such a modification structure.

5. Conclusion

Otsu 1981 sought to identify what preschool-age children knew about the formation of long distance dependencies into relative clauses, concluding that, at least by the age of seven, children possessed both the necessary syntactic structures and the constraints that determined the distribution of long distance dependencies across those structures. Work by de Villiers and Roeper (1995) followed Otsu's lead, showing strongly adult-like behavior in responding to question with potentially island-violating interpretation. Both studies fail to offer the assurance that the island-violating interpretation would in principle be available to the child were the grammar not standing in the way.

This paper employs sluiced questions with island structures, known to ameliorate island effects (Ross 1969), to show that the otherwise island-violating interpretations are accessible to four-year-old children, and once the island constraint is reintroduced in the test question, child behavior shifts appropriately to respect the constraint.

Children also offer a number of apparently island-violating or irrelevant answers to the questions with island structures, leading to the possibility that grammatical knowledge is not the source of the behavioral shift across the conditions, and that the response patterns are a reflex of general failure to comprehend the test question accurately.

An alternative explanation for this response pattern is that children possess and attempt to implement the relative clause island constraint in their online parsing decisions, but this is in direct conflict with a particular parsing procedure that would lead them to construct a wh-dependency into an island before being able to identify it as such. Importantly, the former conjecture offers an explanation of children's behavior in the experiment above without any recourse to formal grammatical knowledge, while the second hypothesis is

contingent on children having exactly the knowledge covered throughout this paper in order to explain the results above.

The two hypotheses also offer differentiable predictions about how children should respond to a slight modification of the critical island questions if overall syntactic complexity is maintained but the potential influence of the alternative hypothesis's parsing strategy is removed. This allows for further clarification of what children know about island constraints, and can serve to illuminate how complex syntactic constraints come to be engrained in the grammar.

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Proceedings of the 41st annual Boston University Conference on Language Development

edited by Maria LaMendola
and Jennifer Scott

Cascadilla Press Somerville, MA 2017

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Proceedings of the 41st annual Boston University Conference on Language Development
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ISSN 1080-692X

ISBN 978-1-57473-076-0 (2 volume set, paperback)

ISBN 978-1-57473-176-7 (2 volume set, library binding)

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