

담화와 인지, 제29권 4호, 2022년
doi: 10.15718/discog.2022.29.4.37

Asymmetries of English *wh*-adjunct/argument in Negative Island Sensitivity: An Experimental Study*

Ziying Li**

(Ph.D. student, Sungkyunkwan University)

Nayoun Kim***

(Assistant Professor, Sungkyunkwan University)

Li, Ziying and Kim, Nayoun. 2022. Asymmetries of English *wh*-adjunct/argument in negative island sensitivity: an experimental study. *Discourse and Cognition* 29:4, 37-59. It has been argued that English *wh*-adjunct/argument reveals some asymmetries in island (in)sensitivity such that *wh*-arguments are insensitive to islands while *wh*-adjuncts are not (Huang 1982; Ross 1984; Rizzi 1990, 1992; Lasnik and Saito 1992; Szabolcsi and Zwarts 1993; Sprouse and Hornstein 2013). Arguments have addressed this assumption from various perspectives, among which the two major classes are general government (e.g., the Empty Category Principle) and binding (e.g., referentiality). While the government relations are strictly local (Chomsky, 1981), binding can span a certain distance as long as there is coindexation between the operator and the variable (Pesetsky 1987; Cinque 1990; Rizzi 1990, 1992). In this study, we conduct two acceptability rating experiments to investigate the adjunct-argument asymmetry in island sensitivity. By comparing two *wh*'s with two *wh*'s in two distinct syntactic positions (see Kim 2019; Kim, Wellwood, and Yoshida under revision for the assumptions of two different *wh*'s), we demonstrate that there is a general ban on *wh*-movement out of negative islands. However, the referentiality may potentially ameliorate the violation of negative island for *wh*-argument compared with *wh*-adjunct (Cinque 1990; Rizzi 1990, 1992). (Sungkyunkwan University) (183 words)

Key words: experimental syntax; *wh*-adjunct/argument asymmetry; negative

* This research has been supported by the Brain Korea 21+ Grant, as administered by Sungkyunkwan University, English Language and Literature Department.

** First author

*** corresponding author

islands; referentiality

1. Introduction

This study¹⁾ investigates the English *wh*-adjunct/argument asymmetries by experimentally testing their sensitivity to negative islands²⁾. Human languages are full of sentences with dependencies between non-adjacent elements (Chomsky 1977). For example, in the sentence, “What did Elsa eat *t*?” the distance between the *wh*-phrase “what” and the gap that governs the interpretation and the case associated with the *wh*-phrase (trace *t*) can be unrestrained. However, dependencies are subject to certain constraints, and there are structures that limit such long-distance dependencies, referred to as islands (Ross 1967). As a result, long-distance dependencies spanning the islands usually result in unacceptability³⁾, as shown in the prohibition of extraction of the *wh*-adjunct *how* when the dependency spans sentential negation (i.e., negative islands; Ross 1984; Cinque 1990; Rizzi 1990, 1992; Szabolcsi and Den Dikken 1999; Abrusán 2011).

- (1) a. How do you think that Jack criticized Lily *t*?
 b. *How don't you think that Jack criticized Lily *t*?

¹⁾ This study is a natural extension of parts of the Kim (2019) and Kim et al. (under revision).

²⁾ Negative islands are a type of weak islands (Ross 1984; Cinque 1990; Rizzi 1990, 1992; Abrusán 2011; Szabolcsi and Lohndal 2017), which need not necessarily involve subordination like other islands (e.g., *wh*-islands, complex NP islands, etc., see Szabolcsi and Lohndal 2017 for more island types) and whose effects can be eliminated just by removing the negative element, as illustrated in (i).

- (i) a. A: How did you go to school yesterday?
 B: By bus.
 b. A: *How didn't you go to school yesterday?
 B: By bus.

Being trapped by the negative islands, *how* is forbidden to go all the way up to the Spec CP, which results in unacceptability, as in (ib). However, by removing the negative element, the sentence becomes acceptable, as in (ia).

³⁾ This study adopts the terminology “unacceptability” to refer to sentences that lead to the processing overload to the readers due to complexity of the sentences (Kim and Noh 2019; Leivada and Westergaard 2020, p. 364; Choe 2022). To avoid potential confusion, we use * to mark unacceptable sentences, and ?? to mark those less acceptable but not completely unacceptable ones.

As an adjunct adjoined to the verb phrase (VP), the *wh*-element *how*, is blocked from crossing the negative phrase (NegP), which is syntactically higher than the VP, rendering the sentence unacceptable as in (1b). Nevertheless, the sentence with *wh*-argument *who* as in (2b) is acceptable despite its violation of a negative island constraint.

- (2) a. Who do you think that Jack criticized *t*?
 b. Who don't you think that Jack criticized *t*?

Many researchers have thus argued that some kinds of asymmetries exist in the (un)acceptability of island extractions between *wh*-adjuncts and *wh*-arguments; that is, the extraction of *wh*-arguments exhibits less severe negative island effects than *wh*-adjuncts (e.g., Huang 1982; Ross 1984; Kroch 1989; Rizzi 1990, 1992; Lasnik and Saito 1992; Szabolcsi and Zwarts 1993; Sprouse and Hornstein 2013).

Assumptions addressing this phenomenon have been proposed from various perspectives (e.g., Chomsky 1981; Pesetsky 1987; Kroch 1989; Cinque 1990; Rizzi 1990, 1992). Among such accounts, Rizzi (1990: 86) proposes that the (in)sensitivity to negative islands is modulated by the presence or absence of a “referential” theta-role⁴). This approach divides the *wh*-phrases into two categories: “referential *wh*-phrases” can undergo long-distance movement as they are assigned a referential theta-role (i.e., participants in an event) and receive a referential index with their trace; whereas, “nonreferential *wh*-phrases” (e.g., manner phrases) cannot be extracted out of negative islands as they lack a referential theta-role and leave traces without indexes (Rizzi 1990: 86-88). In other words, the referentiality may potentially contribute to the asymmetry between (1b) and (2b). In (2b), the “referential *wh*-phrase” *who* carries a referential coindex with its trace. With this referential coindexation, when it moves, it forms a binding chain with its trace (Chomsky, 1986). Conversely, in (1b), without a referential index to form a binding relation, the “nonreferential *wh*-phrase” *how* needs to antecedent-govern the trace when it moves. However, owing to the intervention of negation, the antecedent government relations between the extracted *wh*-element and an unindexed trace is interrupted,

⁴) In generative grammar, a theta role is the formal device that represents the syntactic argument structure required by a particular verb (Chomsky 1981), e.g., *agent*, *theme*, etc.

violating the Relativized Minimality (RM; Rizzi 1990, 1992). Therefore, *how* results in severe unacceptability but *who* does not.

In this paper, we provide experimental evidence to the *wh*-adjunct/argument asymmetries in island sensitivity by testing their sensitivity to negative islands. By conducting two acceptability rating experiments, we address whether: i) *wh*-arguments are less sensitive to negative islands than *wh*-adjuncts; and ii) the prohibition of extraction of a *wh*-argument out of a negative island can potentially be ameliorated by referentiality. To do so, we experimentally compare the *wh*-elements *whys* with *whos* in two syntactic positions (see Kim et al. under revision for two different *whys*). *Why*-questions in English have been reported to have two distinct interpretations: i) a reason interpretation, where *why* is related to a syntactic position higher than negation (i.e., the CP area) and is thus unconstrained by negative islands; and ii) a purpose interpretation, where *why* is adjoined to the VP area, which cannot be extracted out of the negative islands (e.g., Chapman and Kučerová 2016 and Kim et al. under revision). By comparing the acceptability of two distinct *whys* with *whos* in negative environment, we examine whether *wh*-arguments are (in)sensitive to negative islands. Additionally, by comparing the acceptability of *whos* in two different syntactic positions (i.e., the subject and the object), we examine whether referentiality can potentially ameliorate the prohibition of extraction of a *wh*-argument out of a negative island (Cinque 1990; Rizzi 1990, 1992).

In the following sections, we review some promising assumptions and explanations of the *wh*-adjunct-argument asymmetries. We report our experiments in Sections 3 and 4, followed by a general discussion in Section 5. Section 6 concludes this study.

2. Assumptions and Explanations of the *wh*-adjunct/argument Asymmetries

A promising explanation of the difference in island effects on complement vs. non-complement differences concerns the structural differences between the two. First, when undergoing cyclic movement to CP₁ and then to CP₂, as schematized in (3a) and (4a), *wh*-movement in both (1a) and (2a) respects the subjacency constraint (Chomsky 1973, 1977). Conversely, the *wh*-movements of *how* in (1b) and *who* in (2b) are blocked because of the intervention of the negation, resulting in the violation of subjacency, as in (3b) and (4b).

- (3) a. [_{CP2} How do [_{TP2} you think [_{CP1} *t* that [_{TP1} Jack criticize Lily *t*]]]]
 b. * [_{CP2} How do [_{TP2} you think [_{CP1} *t* that [_{TP1} Jack **not** criticize Lily *t*]]]]
- (4) a. [_{CP2} Who do [_{TP2} you think [_{CP1} *t* that [_{TP1} Jack criticize *t*]]]]
 b. [_{CP2} Who do [_{TP2} you think [_{CP1} *t* that [_{TP1} Jack **not** criticize *t*]]]]

However, although both violate the subjacency constraints, only the extraction of the *wh*-adjunct *how* within the negative island results in unacceptability. To capture this asymmetry, the Empty Category Principle (ECP) suggests that a nonpronominal trace (i.e., the empty category left by the movement) must be properly governed⁵⁾ and that this can be licensed in two ways—by virtue of being theta- or antecedent-governed (Chomsky 1981; Stowell 1981). Following this assumption, in the case of the *wh*-argument *who* as in (2b), the trace left by the movement is assigned a theta role (i.e., the *patient*) which is lexically governed by the verb, respecting the ECP (Chomsky 1981; Stowell 1981), and is therefore regarded as acceptable. Conversely, the trace left by *wh*-adjunct *how* as in (1b) is not properly governed in either way. First, it is not theta-governed as a verb assigns no theta role to an adverb. Additionally, it is not lexically head-governed as it has no verb head. Furthermore, it is not antecedent-governed as the antecedent (i.e., *how*) and its A'-anaphor (i.e., the trace left by the *wh*-movements; see Aoun, Hornstein, Lightfoot, and Weinberg 1987 for the detailed assumption) are not in a local domain (i.e., the minimal TP or NP; cf. Aoun et al. 1987). Consequently, by violating both subjacency and ECP, *wh*-adjunct results in more severe unacceptability as in (1b).

Building on the ECP, Rizzi (1990, 1992) proposed a more specific explanation for the unacceptability of (1b)—RM—which suggests that the intervention of a potential governor of a certain type blocks the same type of government relation⁶⁾. When the specifier of the NegP is filled by the negative

⁵⁾ By saying governed, we refer to the definition by Chomsky (1981: 165) that A governs B iff: (i) A is a governor (head of a lexical category, e.g., V, N, etc.); (ii) A c-commands B; (iii) no potential governor C which is c-commanded by A and c-commands B intervenes between A and B.

⁶⁾ In general, there will be only one governor for each governee and the government of X on Y will be blocked if there is an intervention of a closer governor Z (Rizzi 1992: 366). For instance, in the case of (1b), *how* cannot govern *criticize* because of the intervention of the negative *not*, i.e., ...[*how* did Jack [**not** criticize]...]...

operator *not*, the movement of the *wh*-adjunct *how* is blocked and the locality of *how* and the verb is broken (Rizzi 1990, 1992). This results in no government relation between the verb and the *wh*-element *how* (assuming that manner adverbials are lexically governed by the verb; see Roberts 1988).

Nevertheless, many researchers have highlighted that there is a criterion governing whether a *wh*-phrase can undergo so-called “long” movement, that is, the coindexation with a “referential” theta-role (e.g., Pesetsky 1987; Cinque 1990; Rizzi 1988, 1990, 1992). The sense of “referential” refers to the “D(iscourse)-linked” status proposed by Pesetsky (1987), such that certain *wh*-phrases are “D-linked,” as the answers to the *wh*-phrases are predictable and can be drawn from the specific set of alternatives that speakers have in mind. For instance, comparing the *wh*-argument *who* in (2b) with the *wh*-adjunct *how* in (1b) in terms of “D-linked” *wh*-phrases, readers would probably think of a party that the verb *criticize* acts on but not the way it is carried out. Under this criterion, *wh*-phrases can be categorized into: i) “referential *wh*-phrases,” which are assigned theta-roles and carry referential indexes; and ii) “nonreferential *wh*-phrases,” which are assigned no theta-roles and lack a referential index (Rizzi 1990: 86). With this in mind, compare three kinds of *wh*-phrases in a negative environment, as in (5).

- (5) a. Who don't you think we can help *t*?
 b. ?Who don't you think [*t* can help us]?
 c. *Why don't you think [*t* [we can help him]]? (Rizzi 1990: 83)

Following the subjacency and ECP, the acceptability of (5a) could be said to indicate that there is theta-government by the verb on the trace, and the unacceptability of (5c) reveals that the *wh*-adjunct *why* is not properly governed if it is intended to be adjoined to the lower clause due to the RM (Rizzi 1990). However, the degraded acceptability (but not complete unacceptability) of (5b) fails to be adequately addressed under both assumptions, as the trace left by the movement is not properly governed; in particular, it has no verb head that can operate the government.

Conversely, taking referentiality into account, both (5a) and (5b) are assigned theta-roles (i.e., *patient* and *agent*, respectively) by the verb *help* and receive a referential coindex *j* with their traces. With this coindexation between the *wh*-phrase *whos* and the traces, the operator is connected to its variables (i.e.,

the *wh*-nominal *who*) through binding, as illustrated in (6a) and (6b). As the binding relationship between an extracted *wh*-element and a trace bearing a referential index would not be intervened by negation, (5a) and (5b) result in acceptability to a certain extent. Conversely, being assigned no theta-role, the *wh*-adjunct *why* moves without a referential index with its trace. Additionally, as the connection between the operator *why* and an unindexed trace is interrupted by the negation, as illustrated in (6c), the sentence becomes unacceptable, as in (5c).

- (6) a. _[patient] **Who**_j do _[TP2] you think _[TP1] we can not help *t_j*]?
 b. ^{??}_[agent] **Who**_j do _[TP2] you think _[TP1] *t_j* can not help us]?
 c. ***Why** don't you think [*t* [we can help him]]?

In sum, given the referentiality, the *wh*-argument *whos* in (5a) and (5b) are successfully connected to the operator at a long distance via binding. Although the acceptability is degraded slightly by the violation of subjacency (especially in the case of (5b), which is also supposed to violate the ECP), they are still licensed despite the overt *wh*-movement. Conversely, being a “nonreferential *wh*-phrase” and having no binding relations between the operator and variable, *wh*-adjunct *why* in (5c) can only resort to the government relations. Consequently, when both binding and government fail, (5c) results in severe unacceptability.

Accordingly, both the *wh*-argument subject *who*⁷⁾ (*who_{subject}*) as in (7a) and object *who* (*who_{object}*) as in (7b) should be evaluated as equally acceptable in negative island extraction (Rizzi 1990, 1992), but not for *wh*-adjunct *how* and *when*, as in (8a) and (8b), respectively.

- (7) a. A: Who didn't tease Lydia?
 B: Tony.
 b. A: Who didn't Tony tease?
 B: Lydia.
- (8) a. A: *How didn't Tony tease Lydia?

⁷⁾ By saying subject *who*, we simply refer to the DP specifier of the VP, and object *who* the DP complement of the V.

B: Happily.

b. A: *When didn't Tony tease Lydia?

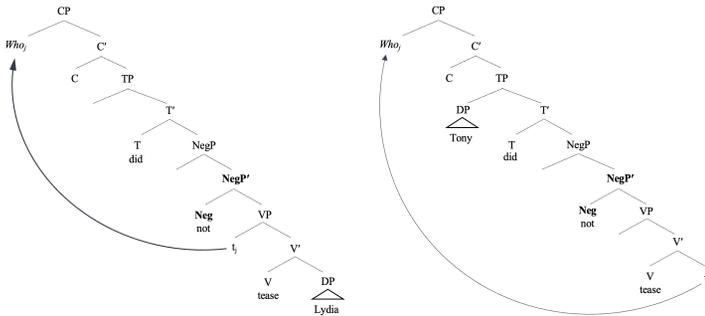
B: An hour ago.

Being assigned a theta role, that is, *agent*, by the verb *tease*, *who*_{subject} in (7a) is acceptable despite the violation of subadjacency, as visualized in (9a). Similarly, being assigned the *patient* role, *who*_{object} in (7b) is considered acceptable, as visualized in (9b).

(9) Proposed structures of the two *whos* with negative islands

a. Subject *who*

b. object *who*



However, in contrast to the “referential *wh*-phrases” *whos*, the “nonreferential *wh*-phrases” *how* and *when* as in (8a) and (8b), without available coindexation and binding, can only seek the chain of government relations, which are intrinsically local. As a result, once the locality is broken, the connection fails and the structure is ruled out (Chomsky 1977, 1981, 1986; Aoun et al. 1987).

Whereas the severe negative island effects seem to capture the unacceptability of *wh*-adjunct extraction out of island sentences in general, *why* differs from other *wh*-adjuncts, such as *when* and *how*, in its island-insensitivity. As compared in (10), *why* is not severely constrained by negative islands (Chomsky 1973, 1986; Rizzi 1990; Lasnik and Saito 1992; Kim 2019; Lu, Thompson, and Yoshida 2020; Kim et al. under revision).

(10) a. A: Why didn't you go to bed last night?

B: Because I drank too much coffee.

- b. A: *How didn't you go to bed last night?
 B: Comfortably.

While the *how*-question in (10b) becomes unacceptable when crossing the negation, the *why*-question in (10a) exhibits insensitivity to negative island effects, indicating that *why* is insensitive to the negative island effect when it stands for reason (see Stepanov and Tsai 2008 for Russian and Chapman and Kučerová 2016 and Kim et al. under revision for English) as it is base-generated in the CP (Rizzi 2001; Ko 2005; Stepanov and Tsai 2008; Yoshida, Nakao, and Ortega-Santos 2015; Chapman and Kučerová 2016).

It has been observed that *why*-questions reveal properties that signal movement, as illustrated in island sensitivity and Subject-Auxiliary inversion, suggesting that *why* may originally be located in the VP area (Lasnik and Saito 1992). Meanwhile, *why*-questions are not strictly constrained by negative islands (Ross 1984) and do not scopally interact with a quantified subject like *everyone* under certain circumstances (Yoshida et al. 2015), indicating that *why* is base-generated in the TP or a higher position, and possibly base-generated in the CP (Ko 2005; Stepanov and Tsai 2008; Shlonsky and Soare 2011; Yoshida et al. 2015; Chapman and Kučerová 2016; Kim 2019; Kim et al. under revision).

It is thus suggested that *why* elements in English simultaneously reveal both movement and non-movement properties, yielding the following distinct interpretations: i) reason *why* (*why*_{Reason}) base-generated within the CP, which typically yields *because*-answers, as in (11a); and ii) purpose *why* (*why*_{Purpose}), adjoined to the VP, which triggers *in order to*-answers (e.g., Chapman and Kučerová 2016; Kim et al. under revision), as in (11b).

- (11) A: Why did John resign?
 B: a. Because John is fed up with his boss.
 b. In order to find a better job.

The syntactic distributional constraints on its two interpretations provide promising evidence for the existence of two different *whys*. Although both interpretations are compatible with dynamic predicates, as illustrated in (11), only *why*_{Reason} is compatible with passive, unaccusative, locative-existential, stative, and sentient predicates (cf. Chapman and Kučerová 2016). As

illustrated in the examples with passive (12) and stative predicate (13), the *in order to*-clause answer with the purpose interpretation is not compatible with passive or stative predicates, whereas the *because*-clause answer is permissible.

(12) Passive: only *why*_{Reason}

A: Why was Ben criticized?

B: a. Because he has made too many mistakes.

b. *In order to be careful.

(13) Stative predicate: only *why*_{Reason}

A: Why is Mary so happy?

B: a. Because she has won the first prize in the competition.

b. *In order to stay in a positive attitude.

The degraded acceptability of *why*_{Purpose} with these predicates indicates that *why*_{Purpose}-questions strictly require an agent role as they are semantically associated with its motivations (e.g., Tsai 1999; Williams 2015; Chapman and Kučerová 2016). The purpose interpretation is not acceptable with predicates such as “being criticized” or “being happy,” suggesting that *why*_{Purpose} must appear as the adjunct of VP and that agents play an important role in *why*_{Purpose}-questions (Williams 2015).

Additionally, *why*-questions become less acceptable when *why* stands for purpose in a negative context (i.e., 14b), which serves as a VP modifier as it crosses the NegP.

(14) A: Why didn't you go to bed last night?

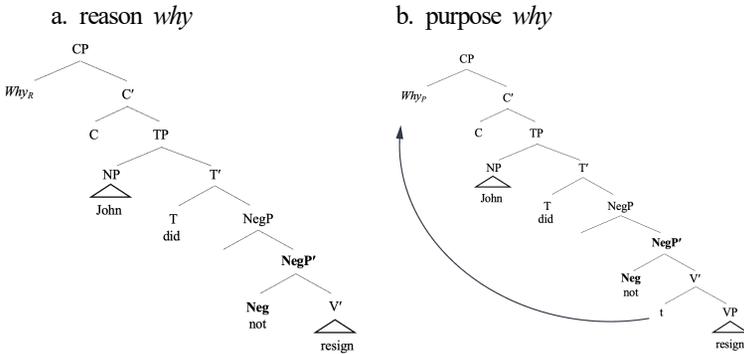
B: a. Because I drank too much coffee.

b. *In order to play computer games.

Kim, Wellwood, and Yoshida (under revision) experimentally investigated the (in)sensitivity of *whys* in English to negative islands. The authors established that the two distinct readings of *why* in English correspond to two different syntactic positions, which give rise to different island (in)sensitivities. The observed island sensitivities could in turn be attributed to the structural positions of *whys* in English; *why*_{Reason} is not constrained by negation as it is scopally higher than the NegP, in the CP area. Conversely, *why*_{Purpose} is

scopally lower than the NegP and hence is sensitive to the negative island (Kim et al. under revision).

(15) Proposed structures of the two *whys* with negative islands



As shown in (15a), *why_{Reason}* is scopally higher than the NegP and need not move across the negative island. However, in (15b), as *why_{Purpose}* is trapped by the NegP, and having no referential index, *wh*-adjunct *why_{Purpose}*-sentences are typically unacceptable under the negative context (see Kim et al. under revision for detailed discussion).

Based on the observed phenomena of the two different *whys* and *whos* illustrated above, we may expect that sentences with *wh*-argument *whos* in both syntactic positions would still be acceptable when crossing negative islands due to potential amelioration by referentiality (Cinque 1990; Rizzi 1990, 1992). Conversely, sentences with *wh*-adjuncts in a lower syntactic position (i.e., *why_{Purpose}*) become more severely unacceptable than the two *whos* in violation of island constraints due to the failure of both binding and government relations (Chomsky 1981; Cinque 1990; Rizzi 1990, 1992).

However, whether *wh*-arguments are insensitive to island effects while *wh*-adjuncts are not, and whether such asymmetries can potentially be captured by the referentiality still need to be further established. Therefore, we conducted two acceptability rating experiments to address the *wh*-adjunct/argument asymmetry regarding their (in)sensitivity to negative islands.

As an overview, in Experiment 1, three *wh*-phrases (*why_{Reason}*, *who_{Subject}* and *who_{Object}*) were manipulated as independent factors. To avoid potential ambiguity and complexity that may affect the readers' interpretation of *why*, we employed

why_{reason} across-the-board in order to directly test whether *wh*-argument *whos* are insensitive to negative islands in comparison with *why_{Reason}*. Then, to test whether referentiality can potentially ameliorate the general negative island violation of *wh*-argument movement, we added another independent factor in Experiment 2, *why_{purpose}* (see Kim et al. under revision for detailed discussion on two distinct *whys*), as a representative of *wh*-adjuncts (i.e., nonreferential *wh*-phrases).

Overall, *wh*-argument *whos* should exhibit negative island effects but not *why_{Reason}*, as *whos* violate the subjacency constraints. However, the island violation by *whos* should be less severe than that by *why_{Purpose}*. More specifically, no difference in island effects should be observed between *who_{subject}* and *who_{object}*, as they both are “referential *wh*-phrases.”

3. Experiment 1: Acceptability of Negative Island Sensitivity for the Two *whos* (Subject and Object) and *why_{Reason}*

In Experiment 1, we examined the negative island effects of *wh*-argument, *who_{subject}* and *who_{object}*, compared with *why_{Reason}*. As reviewed above, *why_{Reason}* is scopally higher than NegP and should not show island effects, whereas both *who_{subject}* and *who_{object}* should exhibit island effects as their movement spans the island. We investigated whether these *wh*-phrases differ in island effects due to their structural positions (see Kim et al. under revision for the negative island insensitivity of *why_{Reason}*).

3.1. Participants, Materials, and Experimental Design

A total of 27 native speakers of English with no language-related disorders were recruited. Only individuals residing in the United States during the study period (their IP address had to be in the United States) were eligible to participate. All participants provided informed consent prior to the experiment, and were paid \$6 in exchange for their participation. The critical experimental items comprised 16 sentences in the form of a 1×4 design where different kinds of *wh*-phrases (*who_{subject}*, *who_{object}*, and *why_{Reason}*) were manipulated as independent factors. A sample set of stimuli with four conditions is illustrated in Table 1. All experimental stimuli involved the Question-Answer pair between Person A and Person B. The logic is that if the negative island can

disambiguate the two readings, then the lower reading of *why* should not be available when there is a weak island, but the higher reading of *why* should be available. The answers for *who_{subject}* and *who_{object}* involve the subject and direct object of the verb, respectively, and that for *why_{Reason}* starts with a *because*-clause, which is the signal that participants could conjecture an occurrence of *why_{Reason}*. In addition to these experimental items, 28 filler items irrelevant to the manipulations of the current experiment were included.

<Table 1> Example Stimuli for the Experiment 1

Factors	Examples
<i>that</i>	A: Didn't Bill kiss Elsa? B: No, he didn't.
<i>who_{subject}</i>	A: Who didn't kiss Elsa? B: Bill.
<i>who_{object}</i>	A: Who didn't Bill kiss? B: Elsa.
<i>why_{Reason}</i>	A: Why didn't Bill kiss Elsa? B: Because he was too shy to do that.

All items were pseudo-randomized in a Latin-square design so that the identical condition did not appear successively. The experiment was administered using the PC IbxFarm web-based experimental presentation platform (Drummond 2020). Participants were able to take part in the experiment by clicking an experimental link distributed via Prolific. They were instructed to rate the sentences on a scale of 1 to 7 based on the naturalness of the conversation between A and B (1 = totally unnatural, 7 = perfectly natural). Prior to the experiment, they were provided six practice sentences.

3.2. Analysis

Data were analyzed using linear mixed-effect models by employing the lme4 package (R Core Team 2013). Fixed factors were coded by several layers using the Helmert contrast (Orth, Yoshida, and Sloggett 2021⁸). The first layer

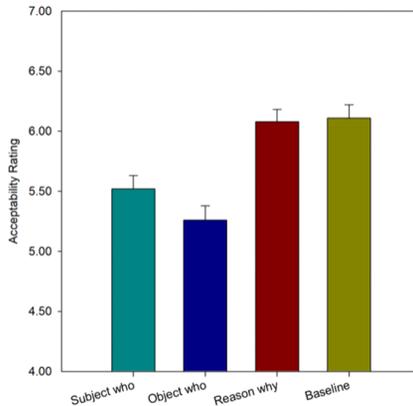
⁸) Following Orth et al. (2021), the motivation behind using helmert coding architecture is to examine the differences between argument and adjunct asymmetry in island sensitivity without the increased possibility of false positives which could have arisen from the simple pairwise comparisons to the

compares the baseline condition, weighted 1, and the other three *wh*-phrases, weighted $-1/3$. The second layer compares the *why*_{Reason} condition, weighted -1 , with the two different *whos*, weighted $1/2$, and the baseline weighted 0. The last layer compares the differences between *who*_{subject} and *who*_{object}, weighted 1 and -1 , respectively. This model architecture was implemented using maximally converging random effect structures, and random slopes were removed in a step-wise fashion until convergence (Matuschek, Kliegl, Vasishth, Baayen, and Bates 2017).

3.3. Predictions

We predicted that, owing to island effects, *who*_{subject} and *who*_{object} should be rated lower than baseline *that* and *why*_{Reason}. In particular, there would be a significant difference between *who*_{subject} and *who*_{object}, vs. *why*_{Reason} because of the violation of negative island constraints on *wh*-movement for two different *whos* but not for *why*_{Reason}; however, there would be no significant differences between *who*_{subject} and *who*_{object} because both contain a referential index with a trace bound by the predicate (Cinque 1990; Rizzi 1990, 1992).

3.4. Results



<Figure 1> Acceptability scores of *who*_{subject}, *who*_{object}, *why*_{Reason}, and the *Baseline*

baseline for each condition.

The results revealed a marginal difference between *who_{subject}*, *who_{object}*, and *why_{Reason}* vs. the *baseline* ($\beta = 0.38$, $SE = 0.21$, $t = 1.83$, $p > 0.05$). There was a significant difference between *who_{subject}* and *who_{object}* vs. *why_{Reason}* ($\beta = 0.44$, $SE = 0.19$, $t = 2.29$, $p < 0.05$), suggesting that, as expected, *why_{Reason}* is insensitive to negative islands as it is base-generated higher than the NegP and need not cross the island boundary (Kim 2019). However, both *who_{subject}* and *who_{object}* exhibit lower acceptability ratings than *why_{Reason}*, as they are base-generated within the VP and have to cross the NegP to reach Spec_CP. Crucially, there were no significant differences between *who_{subject}* and *who_{object}* ($\beta = 0.10$, $SE = 0.08$, $t = 1.27$, $p > 0.05$), suggesting that both similarly violate the negative island constraint in comparison with *why_{Reason}*.

In summary, in Experiment 1, we observed asymmetries in acceptability between two *whos* in two different syntactic positions and *why_{Reason}* due to syntactic structural differences, but we find no difference in acceptability between *who_{subject}* and *who_{object}*, supporting the claim that referentiality may potentially ameliorate the negative island violation of *wh*-argument movement (Cinque 1990; Rizzi 1990, 1992).

4. Experiment 2: Acceptability of Negative Island Sensitivity for Two *whos* (Subject and Object) and Two *whys* (Reason and Purpose)

Experiment 2 investigated the *wh*-adjunct/argument asymmetry by comparing two different *whos* with two different *whys*. Experiment 1 revealed that, due to their structural differences, both *whos* exhibit some sort of island effects compared with *why_{Reason}*. Experiment 2 examined whether they can be regarded as island-insensitive due to referentiality when compared with *why_{Purpose}*. In this experiment, *why_{Purpose}* was selected as the representative of *wh*-adjuncts (i.e., nonreferential *wh*-phrase) to compare with two *whos* (i.e., referential *wh*-phrase). We compared *whos* and *why_{Reason}* with *why_{Purpose}*, which due to the violation of negative constraint and the lack of referential indexation, should be rated low in acceptability (Kroch 1989; Cinque 1990; Rizzi 1990, 1992).

4.1. Participants, Materials, and Experimental Design

A total of 28 native speakers of English with no language-related disorders were recruited. Only individuals residing in the United States during the study

period (IP address should be in the United States) were eligible to participate). All participants provided informed consent, and they were paid \$6 in exchange for their participation in the experiment. The critical experimental items comprised 16 sentences in the form of a 1×5 design, where different kinds of *wh*-phrases (*who_{subject}*, *who_{object}*, *why_{Reason}*, and *why_{Purpose}*) were manipulated as independent factors. This experiment was also implemented in the form of Question-Answer pairs. The answers for *who_{subject}* and *who_{object}*, were the subject and direct object of the verb, respectively. The answer for *why_{Reason}* started with a *because*-clause, which indicated that participants could conjecture an occurrence of *why_{Reason}* (Kim 2019; Kim et al. under revision). Finally, the answers for the *why_{Purpose}* started with an *in order to*-clause, indicating that participants could conjecture an occurrence of *why_{Purpose}*. A sample set of stimuli displaying the five conditions is illustrated in Table 2. In addition to these experimental items, 28 filler items irrelevant to the manipulations in the current experiment were included.

<Table 2> Example Stimuli for Experiment 2

Factors	Examples
that	A: Didn't Lucy contact Ann last week? B: Yes, she gave Ann a call.
<i>who_{subject}</i>	A: Who didn't contact Ann last week? B: Lucy.
<i>who_{object}</i>	A: Who didn't Lucy contact last week? B: Ann.
<i>why_{Reason}</i>	A: Why didn't Lucy contact Ann last week? B: Because she was too busy with her part-time job.
<i>why_{Purpose}</i>	A: Why didn't Lucy contact Ann last week? B: In order to avoid being misunderstood by Lydia.

4.2. Analysis

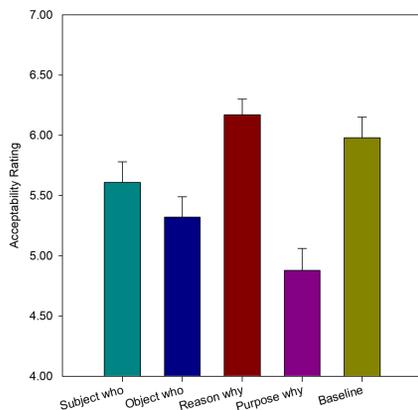
Similar analyses as above were employed. Similar to Experiment 1, fixed factors were coded by several layers using Helmert contrast (Orth et al. 2021). The first layer compares the *baseline* condition, weighted 1, and the other three *wh*-phrases, weighted -1/4. The following layer compares the *whos* conditions, weighted -1/2, with the two different *whys*, weighted 1/2, and the baseline weighted 0. The next layer compares the difference between *who_{subject}* and

who_{object}, which were weighted 1 and -1, respectively. The last layer compares the difference between *why_{Reason}* and *why_{Purpose}*, weighted 1 and -1, respectively. Similar analyses were employed as in Experiment 1.

4.3. Predictions

We predicted that, owing to general island effects, *who_{subject}*, *who_{object}*, and *why_{Purpose}* would be rated lower than *why_{Reason}*. Moreover, *why_{Purpose}* should be rated lower than two *whos*. This is because *why_{Purpose}* violates the negative island constraint on *wh*-movement and lacks referential coindexation, which could potentially ameliorate the negative island violation through binding. There would be no significant differences between *who_{subject}* and *who_{object}* because they both belong to the category of “referential *wh*-phrases.”

4.4. Results



<Figure 2> Acceptability scores of *who_{subject}*, *who_{object}*, *why_{Reason}*, *why_{Purpose}* and the *Baseline*

Acceptability rating scores were analyzed using a linear mixed-effect model. The results revealed a significant difference between *who_{subject}*, *who_{object}*, *why_{Reason}*, and *why_{Purpose}* vs. the *baseline* ($\beta = 0.41$, $SE = 0.12$, $t = 3.36$, $p < 0.001$). There was no significant difference between *who_{subject}* and *who_{object}* compared to the difference between *why_{Reason}* and *why_{Purpose}* ($\beta = 0.08$, $SE = 0.14$, $t = 0.57$, $p > 0.05$). This suggests that there are no significant syntactic

position differences between *who_{subject}* and *who_{object}* compared to *why_{Reason}* and *why_{Purpose}*. Crucially, there were no significant differences between *who_{subject}* and *who_{object}* ($\beta = 0.13$, $SE = 0.10$, $t = 1.35$, $p > 0.05$), suggesting that, as revealed in Experiment 1, both are assigned a theta role by the verb and receive a referential index with their traces, which connects them with the operator via binding. Lastly, there were significant differences between *why_{Reason}* and *why_{Purpose}* ($\beta = 0.67$, $SE = 0.10$, $t = 6.92$, $p < 0.001$), suggesting that the unacceptability of *why_{Purpose}* was due to the structural/configurational difference, which aligns with the previous study (see Kim et al. under revision for the similar results in another experiment).

Overall, the results suggest that *who_{subject}* and *who_{object}* do show some island effects (i.e., they are less acceptable than *why_{Reason}*), as revealed by Experiment 1, which can be attributed to the configurational/syntactic differences between *whos* and *why_{Reason}*. However, they are still less constrained by negative islands (i.e., insensitive) than *why_{Purpose}*, which exhibits more severe island effects and is rated significantly lower (i.e., sensitive to negative islands) than other *wh*-phrases (see also Kim et al. under revision). This is compatible with the idea that *wh*-arguments are insensitive to negative islands in general (Ross 1984; Rizzi 1990, 1992).

5. Discussion

In this study, we experimentally address the assumptions that *wh*-adjuncts and arguments show certain asymmetries in terms of their island (in)sensitivity—*wh*-adjuncts are sensitive to negative islands while *wh*-arguments are not. By conducting two acceptability rating experiments, we reveal several significant findings. First, there is a general negative island effect on both *wh*-adjuncts and *wh*-arguments when they are extracted out of a negative island. Although *wh*-arguments are believed to be insensitive to negative islands, our experimental results do show a lower acceptability of *wh*-argument *whos* in a negative island environment than *why_{Reason}*.

In addition, our results suggest that the violation of the negative island constraint on *wh*-arguments (*who_{subject}* and *who_{object}*) is less severe than for *why_{Purpose}*. This suggests that the referentiality may potentially contribute to the *wh*-adjunct/argument asymmetries in island (in)sensitivity. That is to say, given the referential coindexation with a trace, “referential *wh*-phrases” (i.e.,

wh-argument) *whos* are successfully connected to the operator (via binding), potentially ameliorating the negative island effect caused by the violation of subjacency. This is evidenced by the results that there was no significant difference in the acceptability of *who*_{subject} and *who*_{object} extraction over negation.

Conversely, as shown in our results, *why*_{Purpose} exhibits the greatest negative island effect (rated the most unacceptable, against *why*_{Reason}, *who*_{subject} and *who*_{object}), as it is ruled out by both binding and government relations (see also Kim 2019 and Kim et al. under revision). First, being adjoined to the VP area, it violates the structural constraints when crossing the NegP, resulting in a violation of subjacency. In addition, being assigned no theta role and lacking a referential coindex with its trace, it has to obtain a series of government relations to connect the operator with the variable (i.e., the trace) after movement (Rizzi 1990: 87). Finally, being intervened by the NegP, the trace is not properly governed (particularly antecedent-governed), leading to more severe unacceptability.

To sum up, we conducted a three-way comparison based on the difference of *wh*-phrases in syntactic structures and referentiality: i) *why*_{Reason} base-generated in the Spec_CP position vs. two *whos* base-generated in the VP; ii) *why*_{Purpose} adjoined to the VP vs. two *whos*, and iii) *who*_{subject} vs *who*_{object}. By comparing the acceptability of two different *wh*-adjunct *whys* with *wh*-argument *who*, we are able to establish the adjunct-argument asymmetry—while *wh*-adjuncts are sensitive to island constraints, *wh*-arguments are not (Ross 1984; Cinque 1990; Rizzi 1990, 1992). Furthermore, by comparing *who*_{subject} with *who*_{object}, our results also reveal that referentiality may potentially play a role in ameliorating the prohibition on *wh*-argument movement out of the negative island, especially for *who*_{subject}, which is assumed to be more restricted by islands than *who*_{object} (e.g., Chomsky 1981).

Our study aligns with the findings of previous studies that *why*_{Reason} differs from *why*_{Purpose} in being insensitive to negative islands, which can be attributed to the structural differences between them (see Kim 2019 and Kim et al. under revision). Although Kim (2019) also shows that *who*_{object} was rated high in acceptability, similar to *why*_{Reason}, in our study we further compared two *whys* with two different *whos* in the subject and object positions. In both Experiments 1 and 2, there were no differences between *who*_{subject} and *who*_{object} in their sensitivity to negative islands. This suggests that referentiality may potentially play a role in ameliorating the general prohibition on the extraction

of *wh*-argument out of a negative island. However, the potential role of referentiality in ameliorating the negative island violation was drawn from the null effect between *who*_{subject} and *who*_{object}. In a future study, we can experimentally test specific *wh*-elements depending on “D-linked” *wh*-phrases as well as different contexts to examine whether the adjunct-argument asymmetries can be modulated by referentiality.

6. Conclusion

This study systematically addresses *wh*-adjunct/argument asymmetries by investigating the (in)sensitivity of English *wh*-arguments versus *wh*-adjuncts to negative islands. By experimentally testing the negative island effects in four types of *wh*-phrases, that is, two *whos* and *whys* in different syntactic positions (*who*_{subject}, *who*_{object}, *why*_{Reason}, and *why*_{Purpose}) in minimal pairs, we reveal that there is a general negative island effect on the *wh*-movement due to the violation of configurational constraints. Additionally, we provide evidence for the assumption that there is indeed asymmetry in island sensitivity between *wh*-argument and *wh*-adjunct, such that the *wh*-arguments are insensitive to negative islands while the *wh*-adjuncts are island-sensitive (Ross 1984; Cinque 1990; Rizzi 1990, 1992).

Our experimental study also supports the idea that referentiality may potentially play a role in determining whether a *wh*-phrase can undergo “long” movement. With their referential coindexation, the *wh*-arguments *who*_{subject} and *who*_{object} are rated higher in acceptability than *why*_{Purpose}, although showing slight effects of the subjacency violation (Kroch 1989; Cinque 1990; Rizzi 1990, 1992). Conversely, without a referential index, *why*_{Purpose} is rated lower than the two *whos* and *why*_{Reason} in acceptability, as it syntactically violates the structural constraints and also lacks proper binding (Cinque 1990; Kroch 1989; Rizzi 1990, 1992) and government relations (Chomsky 1981; Stowell 1981).

Although our study shows that referentiality may potentially play a role in ameliorating the negative island effect, we did not directly test for the effects of referentiality. In a future study, we can experimentally test specific *wh*-elements depending on “D-linked” *wh*-phrases as well as different contexts to examine whether the adjunct-argument asymmetries can be modulated by referentiality.

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Ziying Li

Ph.D. Student

Department of English Language and Literature, Sungkyunkwan University

25-2 Sungkyunkwan-ro, Jongro-gu, Seoul 03063, Republic of Korea

E-mail: lydialzy12138@gmail.com

Nayoun Kim

Assistant Professor

Department of English Language and Literature, Sungkyunkwan University

25-2 Sungkyunkwan-ro, Jongro-gu, Seoul 03063, Republic of Korea

E-mail: nayoun@skku.edu

이 논문은 2022년 10월 07일 투고 완료되어

2022년 10월 10일부터 10월 28일까지 심사위원이 심사하고

2022년 10월 30일 편집위원 회의에서 게재 결정된 것임.