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Sensitivity to Islands in Korean-English Bilinguals

A dissertation submitted in partial satisfaction of the

Requirements for the degree Doctor of Philosophy

in

Linguistics

by

Boyoung Kim

Committee in charge:

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      Professor Victor S. Ferreira
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      Professor John Moore
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2015

The Dissertation of Boyoung Kim is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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Chair

University of California, San Diego

2015

DEDICATION

I dedicate this dissertation to my parents, Jongho Kim and Yeoyoung Bang,

who have raised me with so much love, with constant prayers and unconditional support.

I am forever grateful for their unwavering faith and love.

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ABSTRACT OF THE DISSERTATION

Sensitivity to Islands in Korean-English Bilinguals

by

Boyoung Kim

Doctor of Philosophy in Linguistics

University of California, San Diego, 2015

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The focus of this dissertation is twofold: First, it examines whether Korean exhibits island effects, as the status of islands in Korean and typologically related *wh*-in-situ languages has been unclear. Second, it explores whether Korean-English bilinguals display native-like island effects in their two languages.

While most accounts of island effects claim that the input is not directly involved and that islands stem from basic properties of grammar/processing that are available to all

humans, another line of accounts claims that islands actually can be learned from the input. These different approaches to the learnability issue on islands would then predict different outcomes for bilinguals. Under the accounts claiming that islands are not learned but available to all speakers regardless of one's learning environments, we might expect native-like island effects in bilinguals regardless of their learning environment. On the other hand, if input plays an important role in having island effects, as the second position argues, then bilinguals might be expected to show non-native-like and/or various types of island effects.

Four acceptability experiments on island effects in Korean (involving a *whether*-island and an adjunct island) in native and Korean-English bilinguals (i.e. heritage speakers of Korean) revealed the presence of a *whether*-island but the absence of an adjunct island in Korean in both native and heritage speakers of Korean. Another five acceptability experiments on island effects in English (a *whether*-island, a *wh*-island, and three types of adjunct islands) showed that Korean-English bilinguals, grouped according to their AoA (i.e. Heritage: AoA 0-5, Early: AoA 6-10, and Late: AoA 11-14), displayed adjunct island effects but either had weaker *whether/wh*-island effects than native speakers or lacked these effects altogether. Their island effect sizes, measured by DD scores, indicated that islands get weaker with increasing AoA. There was also found a positive correlation between AoA and length effects in bilinguals, suggesting a difficulty with long-distance dependencies as AoA increases. These results are discussed in light of the cross-linguistic similarities and differences in islands, and the role of input in island effects.

Chapter 1: Introduction

This dissertation investigates island effects in Korean, and Korean-English bilinguals' sensitivities to (non-)island phenomena in both Korean and English. Two specific research questions are asked:

(i)   Does Korean exhibit island effects?

(ii)   Do Korean-English bilinguals show native-like behavior on island effects in both Korean and English?

Answering these questions would help us understand mechanisms underlying both island phenomena and language acquisition. The issues involved in each research question are briefly discussed in the following Sections (1.1 and 1.2).

1.1.Island effects in Korean

An island refers to the case when an extraction of an element out of a certain type of an embedded clause results in the unacceptability of the sentence. For example, the *wh*-island effect arises when an element is extracted out of a *wh*-clause, such as (1.1).

(1.1)   *What did you wonder [**who** [___ ate ___ at the restaurant]]?

The etiology of island phenomena continues to be a central concern in linguistic theory, and *wh*-in-situ languages have an important role to play. Since there is no extraction in *wh*-in-situ languages, these languages have been considered to lack an island effect. However, the status of island effects in Korean and typologically related *wh*-in-situ languages is not completely clear. Some have argued for the presence of island effects (e.g. Lee 1982, Han 1992, Hong 2004b for Korean;

Nishigauchi 1990, Watanabe 1992 for Japanese), while others have argued against it (e.g. Suh 1987, Choi 2006, Hwang 2007 for Korean; Ishihara 2002, Sprouse et al. 2011, for Japanese). This unclear status of islands in Korean and other *wh*-in-situ languages has been an obstacle in the investigation of island phenomena not only in *wh*-in-situ languages, but also cross-linguistically. This situation points to the need for carefully designed, formal acceptability experiments to determine exactly what the facts are.

However, languages like Korean raise difficult methodological concerns. Specifically, *wh*-constructions in Korean are ambiguous, particularly regarding *wh*-scope assignment (i.e. the domain of the sentence that is being questioned) and the interpretation of a *wh*-word. First, while in *wh*-movement languages like English, an island-violating reading (i.e. matrix *wh*-scope) is clearly indicated by the location of a *wh*-word out of an island domain, in *wh*-in-situ languages like Korean, *wh*-scope in Korean is not straightforward as it always stays in-situ. Thus, while a judgment on island configuration in *wh*-movement languages would directly reflect the acceptability of an island violating reading, it is not usually the case in *wh*-in-situ languages since it is difficult to be certain whether a speaker is giving a matrix *wh*-scope reading or an embedded *wh*-scope reading.

In addition, bare *wh*-words in Korean, specifically argument *wh*-words such as *who* and *what*, are ambiguous either as *wh*-question words (e.g. *who*) or as existential pronouns (e.g. *someone*). Thus, a judgment of an island construction could be when a *wh*-word is interpreted as an existential pronoun, not as an interrogative *wh*-word, which is not relevant regarding the existence of islands. Such ambiguities in *wh*-

constructions in Korean make studying constraints on *wh*-questions in Korean very difficult since the conventional way of getting acceptability judgments for island configurations would not work well for Korean.

This dissertation thus contributes to this by exploring the possible existence of island effects in Korean experimentally (Chapter 5). Series of acceptability judgement tasks were conducted on two specific islands, *whether*-islands and adjunct islands. In order to minimize the possible ambiguities in *wh*-constructions in Korean discussed above, the tasks measured the acceptability not of the *wh*-question itself, but of the two types of answers (i.e. either "*wh*-answers" or "yes/no answers") to the question, given a particular context. "*Wh*-answers" are appropriate for a direct *wh*-question interpretation of the preceding question, while "yes/no answers" are appropriate for a yes/no question interpretation. The answers would thus encourage one reading or the other. In addition, the presence of a context makes the *wh*-reading pragmatically plausible, even when this would violate an island.

The experiments revealed an interesting result: Korean exhibits the *whether*-island, but no adjunct island effect. This shows that despite the difficulties, an experimental approach to acceptability in Korean *wh*-questions is possible. The results are discussed in Chapter 5.

1.2.Island effects in Korean-English bilinguals

Island phenomena have been a popular topic in acquisition studies, particularly in the investigation of "the Poverty of the Stimulus" effect (i.e. how speakers acquire complex and rich knowledge given limited evidence), as despite the absence of

evidence of island configurations in the input, children still figure out that extraction out of the island domain is impossible. Previous research on this topic has revealed interesting findings and insights, but unfortunately most studies have been limited to *wh*-movement languages, with an assumption that *wh*-in-situ languages like Korean do not exhibit an island effect (e.g. Huang 1982), and that as a result, there is nothing to explore there. Nevertheless, as mentioned above, the status of island effects in *wh*-in-situ languages is not yet completely clear, and there has been increasing evidence of an existence of a certain type(s) of island effects in *wh*-in-situ languages. If there is an island effect in *wh*-in-situ languages, then both types of languages would have a clear poverty of the stimulus problem: in the case of *wh*-islands, for instance, the learner has to figure out that questioning something within an indirect question is impossible, even though s/he never gets any evidence for this. The difference would be that in *wh*-movement languages, the missing evidence is a sentence (a particular pattern), while in *wh*-in-situ languages, the missing evidence is a reading (a particular meaning for a sentence).

This dissertation thus explores acquisition of islands in Korean, specifically focusing on the development of island effects in sequential Korean-English bilinguals in the U.S (i.e. heritage speakers of Korean) in their two languages (i.e. heritage Korean and L2 English). The term "heritage speakers" generally refer to early bilinguals who grew up with exposure to the heritage language (L1) and the majority language (L2) either simultaneously or sequentially in early childhood, but whose L2 became the primary language at some point during childhood. This is a fairly understudied but important population in linguistic research. In particular, some of the

characteristics of heritage speakers might play an important role in understanding the learnability of issue of islands.

In general, heritage speakers' learning environments are different from typical first and second language acquisition. For example, the amount of time that heritage speakers are exposed to each language is less than what would occur with a monolingual. Also, since languages of heritage speakers are in a majority–minority relationship, the input of the heritage language is mostly limited to home-/family settings. In addition, the input of the society language is also possibly reduced for many heritage speakers, as the exposure to the language usually starts later in life, not from birth. Then, largely two different patterns of island effects would be predicted for heritage speakers.

Most common accounts of poverty of the stimulus effects in island effects may be divided largely into two types, depending on their assumptions on the learnability of islands. One position argues that islands actually aren't poverty of the stimulus effects and can be learned from the input (e.g. Culicover and Jackendoff 2005, Pearl and Sprouse 2013). On the other hand, the other position, such as traditional UG accounts, computational efficiency accounts, and processing accounts (e.g. Kluender 1998, Hofmeister & Sag 2010), assume that island effects are not learned, or even learnable. Then, under the first position, which argues that input plays an important role in having island effects, heritage speakers might be expected to show non-native-like island effects, as the input of heritage speakers' is generally restricted, compared to that in typical first and second language acquisition, although it is also always possible that the input for heritage speakers is different, but not in a way that affects

their island behavior. On the other hand, if islands are not learned but available to all speakers regardless of one's learning environments, as the second position claims, then, we might expect native-like island effects in heritage speakers. Investigating island effects in heritage speakers might thus help us evaluate these two different approaches to learnability of islands.

In addition, heritage speakers are generally native-like in most aspects of their society language, as the society language is the dominant language for most heritage speakers. Thus, we might expect them to show native-like island effects in their dominant language. Nevertheless, the acquisition process of the society language in heritage speakers may not be the same as the typical first language acquisition, and instead heritage speakers may share some similarities with second language learners. Thus, investigating the two languages of heritage speakers would also help us better understand heritage language speakers and language acquisition in general.

1.3. Dissertation chapter overview

The organization of the dissertation is as follows:

Chapter 2 presents various analyses of island effects from both processing-based and grammar-based perspectives. Specifically, under the grammar-based approaches, Relativized Minimality theory (Rizzi 2013), the Late Adjunction theory (Stepanov 2001, 2007), and the Event Locality theory (Truswell 2007a,b,c) are discussed. Under the processing-based approaches, resource-based processing accounts (e.g. Kluender and Kutas 1993a,b) are discussed. Experimental approaches to island effects are also discussed, such as characteristics of formal acceptability

experiments, a factorial definition of island effects, and quantifying an island effect size (i.e. Differences-in-Differences scores). Some of differences in the approaches to acceptability judgement tasks between the second language acquisition studies and the syntax literature are also discussed.

Chapter 3 first presents a grammatical description of *wh*-constructions in Korean, including indeterminate *wh*-phrases, and ambiguous *wh*-scope. Then, the status of island effects in Korean and other cross-linguistically related *wh*-in-situ languages are discussed, as well as some challenges and possible solutions to experimentally testing island phenomena in these languages. Lastly, various analyses to island effects in *wh*-in-situ languages are presented: LF movement of a *wh*-phrase (Huang 1982), operator movement (Watanabe 1992, 2001), unselective binding (Tsai 1994, 1997, 1999), semantic approach (Shimoyama 2001, 2006), and processing account (Sprouse et al. 2011).

Chapter 4 deals with island phenomena in language acquisition, with a discussion of characteristics of heritage speakers, and four different approaches to the learnability problems in island phenomena (i.e. traditional UG-based accounts, contemporary minimalist grammar accounts, working-memory processing accounts, and input-driven accounts) and their predictions for island effects in heritage and L2 speakers.

Chapter 5 focuses on experimental investigation of island effects in Korean (i.e. a *whether*-island and an adjunct island) in native and heritage speakers of Korean, and provides experimental stimuli, methods, and results. The results show the presence of the *wh*-island but the absence of the adjunct island in Korean in both native and

heritage speakers of Korean. I argue that the asymmetry between the *whether*-island and the adjunct non-island in Korean is a natural consequence of the interaction between a *wh*-word and a licensor, such as a question marker, and thus (non-)island phenomena in Korean are expected to be available to various types of speakers.

Chapter 6 tests Korean-English bilinguals' sensitivities to island effects in English (i.e. a *whether*-island, a *wh*-island, and three types of adjunct islands). The results revealed native-like adjunct island effects, but no *wh*-island effect in all bilingual groups, and the absence of the *whether*-island in the Late group. However, when we look at the results more closely, such an asymmetry between island types may not actually be present. Instead, the apparent asymmetry may simply be due to bilinguals' weaker island effects overall, derived from their special difficulty with a long-distance *wh*-dependency.

Chapter 7 presents a summary of the major findings of the dissertation, and discusses implications of the findings, particularly regarding cross-linguistic similarities and differences in island effects in languages, and island effects in Korean-English bilinguals.

Chapter 2: Issues in Island Effects

2.1. Introduction

Since their initial extended treatment in Ross (1967), island phenomena have been a popular topic of research in various fields of linguistics and other related domains. This chapter presents some of the basic facts of island effects. First, one of the main topics regarding island effects is what the mechanism underlying island phenomena is, such as whether islands are due to properties of grammar, processing, or some combination of these. Formal grammatical approaches assume that island effects are consequences of grammatical constraints (e.g. Subjacency Principle, Chomsky 1971). Processing-based approaches, on the other hand, argue that (at least some) island effects are not a product of grammar, but of limited human language processing resources (i.e. a performance issue) (e.g. Pritchett 1992, Kluender and Kutas 1993, Kluender 1998, 2004, Sag et al. 2010). These two competing positions on island phenomena have been promising avenues to explore island effects. In this chapter, accounts under each of these two views are discussed, specifically focusing on *wh*-island and adjunct island effects (Section 2.2).

Another ongoing discussion in the research on island phenomena is how to test island effects experimentally. With the growing interest in experimental approaches to syntax in the past decade, a number of articles have addressed methodological issues in the investigation of island effects (e.g. Sprouse 2007, Hofmeister and Sag 2010, Sprouse et al. 2011, 2012, 2013, Kim and Goodall 2011). Section 2.3 discusses this issue, including factorial definition of island effects, and also how the "experimental

syntax" approach (Cowart 1997) to island phenomena differs from experimental approaches used in the second language acquisition literature.

2.2. Accounts for *wh*-island and adjunct island effects

Among various types of island effects, this dissertation focuses on two specific types of islands, *wh*-islands (a weak island) and adjunct islands (a strong island). First, the *wh*-island phenomenon refers to the case when an extraction of an element out of a *wh*-clause results in the unacceptability of the sentence. The domain where the extraction is banned (i.e. the embedded *wh*-clause) is called a *wh*-island, as in (2.1). An adjunct island blocks syntactic movement out of this clause, as in (2.2).

(2.1) *What did you wonder [**who** [___ bought ___ at the shop]]?
(2.2) *What did you drink [**after** [John bought ___ at the shop]]?

There are two leading approaches to island effects: grammatical approaches and processing approaches. Analyses under these two different views have provided different insights and empirical evidence to the investigation of island effects in the past decades. The first, a widely-adopted approach, views islands as a reflection of universal grammatical conditions or principles of computational efficiency which limit grammatical application, such as specific types of island constraints (e.g. *Wh*-island constraint) or the Subjacency Principle (Chomsky 1971, 1977). The second approach, on the other hand, assumes that the unacceptability of islands is a by-product of processing constraints, not the reflection of grammatical constraints. Some representative studies of each view are discussed in the following sections.

2.2.1. Grammatical Approaches to Islands

2.2.1.1. Grammatical Approaches to *Wh*-Islands

One influential syntactic account of *wh*-island effects comes from Relativized Minimality theory (RM, Rizzi 1990, 2004, 2006, 2013). The main idea of RM is hierarchical "intervention locality," which blocks movement or other local relations between X and Y across an intervening element of the same type as X, as in (2.3)

(2.3) *What$_i$* do you wonder [*who*$_{ii}$ [____$_{ii}$ saw ____$_i$]]?
       X   ...   Z   ...   Y

What qualifies as an intervening element of the same type that blocks the local relation of X and Y has been refined since its first proposal by Rizzi (1990). The latest version of RM, 'featural Relativized Minimality' (Rizzi 2013), defines the intervening element in featural terms, as described in (2.4).

(2.4) Relativized Minimality: in the configuration
      . . . X . . . Z . . . Y . . .
A local relation (e.g., movement) cannot hold between X and Y if Z intervenes and Z fully matches the specification of X in the relevant morphosyntactic features (Rizzi 2013:179).

It argues that no element that fully matches with X in features can intervene between the antecedent X and its trace Y. For example, the *wh*-island effect in (2.3) is due to the featural overlap between the target '*what*' and the intervener '*who*' which blocks the computation of the dependency '*what*' and its trace.

The motivation for the featural analysis of RM comes from cases where extraction from indirect questions is possible. Consider the asymmetry between the examples in (2.5) (the examples and judgments are from Rizzi 2013:177).

(2.5) a. ?Which problem do you wonder [how to solve ___ ___]?
     b. *How do you wonder [which problem to solve ___ ___]?

The two sentences differ minimally in the types of *wh*-words, but (a) is more acceptable than (b). Rizzi proposes that this asymmetry is due to different degrees of lexical specification between the intervener and the extracted element in terms of features. Specifically, if the intervener is as specified as the extracted element, it blocks the local relation of X and Y while the extraction of the less specified element over the more specified element is possible. For example, in (2.5) the features of *which problem* are [+Q, +N] and that of *how* is [+Q]. Since *which problem* is more specified in features (i.e. [+Q, +N]) than *how* (i.e. [+Q]), extraction of *which problem* over an intervener with less features (i.e. *how* [+Q]) is possible as in (2.5a), but not vice versa as in (2.5b). This different specification of features between an extracted element and an intervening NP explains why extraction out of an embedded *wh*-domain is possible in some cases, but not always.

Rizzi (2013) claims that RM is a principle of efficient computation that limits computational resources within a complex domain. That is, the closest element should be the target of movement. Intervention effects are not derived by "arbitrary cognitively or perceptually salient similarities," but by a narrow set of morphosyntactic featural specifications between the target and the intervener. Thus,

RM is language-specific, as languages differ in their featural properties of lexicons, which explains some cross-linguistic variation in *wh*-islands.

In sum, Rizzi explains *wh*-island effects as the results of violating the intervention locality condition. Extraction is impossible when there is an intervening element that fully matches with the extracted item in relevant morphosyntactic features (Rizzi 2013:179). Rizzi (2013) distinguishes this "intervention locality" from another type of locality condition, "impenetrability." The first expresses blocking processes across an intervening element, which is formally implemented as RM, as discussed in this section. The latter refers to syntactic property which prohibits certain syntactic configurations, as expressed in the following schema.

(2.6) Impenetrability: In the configuration
. . . X . . . [a . . . Y . . .]
Movement cannot connect X and Y,
for a = sentential subject, adverbial clause, relative clause, . . .

Rizzi claims that adjunct island effects arise due to this Impenetrability condition, rather than the intervention locality condition (i.e. RM). Extraction from an adjunct violates certain grammatical principles, which make this adjunct domain impenetrable for extractions. In the following section, two different grammatical accounts of adjunct island effects are discussed: 'Late Adjunction Hypothesis' (Stepanov 2001, 2007) with a syntactic approach, and 'Event Locality Condition' (Truswell 2007a,b,c) with a semantic point of view.

2.2.1.2. Grammatical Approaches to Adjunct Islands

    2.2.1.2.1.   Late Adjunction Hypothesis (Stepanov 2001, 2007)

One syntactic account for adjunct island effects is the Late Adjunction Hypothesis by Stepanov (2001, 2007). Building on the proposal by Lebeaux (1988) that adjuncts can be Merged into the structure late (for details of why adjuncts are Merged late, see Lebeaux 1998, Stepanov 2001), Stepanov claims that adjuncts *must* be Merged independently of the main cycle of the syntactic derivation (i.e. post-cyclically), relying on the Least Tampering theory, adopted from Chomsky (1998) (i.e. Merge should not change the set of basic relations in the existing structure; Merge at the root when possible) (For more details, see Chomsky 2000, Stepanov 2001).

He specifically defines adjunction as in (2.7).

(2.7) A nonprojecting syntactic object α is Merged with a syntactic object β by *adjunction* iff the label of α contains no active (''unchecked'') uninterpretable feature(s). (Stepanov 2001:108 (32))

If an object contains no uninterpretable features, it must enter the structure postcyclically, but if an object contains uninterpretable feature(s), it must be Merged cyclically. This late adjunction is a main reason for adjunct island effects. Consider an example of an adjunct island effect and its structural derivation in (2.8).

(2.8) *Who$_i$ did Mary cry after Peter hit ___$_i$?
    [[$_{CP}$ Q [$_{IP}$ Mary cry]][$_{Adj}$ after Peter hit who]]

The adjunct '*after Peter hit who*' in (2.8) lacks uninterpretable features in its label (i.e. *after*). A *wh*-feature in *who* does not determine the label of the whole adjunct phrase since it is embedded deeply. Thus, according to the Late Adjunction Hypothesis, this phrase must be Merged with the rest of the structure post-cyclically. This late adjunction makes the adjunct unconnected with the rest of the structure by the time the

interrogative feature of the matrix complementizer is Merged with the matrix clause *'Mary cry.'* Because of this lack of connection between the adjunct and the matrix clause, the *wh*-word *'who'* cannot move to its specifier to satisfy the EPP property of the Q feature, which must be checked at the point of insertion by the *wh*-word *'who'* (Chomsky 2000). As a result, this Q feature remains unchecked, and this is argued to be responsible for the adjunct island effect in (2.8).

Stepanov argues that adjunct island effects are universal with overt extraction (Stepanov 2007:112). If extraction is not overt, on the other hand, no particular adjunct island effect is expected. This could possibly account for the lack of adjunct island effects in cases involving no overt movement, such as multiple *wh*-questions. However, there are some other cases that the Late Adjunction Hypothesis cannot easily explain. An example is the absence of adjunct island effects with infinitival adjunct clauses, as shown in (2.9).

(2.9) Who did [she go to Harvard [in order to work with ____]]?
                              (Culicover 1997, p. 253)

The infinitival domain here lacks an unchecked uninterpretable feature. Thus, according the Late Adjunction hypothesis, this domain should be Merged postcyclically, which makes extraction out of this domain impossible. However, some infinitival adjuncts are known to lack adjunct island effects, and this is difficult to explain under the Late Adjunction Hypothesis. Stepanov (2001) suggests in a footnote that the infinitival Tense (contra finite tense) may result in an uninterpretable feature, which allows the infinitival domain to be Merged cyclically, but he left it unelaborated

as a topic for future research. Another possible way to account for acceptable adjunct island cases is explored in Truswell (2007), which is discussed in the following section.

2.2.1.2.2. The Event Locality Condition (Truswell 2007a,b,c)

Truswell (2007a,b,c) argues that adjunct island effects are better analyzed by a semantic account than a purely syntactic account and proposes a unified account that explains not only universally ungrammatical extraction from tensed adjunct islands, but also exceptionally acceptable extraction from some untensed adjunct islands. He claims that the semantic relation between an adjunct and a matrix clause is responsible for such a dichotomy in adjunct island effects.

One type of adjunct that Truswell builds his argument on is bare present participial adjuncts, as in (2.10). The sentences in (2.10) are only minimally different in terms of the matrix verb, but the results of sub-extraction from adjuncts are different. Extraction from the adjunct is impossible in one case, as in (2.10a), but possible in other cases, as in (2.10b-c).

(2.10) a. *What does John dance [whistling t]?
        b. What did John drive Mary crazy [whistling t]?
        c. What did John arrive [whistling t]?

Truswell explains this extractability contrast based on semantic characterizations of the predicates. The ungrammatical case (2.10a) has two agentive activity predicates, with an activity described in the adjunct modifies another activity encoded in the matrix clause. These are fully independent agentive events. On the

other hand, in acceptable cases (2.10b-c), the matrix verbs are either accomplishments (2.10b) or achievements (2.10c). The accomplishment verb of the matrix clause in (2.10b) encodes relations between events, and the activity verb in the adjunct specifies the causing event of the matrix accomplishment. In (2.10c), the adjunct clause specifies the immediately preceding event of the achievement in the matrix clause. In these latter two cases, the events in adjuncts require identification by the event in the matrix clause, while the ungrammatical case in (2.10a) does not.

Based on the relation of extractability with the semantic status of the two predicates as shown in (2.10), Truswell proposes that extraction from an adjunct is possible if the event denoted by the adjunct occupies an event position in the argument structure encoded in the matrix verb, as stated in (2.11).

(2.11) Extraction from Adjunct Secondary Predicates:
Extraction of a complement from a secondary predicate is permitted only if the event denoted by the secondary predicate is identified with an event position in the matrix predicate (Truswell 2007:1359(7)).

Both accomplishments, with secondary predicates denoting a causative relation of the two predicates, and achievements, with secondary predicates expressing the temporally preceding event, meet this requirement: the secondary predicate denotes a property of the antecedent event, and thus extraction out of the secondary predicate is possible.

Truswell extends this reasoning to explain ungrammatical extraction from tensed adjuncts, and proposes the Event Locality Condition in (2.12).

(2.12) The Event Locality Condition/Single Event Condition
Wh-questions carry a presupposition that the minimal constituent containing the head and the foot of the chain describes a single event. An instance of *wh*-movement is felicitous only if the denotation of that minimal constituent can be construed accordingly. (Truswell 2007c: 5).

In acceptable extraction cases in (2.10b-c), the two events form a single event. The identification of the sub-event is possible with the matrix event. This suggests that the events denoted in each clause must form a part of one macroevent for extraction to be possible, as stated in (2.12). Truswell argues that this Event Locality Condition explains the unacceptability of extraction from tensed adjuncts as well. Consider the dichotomy in acceptability between extraction from tensed complements and extraction from tensed adjuncts, as in (2.13).

 (2.13) a. Who did John think [that Mary kissed *t*]?
        b. *Who did John cry [because Mary kissed *t*]?

According to the Event Locality Condition, the difference in extractability between adjuncts and complements lies on the relation of two events described in each clause. In the adjunct case, there are two independent events, each bound by the tense of each clause, and the matrix predicate presupposes the truth of the adjunct event, signaling two distinct events in the actual world. Thus extraction from tensed adjuncts violates the Event Locality Condition, which is responsible for its unacceptability. On the other hand, in the complement case the event described by the complement clause is not inferred by the matrix event, and thus the truth of the complement clause is not known, which means that there is a single event in the actual world. Thus, extraction from complements is possible.

In sum, Truswell explains adjunct island effects from a semantic point of view. Specifically, he claims that the islandhood of adjuncts is attributed to semantic behavior of adjuncts different from complements with regard to the relation of events between matrix and secondary predicates. If two events in each matrix and embedded clause form a single event, extraction is possible, while it is impossible if they are two independent events. The fact that this analysis may account for the discrepancy in acceptability between acceptable extraction from some untensed adjuncts and unacceptable extraction from tensed adjuncts is noteworthy.

2.2.1.3.Summary: grammar-based approaches to islands

Grammar-based theories of islands argue that island effects are due to the violation of grammatical constraints. As for *wh*-islands, the Relativized Minimality theory (Rizzi 2013) views *wh*-island effects as locality effects, in that *wh*-island effects arise when the local relation of an extracted element and its gap is interrupted by an intervening element which matches with the extracted item in features.

As for adjunct island effects, two different analyses are discussed, one from a syntactic view and the other from a semantic view. First, the Late Adjunction theory (Stepanov 2001, 2007), a syntactic account, claims that adjunct island effects arise as a result of the post-cyclic Merger of adjuncts. Because the adjunct Merges late to the rest of the clause, the main clause and the adjunct are not connected by the time the movement should take a place, which makes extraction from the adjunct to the main clause impossible. On the other hand, the Event Locality theory (Truswell 2007a,b,c), a semantic account, argues that adjunct island effects are due to the violation of the

semantic restriction on extraction, in that extraction is only possible if the matrix event and the embedded event form a single macro event. Since (tensed) adjunct islands violate this single event condition, extraction from the adjunct is impossible.

2.2.2. Processing Approaches to Islands

2.2.2.1. Processing Approaches to *Wh*-Islands

The core idea of the processing approaches to island phenomena is that island effects are not the result of specific grammatical constraints, but an accumulation of independent processing difficulty associated with building island structures which overloads human cognitive resources (e.g. Deane 1991, Pritchett 1992, Kluender and Kutas 1993, Kluender 1991, 1992, 1998, 2004, Hofmeister and Sag. 2010). The island configurations are avoided because of their high processing demand rather than its ungrammaticality, just as grammatical center-embedded constructions are dis-preferred due to their processing difficulty (Miller and Chomsky 1963).

Two particular processing costs are argued to be responsible for *wh*-island effects: (1) cost involved with processing long-distance *wh*-dependencies (i.e. holding a *wh*-filler in working memory until the gap), and (2) referential processing cost at the clause boundary (i.e. processing complex island structure). Each of these processing costs in isolation does not yield severe degradation in acceptability, but the combined costs of these two (i.e. processing the long-distance dependency and crossing the complex clause boundary (i.e. island structure) simultaneously while holding a filler in working memory) significantly deprives the processor's resources and leads to a decrease in acceptability (i.e. *wh*-island effects).

Kluender and Kutas (1993) demonstrate the interaction of these two processing costs in acceptability and ERP experiments. The cost of processing long-distance *wh*-dependencies was measured by comparing two types of questions: (1) yes/no questions (i.e. no need of holding a *wh*-filler in working memory) and (2) embedded *wh*-questions. The processing costs of island structures (i.e. referential processing at a clause boundary) was tested by comparing three different types of complementizers *that*, *if*, and *who*, with an assumption that semantically heavier complementizers (i.e. *who > if > that*) require more processing costs. The example sentences are shown in (2.14).

(2.14) a. Has she forgotten [that he dragged her to a movie on Christmas Eve?]
      b. Has she forgotten [if he dragged her to a movie on Christmas Eve?]
      c. Has she forgotten [who he dragged __ to a movie on Christmas Eve?]
      d. What has she forgotten [that he dragged her to __ on Christmas Eve?]
      e. What has she forgotten [if he dragged her to __ on Christmas Eve?]
      f. What has she forgotten [who he dragged __ to __ on Christmas Eve?]

Both the ERP and the acceptability judgment tests (an offline scalar judgment and an online forced choice task) revealed the main effects of the two factors and their interaction. First, in the acceptability task, yes/no questions were more acceptable than *wh*-questions. In particular, the grammatical *wh*-extractions out of embedded *that*-complements were rated lower than the corresponding yes/no questions with embedded *that*-complements. This was interpreted to show the processing costs of holding a filler in working memory and carrying it across a clause boundary. In addition, the yes/no questions were rated highest with *that*, followed by *if*, and then *who*. These slight drops in acceptability of the yes/no questions varied by the types of embedded clause were argued to be a reflection of differences in referential processing

costs. Lastly, the effect of the referential processing costs was bigger in the *wh-*questions than in the yes/no questions, indicated by the deeper drops in the acceptability of the *wh-*questions than that of the yes/no questions depending on the types of embedded clauses. Kluender and Kutas argue that this shows the interaction of the two effects (i.e. costs processing filler-gap dependency across a clause boundary, and referential processing costs). The results of the acceptability task are shown in Figure 2.1.
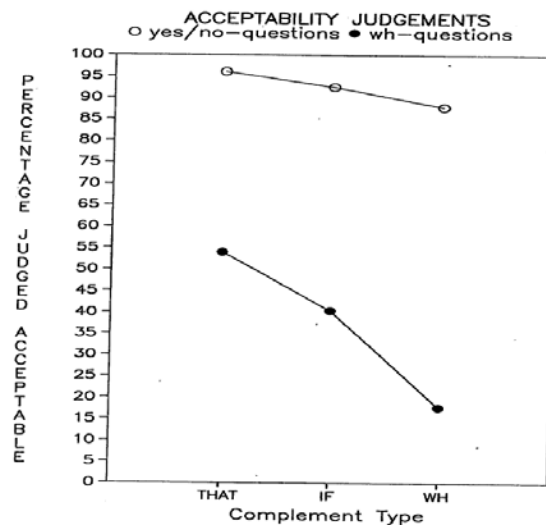
Figure 2.1. Acceptability of yes/no questions and *wh-*questions with embedded *that-*, *if-*, and *wh-*complements.

Similarly, in the ERP experiment, the referential processing costs were shown by the differences in N400 amplitude, and the processing costs of the filler-gap dependency across a clause boundary were reflected in the left anterior negativity (LAN). The interaction in the ERP experiment was seen in the amplitude of the LAN effect after the embedded gap site, and also in the amplitude of the ERP response to the final word of the sentence. However, the response to the final word varied across

participants: the final word of the marginally grammatical *if*-clause questions and of the fully ungrammatical *wh*-island questions elicited an N400 response in half the participants, and a late positivity in the other half of the participants. They did not find any parameter that correlated with this difference. However, regardless of whether there was an N400 or P600 response, the amplitude varied across the three conditions in a very clean and striking way. The results of both experiments were interpreted to support their argument that the unacceptability of the *wh*-islands is due to limited resources in processing.

Hofmeister and Sag (2010) provide another piece of evidence that supports the processing view of islands. They argue that processing difficulty is responsible for much of the unacceptability of island configurations and show that manipulating factors such as increasing the complexity of the displaced *wh*-phrase (i.e. d-linking) facilitates the processing of islands and leads to an increase in acceptability of islands. A 7-point scale acceptability test was performed on two types of *wh*-islands, which differed by the complexity of the displaced *wh*-phrase (i.e. bare *wh*-filler vs. d-linked *wh*-filler) as in "***Who/Which employee** did Albert learn whether they dismissed after the annual performance review?*" The results revealed a significantly higher acceptability of island violating questions with complex *wh*-phrases than with regular *wh*-phrases. This increased acceptability was argued to suggest the close relationship between acceptability and processing difficulty in *wh*-islands, in that a D-linked *wh*-phrase is easier to be maintained and retrieved in/from the working memory than a bare *wh*-word, which would reduce processing burdens, and as a consequence, the reduced processing burden on the processor would be reflected as higher acceptability.

Hofmeister and Sag support this argument with a reading time experiment on the same stimuli. In the results of the reading time study, the effect of the complexity of a *wh*-filler on islands was evidenced by faster reading times at the retrieval site (i.e. embedded verb) in the D-linking condition (i.e. *which*-phrase), compared to the base condition (i.e. *who*), which might indicate less processing burdens on the processor with a D-linked *wh*-word. Notably, the improvement of the acceptability of islands was even to the point that there was no overall difference in reading times between the *wh*-island and non-island constructions. They claim that this is another piece of evidence showing the effects of processing-related factors in acceptability of *wh*-islands.

In sum, researchers with processing views of islands argue that processing difficulty predicts the unacceptability of *wh*-islands, not the other way around. Two specific components of processing factors are argued to be responsible for island effects: processing difficulties associated with long-distance dependencies and processing costs associated with complex island structures, particularly crossing the island clause boundary. Since most island configurations involve these two factors, the processing accounts are also argued to be responsible for various other types of island effects. On the other hand, if one of these two factors is not present, as in *wh*-in-situ questions with no long-distance dependency, processing those types of *wh*-questions might not be as resource-demanding as in *wh*-questions that contain both long-distance dependencies and complex island structures. Fewer processing difficulties in those *wh*-questions are then expected to yield weak (or no) island effects. This may explain some variation in island effects among languages.

2.2.2.2. Processing Approaches to Adjunct Islands

Compared to empirically well-supported processing accounts of *wh*-islands, there has been no empirical evidence or elaborated accounts that could strongly support processing approaches to adjunct island effects, to the best of my knowledge. There are only a handful of papers that argue for processing-based accounts of adjunct islands (e.g. Kluender 1998, Kluender 2004). However, even these papers do not provide a clearly developed explanation or experimental evidence for processing-based approaches to adjunct island effects. The adjunct islands are not the main topic of the papers, but only mentioned very briefly as a part of a discussion of processing accounts of other types of islands that are relatively well-supported by processing views of islands, such as *wh*-islands and subject islands.

For example, Kluender (1998) suggests that the same type of processing accounts for *wh*- and relative clause islands can be extended to adjunct islands. Based on his own judgments, Kluender argues that adjunct islands seem to be sensitive to processing factors which are found to be typically associated with acceptability of *wh*- and relative clause islands (e.g. Kleunder and Kutas 1993). For example, acceptability of adjunct islands could be significantly improved with a d-linked filler, as in (2.15) (?* symbols are from Kluender (1998)).

(2.15) a. ?*Who did she pick up the phone [because she wanted to call ___]?
      b. ?That's the gossip columnist that she picked up the phone [because she wanted to call ___].

However, Kluender does not discuss this further. Thus, how specifically processing factors could account for adjunct island effects still remains unclear, as Kluender (2004) himself also acknowledges, calling these gaps in processing accounts for adjunct islands "puzzling problems."

Recent experimental evidence on adjunct islands effects even adds some doubt to processing-based approaches to adjunct island effects. One example is from studies on the satiation effect, where unacceptable sentences improve upon repeated exposure (e.g. Snyder 2000, Braze 2002, Goodall 2011). In some of these studies, adjunct islands are found to be immune to satiation, while *wh*-islands do show satiation effects. This asymmetry between adjunct islands and *wh*-islands in terms of the satiation effect could be interpreted to imply different mechanisms underlying these two islands. One possibility is that these two types of islands have two different formal grammatical properties (e.g. Snyder 2000, Hiramatsu 2000). Another possibility is that the susceptibility to satiation of *wh*-islands results from a decrease in processing difficulties as the exposure to the *wh*-island construction increases, while no such satiation effect in adjunct islands indicates that extraction from adjuncts violates either the grammar itself or a processing constraint which repeated exposure does not alleviate.

Another piece of experimental evidence which does not support processing approaches to adjunct island effects is from recent acceptability studies employing a factorial definition of island effects (e.g. Sprouse et al. 2011, 2012, 2013) (The factorial design of island effects will be discussed in detail in Section 2.4.). For example, Sprouse et al. (2012) performed acceptability judgment experiments on four

types of islands (i.e. *whether*-island, complex noun phrase island, adjunct island, subject island), comparing two main processing costs argued to be involved with island configurations: (1) long-distance filler-gap dependency, and (2) referential processing at the clause boundary of the embedded island structure, as discussed in the previous Section 2.2.2.1. In their results, they found significant main effects of both types of processing costs in *whether*-islands. However, in adjunct islands only the effect of processing costs with long-distance dependency was significant, and no significant effect of referential processing costs was found. This lack of evidence in one of these two independent processing costs in adjunct islands was argued to cast some doubts on processing-based approaches to adjunct islands, as processing views of island effects claim that combined effects of these two separate processing costs are the deriving factor of island effects in general.

2.2.2.3.Summary: processing-based approaches to islands

In sum, processing approaches to island effects assume that island effects are syntactically licit, but the effects arise due to processing difficulties. Two independent processing costs are particularly assumed to be responsible for island effects: costs involved with (1) processing long-distance filler-gap dependency, and (2) referential processing at the clause boundary of embedded island structure. When these two costs are combined (i.e. holding a filler in working memory until its gap while crossing the clause boundary with a processing-demanding reference (e.g. *whether*)), the required processing costs exceed available processing resources, and this processing limitation leads to unacceptability of islands.

One limitation of processing analyses of island effects is that *wh*-island effects are nicely accounted by them, but not adjunct island effects. Since both *wh*-island and adjunct island configurations are similar in that they involve a long-distance filler-gap dependency, and an intervening complex syntactic structure, these two particular processing costs are assumed to be responsible for both types of island effects, and thus the effects of processing factors are expected to show up in both types of islands. However, the evidence is not clear. While there may be interesting evidence and elaborated accounts which support the processing views of *wh*-islands (e.g. Deane 1991, Pritchett 1992, Kluender and Kutas 1993, Kluender 1991, 1992, 1998, 2004, Hofmeister and Sag. 2010), there has been no strong experimental evidence or account suggesting that adjunct island effects are the result of processing difficulties.

2.2.3. Grammar-based? Processing-based?

Although grammar-based and processing-based approaches to island effects take different paths, they are not necessarily "rivals" competing for first prize. For example, there is no particular reason to assume that the underlying mechanisms of various types of islands are all the same. Some might be governed by a specific grammatical constraint while others by a different mechanism, such as processing limitations. It is also possible that both grammar and processor are responsible for some island effects. Therefore, it might be wise to consider both of these two different avenues as possible options in the investigation of island phenomena.

2.3.   Formal Acceptability Experiments on Island Effects

2.3.1.   Investigation of island effects in formal acceptability experiments

Since island effects were first discussed in Ross (1967), linguistic theories in syntax have mostly relied on informal acceptability judgments. Recently, with a growing interest in experimental syntax (Cowart 1997, Featherston 2005, Alexopoulou and Keller 2007, Myers 2009, Sprouse et al. 2011), numerous studies have investigated syntactic island effects using formal acceptability techniques (e.g. Sprouse 2007, Hofmeister and Sag 2010, Sprouse et al. 2011, Kim and Goodall 2011). Some of the main benefits of formal acceptability experiments in the research on islands are that they allow more systematic and precise investigation of island effects. This is possible by experimental techniques used in formal acceptability experiments, which are distinguished from informal acceptability tasks. Some of the main characteristics of formal acceptability experiments are the use of factorial design in constructing stimuli, response methods, and statistical analysis and representations of results.

First, one of main characteristics in formal acceptability experiments is factorial design. Factorial design is a standard feature of acceptability experiments which tests main effects and interactions of two or more experimental variables. An advantage of using factorial design in the investigation of island effects is that it enables us to see separate effects of factors that are argued to be associated with island effects. This is important since acceptability judgments reflect the combined effects of various factors, so separating the effects of various factors on island effects would allow us to better understand the underlying mechanisms of island effects.

Then, what particular factors are argued to be involved with acceptability of islands? As we have seen, island sentences involve two specific structural factors: a long-distance *wh*-dependency, and an intervening complex syntactic structure. Each of these two structures is reported to contribute to the acceptability of islands, as discussed in Section 2.2.2.1. A long-distance *wh*-dependency is in general less acceptable than a short-distance dependency (i.e. extraction from a matrix clause), presumably since it requires a higher level of cognitive resources as the *wh*-filler has to be hold in working memory for a longer time (e.g. Kluender 1998, 2004, Sag et al. 2010). Complexity of island constructions is also argued to be responsible for the unacceptability of islands (e.g. Kluender & Kutas 1993). For example, even when there is no overt extraction from islands, sentences with an island structure are reported to be generally less acceptable than those without it (e.g. a *that*-complement clause). Thus, in order to obtain reliable and accurate judgments of island effects, testing main effects and interactions of these two particular factors on islands is crucial. A simple way of measuring these effects is comparing island sentences with other types of structures that also involve these two factors. Then, with what types of sentence(s) do we compare island sentences?

First, effects of a complex island structure could be tested by comparing two types of matrix *wh*-questions, one with a non-island embedded clause and the other with an island clause (2.16a vs. 2.16c). This is one experimental variable 'Structure' with two levels (i.e. Non-Island clause (i.e. *that*-clause) vs. Island clause). The second factor 'Extraction' tests the effect of long-distance dependencies on acceptability by comparing two different locations of *wh*-extraction, extraction from the matrix clause

(2.16a) and extraction from the embedded clause (2.16b) (i.e. Matrix clause vs. Embedded clause). The effect of these two factors combined is measured in a single sentence, which is the island violating condition (2.16d).

(2.16) a. (Non-Island | Matrix clause)   Who ___ thought [that Lisa bothered you]?
       b. (Non-Island | Embedded clause) Who did you think [that Lisa bothered ___]?
       c. (Island | Matrix clause)   Who ___wondered [who met Lisa]?
       d. (Island| Embedded clause)   Who did you wonder [who met __]?

Comparing the effects and relation of these four conditions allows us to observe separate and combined effects of these factors on acceptability of island effects.

Another characteristic that distinguishes formal acceptability experiments from informal judgment tasks is response methods. Traditional judgment tasks do not use quantitative measures. The usual way to collect judgement in informal acceptability tasks is by asking several native speakers, either individually or in a group, to simply say whether a given sentence is grammatical or not. Thus, the responses are limited to perhaps two or three levels of grammaticality (e.g. grammatical, questionable, ungrammatical), and lack consistency of judgments across many levels of acceptability. On the other hand, in formal acceptability experiments, responses are gathered more systematically. The experiments use quantitative measures in various forms, such as a numerical scale and a magnitude estimation task, with carefully constructed stimuli. This allows absolute and relative differences in grammaticality, and consistency of judgments.

The other main difference between formal and traditional acceptability judgments is the way results are analyzed and summarized. Since in traditional acceptability tasks, responses are collected informally using non-quantitative measures,

the results are analyzed non-statistically, and represented with diacritic notations such as * and ?. On the other hand, in formal experiments, data collected by quantitative methods is analyzed with statistical tests (e.g. ANOVA), and the results are reported using descriptive statistics (e.g. mean, standard deviation). These quantified results allow more accurate and objective evaluation of island effects, which is another main advantages of formal acceptability approaches to island phenomena.

2.3.2. Predictions of factorial design of island effects

Island effects are defined as a statistical interaction between the two factors, *structure* and *extraction*. There are largely two possible patterns of results we would predict: presence of an interaction vs. absence of an interaction, as represented in Figure 2.2. This applies to both *wh*-islands and adjunct islands.
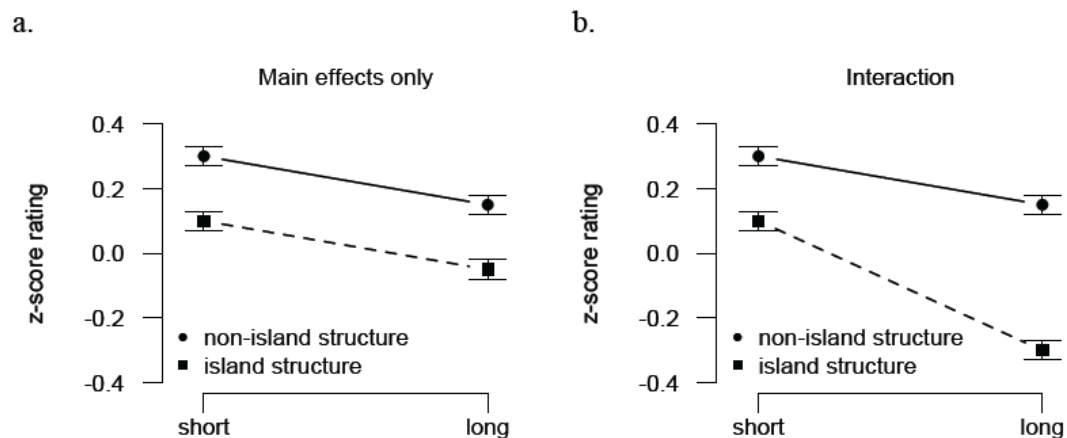
Figure 2.2. Example results of possible island effects.
The separation of the two lines represents the main effect of Structure, and the slope of the lines reflects the main effect of long-distance dependencies (the graphs are from Sprouse and Almeida 2012).

In the first graph, the two parallel lines indicate the absence of a statistically significant interaction of the two factors (i.e. Structure and Extraction), implying that the acceptability of the island violating condition is simply the sum of the two individual factors. On the other hand, the second graph represents a statistically significant interaction of the two factors (i.e. the acceptability of each level of one factor depends upon the level of the other), indicating that the combined effect of the two factors is greater than the sum of these individual costs (i.e. super-additivity).

The super-additive interaction is what has been found in previous experimental studies on island effects which employ the factorial definition of island effects (e.g. Sprouse et al. 2011, 2012, 2013). This is also what both grammar-based and processing-based theories of island effects would predict. However, the causes of the super-additive interaction may differ between the two approaches. The grammar-based approach claims that the super-additive effect is the result of a grammatical constraint that affects that one condition only (long extraction, island structure). On the other hand, processing theories would interpret the super-additivity as a reflection of processing difficulties of island configurations that exceed the sum of the two costs. In other words, you add up the two costs, and then there is an additional cost because you've exceeded the limit.

Lastly, notice that although the two graphs show different types of conceivable island effects, both graphs are the same in that the island-violating condition (i.e. Island/Embedded (2.16d.)) is the least acceptable among the four conditions. This means that getting judgments of an island violating construction only would not be enough to distinguish these two different types of results.

2.3.3. Island effect size: Differences-in-Differences scores

A main advantage of using the factorial design of island effects is being able to quantify the island effect size (i.e. numerical size of the super-additive effect). Island effect sizes are calculated by subtracting the difference between the Non-island/Matrix condition (2.17a) and the Island/Matrix condition (2.17c) from the difference between the Non-island/Embedded condition (2.17b) and the Island/Embedded condition (2.17d) (e.g. Maxwell & Delaney 2004, Sprouse et al. 2012). A positive DD score would signal a larger island effect size (i.e. super-additivity) with an increase of a DD score representing an increased size of the interaction, while a negative DD score would reflect a sub-additive interaction.

(2.17) a. (Non-Island | Matrix clause)   Who ___ thought [that Lisa bothered you]?
         b. (Non-Island | Embedded clause) Who did you think [that Lisa bothered ___]?
         c. (Island | Matrix clause)   Who ___wondered [who met Lisa]?
         d. (Island | Embedded clause)   Who did you wonder [who met __]?

Quantified island effects allow us to scrutinize island effects at a more detailed level. For example, if a certain type of island configurations exhibits significant individual variation in the island effect size depending on individual's working memory capacity, while another type of island does not, this may be an indication of different underlying properties of the two islands. A numerically calculated island effect size is particularly advantageous in comparing island effects in different populations. For instance, if island effect sizes of bilingual groups differ from native speakers in that it correlates with their ages of acquisition, this would signal a significant role of age in acquisition of island effects. This type of information would

not be available by traditional informal acceptability tasks, which is another reason to adopt formal experimental approaches to island effects.

2.3.4. Experimental approaches in second language acquisition

Experimental approaches to acceptability judgments are not identical in all fields of linguistics. One example is between the second language acquisition (SLA) studies and the syntax literature (i.e. experimental syntax, as in Cowart 1997), as discussed in the following.

First, one of the main differences between the two fields is the response methods. The second language studies often use 'not sure' or 'I don't know' as one of the possible choices in an acceptability task (e.g. Bley-Vroman 1988, White et al., 1998, Tsimpli et al. 2006, Umeda 2008), while this option is never used in the experimental syntax. For example, Bley-Vroman et al. (1988) collected judgments of Korean learners of L2 English on *wh*-island, complex NP constraint, relative clauses, and adverbial islands in English, using a three-way acceptably task. Learners were asked to indicate how they felt about the English sentences by selecting one of the three choices - possible, impossible and not sure. This 'not sure' option is also used in a numerical scale, by having the middle number of the scale as that option, as shown in Figure 2.3. Responses to these 'don't know'-type choices are usually excluded from the result analysis.

-3	-2	-1	0	+1	+2	+3
completely unacceptable	likely to be unacceptable	possibly unacceptable	I don't know	possibly acceptable	likely to be acceptable	completely acceptable
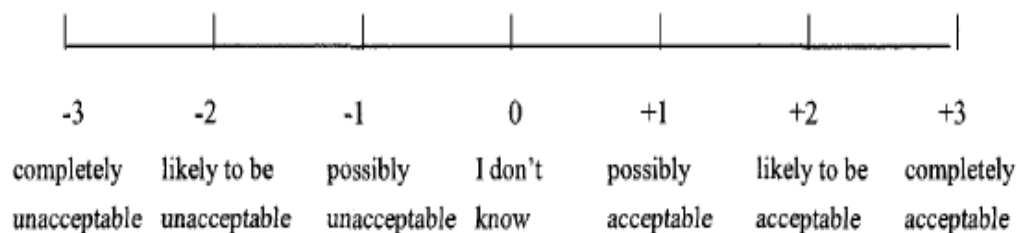
Figure 2.3. An example of a numerical scale with a "not sure" option in acceptability judgment experiments in SLA studies (the figure is from Umeda 2008)

In addition to the use of 'I don't know' as one of the possible choice in acceptability tests in SLA studies, notice in Figure 2.2 that each number on the scale has its own specific description, such as "possibly unacceptable" and "likely to be acceptable." On the other hand, in typical experimental syntax studies, this type of specific description of each number on a scale is not common. If there is any description of numbers on a scale, it is simply about which side of the scale represents a higher/lower acceptability (e.g. the smallest number indicates "unacceptable sentences" and the highest number indicates "acceptable sentences").

Moreover, second language acquisition studies often use both negative and positive digits in a numerical scale task, as shown in Figure 2.2, while experimental syntax studies rarely use negative numbers in a scale. For example, Tsimpli et al. (2006) used a 5-point scale acceptability task to test the degree of acceptability of resumptive pronouns in subject/object *wh*-interrogatives by Greek learners of English. The range of the scale was from –2 ('certainly ungrammatical') to +2 ('certainly grammatical'), including 0 as a 'not sure' option.

Another crucial difference between the two fields is the data analysis and report. In SLA studies, various degrees of responses obtained through a numerical

scale acceptability task are often conflated in that collected response ratings are not used as the way they are collected but grouped into new categories in the result analysis, while this never happens in experimental syntax. For example, Tsimpli et al. (2006) divided L2 learners' responses obtained in a 5-point scale acceptability task (i.e. -2, -1, 0 +1, +2) into two categories, as either 'target' or 'non-target,' and no further distinction was made between the responses to each of the five choices (e.g. whether the response was to the number 1 or the number -1). If the sentences were given positive ratings (i.e. +1, +2) by native controls (i.e. analyzed to be grammatical), leaners' responses to positive ratings were considered to be 'target' and those to negative ratings (i.e. -1, -2) were taken as 'non-target.' Responses to the 0 ('not sure') were excluded from the results.

Why are there such differences in the approaches to acceptability judgement tasks between the two fields? One possible reason is the different nature of the two fields. For example, one of main differences between the two fields is participant population (i.e. native speakers in experimental syntax, and L2 learners in SLA). Most often L2 learners, especially low proficiency learners, lack confidence about their judgments. This makes researchers question the validity and reliability of the data, such as whether learners' responses truly reflect their interlanguage grammar, or it is a random selection of the ratings (although we can control this to certain degrees through statistical analysis). In order to prevent this, some SLA researchers explicitly ask learners to indicate the certainty of their judgments by giving a 'don't know'-type option. However, although some differences in acceptability judgement experiments between the two fields are natural when considering different nature of the two fields,

an acceptability judgement experiment used in the SLA could be improved by adopting some methods used in experimental syntax, as the goal of an acceptability experiment is the same between the two: finding out what syntactic mechanisms speakers are using.

First, using the 'don't know' option may result in the loss of some information that we could have been able to get if this option was not used. It is possible that learners use this option even in cases where they could give judgements because they lack confidence about their judgments. In other words, it might suppress learners' optimal performance, and as a result, we would lose lots of information.

Secondly, the use of +/- numbers and the descriptors make it impossible to treat the scale (and the responses) as truly numerical. How much difference, for instance, is there supposed to be between +1 and -1? If the answer is 2, then is this difference supposed to be same as that between +1 and +3? Or are +1 and +3 somehow closer? The use of descriptors has the same effect. Is the difference between "possibly" and "likely" the same as the difference between "likely" and "completely"? The answer is no. Then we are not dealing with a true interval scale here if we use positive/negative numbers and descriptors for each number. It stops being an ordinal scale. As a consequence, it would become impossible to analyze the results numerically, such as calculating means, etc.

In addition, the conflation process in the result analysis makes it impossible to observe various levels of grammaticality in responses since the results are conflated before we are able to see them. A primary advantage of using a numerical scale task is being able to measure more fine-grained distinctions in acceptability (Wasow, 2007;

Meyers, 2009). Gradient acceptability judgments provide important information in evaluating and understanding syntactic phenomena. A well-known example that shows the importance of getting gradient judgments is the subject/object asymmetry in relative clauses, as in (2.18).

(2.18) a. OR: the reporter who the senator harshly attacked ___ admitted the error.
        b. SR: the reporter who ___ harshly attacked the senator admitted the error.

Both types of relative clauses are grammatical, but object relative clauses (a) are reported to be generally less acceptable than subject relative clauses (b) (due to, for example, different degrees of processing difficulties of the two constructions) (e.g. Kluender and Cowles 1997). Conflating the results would take away the opportunity to observe these subtle differences in acceptability. If we do not pay attention to gradience in acceptability judgments, and simply take them as grammatical, we lose a chance to deepen our understanding of the phenomena. For example, if L2 and native speakers differ significantly in gradience of their judgments, such as no significant subject/object asymmetry in acceptability of relative clauses in L2 speakers, this may indicate different processing strategies between L2 and native speakers, which is something that our theory of SLA should account for. Therefore, it is important to pay special attention to gradience in acceptability judgments to better understand not only syntactic phenomena, but also language acquisition mechanisms, and in order to be able to do it, it is important to use the method more "correctly".

Lastly, one main problem regarding the use of the acceptability tasks in many SLA studies is that an acceptability judgment task in this field is often used as a sort of a grammar test, rather than an "acceptability" task. Responses obtained from an

acceptability judgment task are often "evaluated" as either correct or incorrect regardless of the types of acceptability tasks (e.g. a numerical scale). However, an acceptability of a sentence not only reflect its grammaticality but also various other factors. As shown in (2.18), although the sentences are all grammatical, they show various degrees of acceptability. Therefore, it would be important to reconsider possible losses by using an acceptability task in the way the SLA studies currently do, and maximize the benefits of using acceptability tasks by improving some of the issues addressed above.

Chapter 3: Island Effects in Korean

This chapter provides a brief description of *wh*-constructions and island effects in Korean, and presents various theories of *wh*-in-situ and island effects.

3.1. Description of Korean *wh*-constructions

   3.1.1. Basic Korean grammar

Korean is a head-final language with SOV word order. Grammatical roles of constituents are indicated with case markers. Korean is an agglutinative language. Inflectional suffixes are attached to verbs. This is demonstrated in (3.1).

> (3.1) Ecey   Mary-ka   James-lul   manna-ss-ta.
>   yesterday   -Nom   -Acc   meet-Past-Decl
>   'Mary met James yesterday.'

Scrambling is freely allowed, as long as the verb is always in the sentence-final position. In (3.2), the object is at the beginning of the sentence.

> (3.2) James-lul   ecey   Mary-ka   manna-ss-ta.
>   -Acc   yesterday   -Nom   meet-Past-Decl
>   'Mary met James yesterday.'

Scrambling of an embedded clause is also possible. In (3.3), without scrambling, the embedded clause appears after the matrix subject and before the matrix predicate, while in (3.4) the embedded clause is scrambled to the beginning of the sentence and located before the matrix subject.

> (3.3) Mary-nun [Obama-ka James-lul manna-ss-ta-ko]   malhae-ss-ta.
>   -Top   -Nom   -Acc meet-Past-Decl-Comp say-Past-Decl
>   'Mary said Obama met James.'

(3.4) [Obama-ka James-lul manna-ss-ta-ko] Mary -ka malhae-ss-ta.
          -Nom   -Acc meet-Past-Decl-Comp   -Nom say-Past-Decl
     'Mary said Obama met James.'

3.1.2. A *wh*-in-situ language

Korean is a *wh*-in-situ language. A *wh*-word stays in its canonical positions in *wh*-questions. In an object question as in (3.5), the object *wh*-phrase '*nwukwu-lul*' appears in the same position as a non-*wh*-object. The interrogative nature of the sentence is expressed by the question particle *–ni* suffixed to the verb. If the question marker is not present, as in (3.1), the sentence can be interpreted as a question only when it is spoken with a rising intonation.

(3.5)   Mary-ka   nwukwu-lul   manna-ss-ni?
        Nom   who   -Acc   meet-Past-Q
     'Who did Mary meet?'

Since scrambling is allowed in Korean, fronting the *wh*-phrase to the beginning of the question is possible, as in (3.6).

(3.6)   Nwukwu-lul   Mary-ka   _____   manna-ss-ni?
        who   -Acc   -Nom   meet-Past-Q
     'Who did Mary meet?'

It looks like *wh*-movement superficially, but the general consensus is that scrambling of a *wh*-word is different from *wh*-movement (e.g. Saito 1989, 1992).

3.1.3. Indeterminate *Wh*-phrases

The interpretation of *wh*-words in Korean is not restricted to *wh*-interrogative meanings, but varies depending on the quantificational elements the *wh*-word is

associated with, and thus they are called "indeterminate pronouns" (Kuroda 1965). For example, when a *wh*-word is affixed with existential or universal quantifiers, it is interpreted as an indefinite pronoun, as shown in (3.7-3.8).

(3.7) Mary-ka   nwukwu-nka-lul   manna-ss-ni?
      -Nom   who   - ∃-Acc   meet-Past-Q
    'Did Mary meet somebody?'

(3.8) Mary-ka   nwukwu-na   manna-ss-ni?
      -Nom   who   - ∀   meet-Past-Q
    'Did Mary meet anyone?

A *wh*-word *nwukwu* 'who' in (3.7) is affixed with an existential quantificational particle *-nka* (=∃), and thus it is interpreted as an existential pronoun. Similarly, when universal markers '*-na* (=∀) /*-tunci* (=∀)' are attached to the *wh*-word, as in (3.8), it gets a universal pronoun reading.

Unlike *wh*-words with overt quantification suffixes, bare *wh*-words in Korean are often ambiguous in their meanings. A *bare wh*-word, as in (3.9), can be interpreted either as an interrogative pronoun, as in (3.9a), or as an indefinite pronoun, as in (3.9b).

(3.9) Mary-ka   nwukwu-lul   manna-ss-ni?
      -Nom   who/somebody-Acc   meet-Past-Q
    (a) 'Who did Mary meet?'
    (b) 'Did Mary meet somebody?'

One influential proposal to account for this property of a *wh*-word in Korean is a binding analysis. *Wh*-words in Korean are argued to be variables which lack inherent interrogative or quantificational force. Thus, they need to be bound by an appropriate operator/licensor to receive a meaning (e.g. Baker 1970, Pesetsky 1987, Kim 1989, Nishigauchi 1990, Aoun and Li 1993, 2003, Tsai 1994, Cole and Hermon 1998, Kim

2000, Hong 2004a, Choi 2009). Specifically, as for the indefinite pronoun reading, *wh*-words need to be bound by either overt or implicit existential quantifiers. In the absence of the overt quantifiers to bind the *wh*-word, as in (3.9), the existential pronoun reading is obtained by default insertion of an implicit existential quantifier, which is introduced via the process of Existential Closure (e.g. Heim 1982).

On the other hand, in order to receive the *wh*-interrogative reading, as in (3.9a), a *wh*-word must be bound by an overt question marker (e.g. *-kka*, *–ni, -nunci, -ci*) suffixed to a verb. Compare the following sentences in (3.10-3.11).

(3.10) Mary-nun [Obama-ka nwukwu-ul   manna-ss-nunci]   malhae-ss-ta.
          -Top   -Nom who -Acc   meet -Past -Q   say-Past-Decl
        'Mary said who Obama met ___.'

(3.11) Mary-nun [Obama-ka nwukwu-ul   manna-ss-ta-ko]   malhae-ss-ta.
          -Top   -Nom who -Acc   meet-Past-Decl-*that* say-Past-Decl
        'Mary said Obama met somebody.'
        '*Mary said who Obama met ___.'

These two sentences minimally differ by the existence of the question marker in the embedded clause. In (3.10), a question marker *–nunci* is suffixed to the embedded verb, while in (3.11), a complementizer equivalent to *that* appear instead. The presence/absence of the question marker in these examples is thus responsible for the different interpretation of the *wh*-words. The *wh*-word in (3.10) receives the interrogative pronoun reading by being bound by the question particle. On the other hand, the *wh*-word in (3.11) cannot be interpreted as the question word, since there is no question marker to assign the *wh*-interrogative reading, and it thus instead receives the indefinite pronoun reading ('somebody') from the implicit existential quantifier. This asymmetry in the interpretation of *wh*-words depending on the presence/absence

of the question marker suggests a variable and operator dependency between the *wh*-word and the question particle (e.g. Cheng 1991, Choe 1994, Chung 1996, Choi 2006).

Let us now return to the example in (3.9) which shows an ambiguity in the interpretation of a *wh*-word, between the *wh*-question and existential pronoun readings of the *wh*-word, which is restated in (3.12).

(3.12) Mary-ka   nwukwu-lul   manna-ss-ni?
       -Nom   who/somebody-Acc   meet-Past-Q
       (a) 'Who did Mary meet?'
       (b) 'Did Mary meet somebody?'

As discussed above, here the interrogative pronoun reading is assigned by the sentence-final question marker, while the existential pronoun reading is given by the implicit existential quantifier. In the latter case, the sentence-final question particle serves only to mark the sentence as a question. Out of these two possible readings, speakers more readily get the interrogative reading than the existential pronoun reading, unless some additional factors, such as contextual information or intonation, facilitate the indefinite pronoun reading. Korean uses explicit quantificational elements (e.g. existential '-nka (=∃)', universal '-na (=∀) /-tunci (=∀)') to indicate the pronoun interpretation of *wh*-words, so without an overt quantifier that clearly expresses the interpretation of *wh*-words, the *wh*-question reading is more likely to be the more readily available option in a question sentence with an overt Q marker. In other words, a bare *wh*-word in Korean is more easily bound by the question marker than by the implicit existential quantifier.

3.1.4. Scope of *wh*-in-situ

In order for a *wh*-question to be interpreted, the *wh*-word should be assigned scope. Interrogative scope refers to the domain of the sentence that is being questioned. In *wh*-movement languages, the scope of a moved *wh*-word is obvious since it is marked by the syntactic position of the *wh*-word. In Korean, on the other hand, the scope of a *wh*-phrase is not marked by the location of the *wh*-element, but by the question marker a *wh*-word is associated with.

Consider the following minimal pairs in (3.13) and (3.14). In each example, a *wh*-phrase appears in different locations. In (3.13) it is located in the matrix clause, while in (3.14) it appears inside the embedded clause.

(3.13) Nwukwu-ka [Obama-ka Mary-ul manna-ss-ta-ko]   malhae-ss-ni?
              -Top   -Nom   -Acc meet-Past-Decl-Comp   say-Past-Q
        'Who said that Obama met ___?'

(3.14) Mary -nun [Obama-ka nwukwu-ul manna-ss-ta-ko]   malhae-ss-ni?
              -Top   -Nom who -Acc meet-Past-Decl-Comp   say-Past-Q
        'Who did Mary say that Obama met ___?'

 Nevertheless, the *wh*-words in both examples take matrix *wh*-scope. This is possible because the question markers appear in the matrix clause in both examples. This thus demonstrates that in Korean the location of a question marker determines *wh*-scope, not that of a *wh*-word.

The following example also shows the role of a question particle as a scope marker in Korean. Compare the sentence in (3.14) with the sentence in (3.15).

(3.15) Mary -nun [Obama-ka nwukwu-ul   manna-ss-nun-ci]   malhae-ss-ta.
     -Top -Nom who -Acc   meet-Past-Adn-Q   say-Past-Decl
   'Mary said who Obama met ___.'

These two sentences minimally differ by the location of the question particles. In (3.14) the question marker *-ni* is attached to the matrix verb and a complementizer *–ko* is affixed to the embedded verb. On the other hand, in (3.15) the question marker *–ci* appears in the embedded clause, and the declarative particle *-ta* is suffixed to the matrix verb. Since there is only one question marker in these two sentences, the location of the question maker unambiguously indicates the domain where the *wh*-word takes scope over. The matrix question marker *–ni* in (3.14) indicates matrix *wh*-scope, while the embedded question marker *-ci* in (3.15) shows embedded *wh*-scope. Therefore, only matrix scope is possible in (3.14), while embedded scope is only obtained in (3.15).

Scrambling of a *wh*-word also demonstrates that what determines *wh*-scope in Korean is not the syntactic location of a *wh*-word, but that of a question marker. In (3.16) the *wh*-word is scrambled to the beginning of the sentence out of the embedded clause but it still takes embedded scope (e.g. Saito 1989). The matrix question reading is impossible since only the embedded clause has the question marker.

(3.16) Nwukwu-lul Mary-nun [Obama-ka ___ manna-ss-nun-ci]   malhae-ss-ta.
     -Top -Nom who -Acc meet-Past-Adn-Q say-Past-Decl
   'Mary said who Obama met ___.'

Then what about the case with two question markers, each in different clauses of a sentence, as in (3.17)?

(3.17) Mary -nun [Obama-ka <u>nwukwu</u>-ul manna-ss-nun-ci]   ahl-ass-ni?
         - Top   -Nom who -Acc meet-Past-And-Q   know-Past-Q
         (a) 'Did Mary know who Obama met ___?'
         (b) 'Who did Mary know whether Obama met ___?'

Which question marker would indicate *wh*-scope? The example in (3.17) has one embedded *wh*-word, and two question markers, each in each clause: a question marker '-*ci*' in Spec of embedded CP, and a question marker '-*ni*' in Spec of matrix CP. Which question marker would be related to *wh*-scope here? If it is the embedded question marker -*ci*, we would expect embedded *wh*-scope, as in (3.17a). If it is the matrix question marker -*ni*, on the other hand, matrix scope would be obtained, as in (3.17b).

Both options are possible *a priori*: the *wh*-phrase can be associated with either the embedded question marker or the matrix question marker, taking either embedded scope or matrix scope, respectively. Nothing in particular would seem to prevent either option. Nonetheless, the actual picture is not so clear. Some speakers report permitting both scope options (e.g. Suh 1987, Choi 2006, Hwang 2007) while others say they allow only one (e.g. Lee 1982, Kim 1989, Han 1992, Hong 2004b). In fact, whether a *wh*-word inside the interrogative clause is able to take matrix scope or not is in essence a question of whether the interrogative clause in Korean is an island or not. This topic of island phenomena in Korean is controversial, and we will discuss it in the following Section.

3.1.5. Summary

Wh-constructions in Korean do not involve overt movement (i.e. a *wh*-word stays in-situ). Although scrambling of a *wh*-phrase is possible in certain constructions in Korean, scrambling has been argued to be different from *wh*-movement. In addition, *wh*-words in Korean are variable expressions (indeterminate phrases) which lack inherent quantificational force and thus need to be bound by a quantificational operator, such as an existential quantifier (overt or implicit) or a question particle. When the existential quantifier *–nka* and the universal quantifiers *-na* (=∀) /*-tunci* (=∀) bind a *wh*-word, indefinite existential and universal pronoun readings are obtained, respectively. Bare *wh*-words, however, are often ambiguous as to whether they are an indefinite existential pronoun or a *wh*-interrogative pronoun. When a question marker binds a *wh*-word, such as *-kka*, *–ni,* and *–ci*, it is interpreted as a *wh*-interrogative pronoun. On the other hand, when it is bound by the implicit existential quantifier, the existential pronoun reading is obtained. *Wh*-questions in Korean are indicated by the presence of a question marker affixed to a verb. Not only does the question marker mark a sentence as a question, but also it determines its scope. *Wh*-scope is indicated by the location of a question marker in Korean.

3.2. Experimental Investigation of Island Effects in Korean

3.2.1. Current understanding of island effects in Korean (and other *wh*-in-situ languages)

Any island phenomena in Korean and other *wh*-in-situ languages involve the question of whether a *wh*-word can take scope outside of a particular configuration.

Traditionally, *wh*-in-situ languages are believed to lack island effects. For example, in a question with an adjunct clause, as in (3.18), most speakers readily allow matrix *wh*-scope outside the adjunct clause, which suggests the absence of an adjunct island effect in Korean.

(3.18) Mary-nun [Obama-ka nwukwu-ul manna-ss-ulttay] natana-ss-ni?
            -Top   -Nom who -Acc meet-Past-when   appear-Past-Q
      'Who did Mary appear when Obama met ___?'

However, there has been increasing evidence that Korean and Japanese display some island effects, specifically *wh*-island effects, as in (3.19-3.20).

(3.19) Mary -nun [Obama-ka nwukwu-ul manna-ss-nunci]   malhae-ss-ni?
            -Top   -Nom who -Acc   meet-Past-Q   say-Past-Q
      ??'Who did Mary say whether Obama met ___?'

(3.20) John-wa [Mary-ga nani-o   katta-kadouka] shiritagatte-iru-no?
           Top   -Nom what-Acc bought-whether want.to.know-Q
      ??'What does John want to know [whether Mary bought __]?'
                                         (Watanabe 1992)

As discussed in the previous Section, a *wh*-word inside an embedded interrogative clause (i.e. *wh*-island configuration) in Korean potentially shows scope ambiguity. Since *wh*-scope in Korean (and Japanese) is linked to a question particle that a *wh*-word is associated with, the presence of question markers in both matrix and embedded clauses could in principle allow both matrix and embedded *wh*-scope. In fact, judgments have been mixed. Some people report permitting both matrix and embedded scope, arguing for the absence of *wh*-island effects (e.g. Suh 1987, Choi 2006, Hwang 2007 for Korean; Ishihara 2002, Sprouse et al. 2011 for Japanese), while others allow only the embedded scope, arguing for the presence of *wh*-island effects

(e.g. Lee 1982, Kim 1989, Han 1992, Hong 2004b for Korean; Nishigauchi 1990, Watanabe 1992 for Japanese).

It is remarkable that even after decades of research on island effects in *wh*-in-situ languages, we still do not know for certain what the facts are. This unclear status of island effects in Korean and other *wh*-in-situ languages points to the need for carefully designed, formal acceptability experiments to determine exactly what the facts are, as will be discussed in the following Section.

3.2.2. Experimental design for investigating island effects in Korean

Formal experimental investigation of island effects in *wh*-movement languages like English has been very successful, yielding interesting and meaningful results, as discussed in Chapter 2 (e.g. Cowart 1997, Sprouse & Hornstein 2013). This approach allows us to obtain a more fine-grained and accurate picture of island effects for better understanding of the phenomenon. Such experiments involve, at a minimum, carefully designed stimuli being presented to subjects, who indicate their sense of acceptability for each sentence through a numerical response.

However, island effects in Korean and typologically related *wh*-in-situ languages have not been properly tested for. In particular, there are surprisingly very few experimental studies that test island phenomena in Korean (e.g. Hwang 2007). One main reason for the lack of experimental studies on island effects in Korean is that some properties of *wh*-constructions in Korean raise difficult methodological concerns. Specifically, ambiguities regarding the interpretation of a *wh*-word and *wh*-scope assignment make it hard to investigate island effects in Korean experimentally.

First, *wh*-questions in Korean show ambiguities in the interpretation of a *wh*-word. As discussed in Section 3.1.3, bare *wh*-words in Korean may be interpreted as such (i.e. as true *wh*-words) or as existential pronouns. This means that, even if one reading is disallowed, the other is typically not, with the result that all questions with *wh*-words appear to be fully acceptable. This would make meaningful evaluation of the results of an acceptability study very difficult since we cannot be sure how subjects are interpreting the stimuli in most cases.

In addition, *wh*-scope in Korean is not as obvious as in *wh*-movement languages like English. In English, *wh*-scope is indicated by the syntactic position of the *wh*-word. Even when a *wh*-phrase stays in-situ, such as in an echo question 'Mary said Obama met who?', *wh*-scope is still clear as the *wh*-item always takes matrix scope. On the other hand, *wh*-scope in Korean is not explicitly marked since a *wh*-word always stays in-situ. Thus, in many cases we cannot be sure which scope speakers assign. In particular, with a *wh*-island construction, as in (3.19), both matrix and embedded scope are possible in principle, as the question marker appears both in matrix and embedded clauses, and thus it is unclear whether speakers assign scope inside or outside the interrogative clause in Korean.

Such ambiguities in *wh*-constructions in Korean make studying constraints on *wh*-questions in Korean very difficult, and doing so experimentally has been virtually impossible. We cannot straightforwardly transfer to Korean experimental techniques developed for studying island effects in other languages. Because of the ambiguities that we have seen, the conventional way of getting acceptability judgments for island configurations would not work well for Korean. How can we then circumvent these

problems to test for island effects in Korean in a formal acceptability experiment? Here we propose one possible solution to this.

Since island effects in Korean can be tested only by examining speakers' interpretation of sentences (i.e. *wh*-scope), we will measure the felicity of Question-Answer pairs. Variants of this method have been used in several studies testing scope ambiguity of *wh*-in-situ (e.g. Pesetsky 1987, Umeda 2008, Kitagawa and Hirose 2012). The specifics of the experimental design are as follows.

We present participants a set of a context, a question (containing an island configuration), and an answer. Then, instead of asking for the acceptability of the question, we ask them to rate the acceptability of the answer as a very first response to the *wh*-question. The answers consist of two types: either "*wh*-answers" or "yes/no answers". "*Wh*-answers" are appropriate for a direct *wh*-question interpretation of the preceding question, while "yes/no answers" are appropriate for a yes/no question interpretation. The answers would thus encourage one reading or the other. The acceptability of *wh*-answers would reflect the possibility of the island-violating interpretation when a *wh*-word is interpreted as a *wh*-question word with scope outside the embedded clause. On the other hand, when the *wh*-word is interpreted as an indefinite pronoun, or as a true *wh*-word with scope over only the embedded clause (yielding an indirect question), a yes/no question results. In addition, the presence of a context makes the *wh*-reading pragmatically plausible, even when this would violate an island. In this way, we can minimize ambiguities of *wh*-scope and *wh*-words in Korean, and be sure that acceptability judgment results reflect the possibility of the island-violating interpretation in Korean. The experimental details

(e.g. procedures, materials, results) to test for island effects in Korean will be introduced in Chapter 5.

3.3. Analyses to (Non-)Island Effects in *Wh*-in-Situ Languages

Various analyses have been proposed to account for the properties of *wh*-in-situ and island effects in *wh*-in-situ languages. The analyses are largely divided into two types: movement approaches and non-movement approaches. In a nutshell, movement approaches claim that *wh*-questions in *wh*-in-situ languages involve movement as in *wh*-movement languages (e.g. movement of a *wh*-word, of a feature, or of an element associated with a *wh*-in-situ phrase). Non-movement analyses, on the other hand, claim that *wh*-in-situ questions do not undergo movement but employ some other types of mechanisms, such as binding. In this Section, some of the analyses of *wh*-in-situ and island effects are discussed with a focus on their predictions for island effects in *wh*-in-situ languages.

3.3.1. (Partial) Movement account

3.3.1.1. LF movement of a *wh*-phrase (Huang 1982)

One influential proposal that argues for movement of *wh*-in-situ is the LF movement theory by Huang (1982) (also see, e.g. Chomsky 1973, Lasnik and Saito 1984). Huang assumes a *wh*-word in-situ is a type of quantifier and claims that it needs to move to its scope position. Thus, *wh*-questions in both *wh*-movement and *wh*-in-situ languages involve movement. However, the two types of languages differ with regard to the level where *wh*-movement happens. While a *wh*-word in *wh*-movement

languages moves to Spec CP in the syntax, in *wh*-in-situ languages it moves in the level of Logical Form (LF). For example, although a *wh*-phrase in Chinese stays in its base position at the level of Syntax, as in (3.21), in the LF interpretive component it moves to a position that c-commands the sentence, as represented in (3.22).

(3.21) Ni   xihuan shei?
     you like   who
    'Who do you like?'

(3.22) [shei [ni   xihuan e]]
     who you like

The argument for the covert movement of *wh*-in-situ is based on some similarities between *wh*-in-situ and *wh*-movement. For example, both Chinese (*wh*-in-situ language) and English (*wh*-movement language) show similar selectional requirements of verbs for their subcategorized complements. For example, *ask* type verbs take only a question complement while *think* type verbs must take a declarative complement, and *see* type verbs allow both declarative and question complements. Huang argues that these requirements are satisfied by movement of *wh*-phrases to Spec CP, either overtly or covertly.

Although both *wh*-movement and *wh*-in-situ languages undergo movement, Huang argues that covert movement in LF needs not obey island constraints (i.e. Subjacency Principle (Chomsky 1977), as in (3.23)), while overt movement in Syntax needs to.

(3.23) Subjacency condition (Chomsky 1977)
    "A cyclic rule cannot move a phrase from position Y to position X (or conversely) in … X … [α… [β… Y …] …] … X …, where α and β are cyclic nodes. Cyclic nodes are S and NP"

This claim is based on the absence of island effects with *wh*-in-situ, as in multiple *wh*-questions in English in (3.24), and single and multiple *wh*-questions in Chinese, as in (3.25-3.26). In a multiple *wh*-question in English, the *wh*-word in-situ inside a complex noun phrase takes matrix scope, but the sentence is still grammatical. Similarly, in the Chinese examples in (3.25-3.26), the *wh*-words stay inside the island domain, a complex noun phrase in (3.25) and a *wh*-clause in (3.26), but both take scope over the entire sentences, indicating the absence of the CNPC and the *wh*-island effect in Chinese.

(3.24) Who spread the rumor that Mary hit who?

(3.25) [ni   xihuan[wo piping   shei de] wenzhang]]]?
     You like   I   criticize who DE article
     '*you like articles in which I criticize who?'

(3.26) [ni   xiang-zhidao [shei mai-le sheme]]?
     You wonder   who bought what
     'Who do you wonder bought what?
     'What do you wonder who bought?
     'You wonder who bought what.'

Huang further argues that the lack of island effects in *wh*-questions with a *wh*-situ element holds universally. Since any *wh*-phrase in-situ undergoes covert movement which is immune from Subjacency, *wh*-questions with *wh*-in-situ are expected to lack island effects in all languages.

In sum, Huang (1982) claims that *wh*-movement and *wh*-in-situ both involve movement, but they differ in the level movement takes place: syntax vs. LF, respectively. Huang argues that only overt movement is subject to Subjacency, while covert movement is not. Huang's theory then does not predict any island effects in *wh*-

in-situ languages. However, as discussed in Section 3.2, it has been suggested that Korean and Japanese display *wh*-island effects (e.g. Nishigauchi 1990, Watanabe 1992). How would Huang's account explain this? The following Sections discuss other theories that account for the presence of *wh*-island effects in Japanese.

3.3.1.2. Movement of an operator (Watanabe 1992, 2001)

Following Huang (1982), Watanabe (1992, 2001) assumes that there are two different levels of movement, overt and covert movement, and only the first level (overt movement) is sensitive to Subjacency while the second level (covert movement) is not. However, Watanabe proposes that *wh*-in-situ in Japanese involves movement at the first level, not at the LF, and thus it is subject to Subjacency.

One piece of evidence for this claim is cross-linguistic differences in island effects. Although it is still debatable, Japanese is argued to display *wh*-island effects, as in (3.27) (e.g. Nishigauchi 1990, Lasnik and Saito 1991). A *wh*-word inside the *whether* clause in (3.27) is not able to take matrix scope easily, indicating the existence of the *wh*-island effects.

(3.27) John-wa [Mary-ga nani-o   katta-kadouka] shiritagatte-iru-no?
            -Top   -Nom what-Acc bought-whether want.to.know-Q
        ??'What does John want to know [whether Mary bought __]?'

On the other hand, other languages such as Chinese and English do not show *wh*-island effects with *wh*-in-situ, as in (3.28-3.29), respectively.

(3.28) [ni   xiang-zhidao [shei mai-le sheme]]?
　 You wonder   who bought what
　　'Who do you wonder bought what?
　　'What do you wonder who bought?
　　'You wonder who bought what.'

(3.29) Who remembers where we bought what?

If Huang's argument is on the right track, which is LF movement is immune from subjacency, it is strange why only Japanese, but not Chinese and English, shows *wh*-island effects with *wh*-in-situ.

　　Watanabe assumes that typological characteristics in the structure of nominal expressions are closely related to cross-linguistic differences in *wh*-movement mechanisms. In many *wh*-in-situ languages, such as Chinese and Japanese, a quantificational system is built on *wh*-phrases by the use of either overt quantificational particles or invisible quantifiers. Specifically, in Japanese, overt quantificational particles are used. Watanabe thus argues that the separability of the overt quantifiers from *wh*-phrases in Japanese indicates that a phonologically empty operator originates in Spec of *wh*-phrases in Japanese. In *wh*-questions in Japanese, the empty *wh*-operator is separated from the rest of the *wh*-phrase, and raises to the Spec of CP, as schematized in (3.30). Importantly, the movement of the empty operator happens in overt syntax.

(3.30)

[CP Op [IP . . . DP . . .] Q]
　　　　　↑　　　　／＼
　　　　└───t　　D'
　　　　　　　　　／▲＼
　　　　　　　　　WH
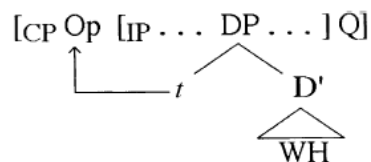
On the other hand, English does not permit such split between a *wh*-operator and a *wh*-word, and thus an entire *wh*-phrase should undergo movement. Therefore, although both languages involve overt movement, one is visible while the other is not.

Watanabe further argues that since movement of the empty operator in Japanese occurs in overt syntax, it is subject to the same syntactic restrictions of movement as in *wh*-movement languages, which explains the *wh*-island effect in Japanese. In the *wh*-island configuration, as in (3.31), the operator moves from Spec DP of a *wh*-word to Spec CP by crossing the *wh*-island. This overt movement of the operator out of the *wh*-island thus results the *wh*-island effect.

(3.31) ?? [[[John-wa [[Mary-ga [[nani$_{iNP}$] t$_{i DP}$]-o katta $_{IP}$] ka-dooka $_{CP}$]
           Top   -Nom   what   -Acc bought   whether
        Tom- ni tazuneta $_{IP}$]   no $_{C'}$] Op$_{i [Q] CP}$]?
           -Dat asked   Q
        'What is the thing x such that John asked Tom whether Mary bought x?'

However, the *wh*-island effects disappear in multiple *wh*-questions both in English and Japanese. In (3.32), a *wh*-word inside the interrogative clause easily takes matrix scope, displaying no *wh*-island effects. This contrasts with the *wh*-island effect in single *wh*-questions in Japanese.

(3.32) John-wa [Mary-ga   nani-o   katta   kadooka] dare-ni   tazuneta no?
            -Top Mary-Nom what-Acc bought whether   who-Dat asked Q
          'Who did John ask whether Mary bought what?'

Watanabe explains the absence of the *wh*-island effect in a multiple *wh*-question by suggesting that only one of the *wh*-words in a multiple *wh*-question is required to move to the Spec of the interrogative CP to allow both *wh*-phrases to take matrix scope. What undergoes movement here is the *wh*-word outside the island domain, not

the *wh*-word inside the island domain. Thus, movement in a multiple *wh*-question does not cross the island, yielding no island effect.

In sum, Watanabe claims that *wh*-words in Japanese involve movement in overt syntax, which is subject to Subjacency. What undergoes movement is, however, not a *wh*-phrase, but a phonologically empty operator. Based on the morphological characteristics of *wh*-in-situ in Japanese, which allows the separation of quantificational particles from *wh*-words, Watanabe assumes that the *wh*-operator is generated at Spec DP and undergoes overt movement to Spec CP. This overt movement of the null operator to Spec CP is claimed to be responsible for the *wh*-island effects in Japanese. This argument nicely explains the *wh*-island effects not only in Japanese, but also in other *wh*-in-situ languages, such as Chinese. Since Chinese does not have the same morphological characteristics as Japanese (i.e. no overt quantificational particles attached to a *wh*-word), it is expected to behave differently, showing no island effects.

3.3.1.3. Unselective binding (Tsai 1994, 1997, 1999)

While both Huang (1982) and Watanabe (1992, 2001) argue for movement of *wh*-in-situ, either covertly or overtly, Tsai argues that *wh*-in-situ arguments in Chinese do not undergo movement but instead make use of unselective binding in the sense of Heim (1982). This claim is based on the assumption that argument *wh*-words are variables which need to be bound by a licensor (see also, Kuroda 1965, Heim 1982, Nishigauchi 1990, Cheng 1991, Watanabe 1991, Aoun and Li 1993).

Specifically, a *wh*-phrase is argued to be an indeterminate pronoun (e.g. Kuroda 1965) and receives different quantificational readings from quantifiers the *wh*-word is associated with. This association of a *wh*-word and a quantifier/question operator is claimed to be done by the mechanism of unselective binding in all languages. For example, the relation between *shei* 'who' and *dou* 'all' in Chinese, is not different from the relation between *dare* 'who' and *-mo* 'all' in Japanese, and between *who* and *-ever* in English, in that the combination of a *wh*-word and a quantifier results an universal pronoun reading. Thus, *wh*-questions in all languages are argued to be subject to the same constraints, such as island effects.

However, Tsai argues that languages differ in where the variable-operator binding is formed. In other words, the location where a question operator is generated is different between languages, and this difference is argued to be correlated with the morphological characteristics of a *wh*-word. Specifically, he proposes that there are three different types of languages regarding where the licensor (null Q-operator) is generated. In Chinese-type languages, the Q-operator is base-generated in Spec CP, and unselectively binds the *wh*-word in-situ from there. In Japanese-type languages, the Q-operator originates from Spec DP or PP (e.g. Watanabe 1992, Aoun and Li 1993b), and thus the operator-variable binding occurs at a phrasal level. In English-type languages, the Q-operator is generated at a word level. This is schematized in (3.33).

(3.33)

CP/IP
Op_x (Chinese-type)   . . . PP/DP
        Op_x (Japanese-type)   . . . D⁰
                Op_x (English-type)   Wh(x)
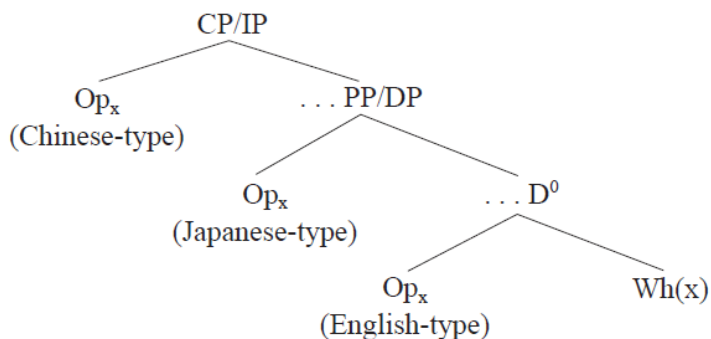
The different height of the operator in languages is argued to be responsible for cross-linguistic differences in *wh*-movement mechanisms and island effects. In Chinese, since the operator originates in Spec, CP, and unselectively binds a *wh*-word from there, movement of a *wh*-word is not necessary, which results in the lack of island effects in Chinese, as shown in (3.34-3.35).

(3.34) Opx[+Q] (Akiu xiangzhidao [*wh*-island shei(x) lai-le   mei-you]   ne)?
                Akiu wonder   who   come-Prf have-not-have Qwh
        'Who is the person such that Akiu wonders whether s/he has come?'

(3.35) Opx[+Q] (Akiu zui xihuan [complex-NP island shei(x) xie   de shu] ne)?
                Akiu most like   who   write Rel book Qwh
        'Who is the person such that Akiu likes the book which s/he wrote most?'

In Japanese, on the other hand, Q-operator originates in the Spec of DP. This leads to the presence of *wh*-island effects, but the absence of CNPC in Japanese. In the case of complex NP islands, as in (3.36), the operator that originates in the Spec of DP unselectively binds a *wh*-in-situ inside the complex NP, and thus no movement out of the complex NP is necessary, which leads to the absence of complex NP island effects. On the other hand, in the case of the *wh*-islands, as in (3.37), the operator must move

from Spec DP to Spec CP, crossing the *wh*-island. This movement thus yields the *wh*-island effects.

(3.36) [[[John-wa [[[[t$_k$ dare(x)-o aisiteiru IP] Op$_k$ CP] onna$_k$ NP] t$_i$ DP]-o
　　　　John-Top　　who-Acc loves　　　　　　　woman　　-Acc
　　　nagutta IP] no c'] Op$_x$ [Q] CP]?
　　　hit　　　Q
　　　'Who is the person x such that John hit the woman who loves x?'

(3.37) ??[[[John-wa [[Mary-ga [[nani$_i$NP] t$_i$ DP]-o   katta IP] ka-dooka CP]
　　　　　　-Top　　-Nom what　　-Acc bought whether
　　　Tom- ni tazuneta IP] no C'] Op$_i$ [Q] CP]?
　　　　-Dat asked　　　Q
　　　'What is the thing x such that John asked Tom whether Mary bought x?'

Lastly, in English, since unselective binding occurs word-internally, where a Q-operator is generated, a *wh*-word itself (i.e. a whole operator-variable pair) must be pied-piped to Spec CP. Thus, English exhibits all types of island effects.

In sum, Tsai proposes that all languages use unselective binding between the operator and a *wh*-word, but they differ in where the binding takes place: word-internal in English-type, word/PP-level in Japanese-type, sentential-level in Chinese-type. The different location where the operator-variable binding occurs is argued to be responsible for cross-linguistic differences in *wh*-movement mechanisms and island effects. This is one nice aspect of Tsai's analysis in that although languages differ in the ability to move a *wh*-phrase and island effects, they are all generated by the same mechanism of unselective binding.

However, there are languages morphosyntactically similar to Chinese regarding *wh*-phrases as bindable indefinites, but differ in that *wh*-phrases obligatorily undergoes overt movement like English (e.g. Passamaquoddy, Bruening 2007). If

morphosyntactic characteristics of *wh*-phrases determine the *wh*-mechanism, as Tsai argues, it is unclear how unselective binding argument can explain this type of languages. This is one challenge not only to Tsai's but also to any other arguments that rely on a typological correlation between using *wh*-phrases as bindable indefinites and a *wh*-in-situ mechanism (e.g. Nishigauchi 1990).

3.3.2. Non-movement accounts

3.3.2.1. Semantic approach (Shimoyama 2001, 2006)

While the studies discussed in previous sections propose syntactic accounts for island effects in *wh*-in-situ languages, Shimoyama approaches them from a semantic point of view. Shimoyama's analysis particularly focuses on the "island puzzle" in Japanese: the presence of the *wh*-island effect, but the absence of the complex NP and adjunct island effects.

Shimoyama's analysis of *wh*-constructions in Japanese builds on the assumption that *wh*-words in Japanese lack quantificational force ("indeterminate phrases" (Kuroda 1965)), which thus need to be bound by quantifiers, as in Watanabe (2001) and Tsai (1999). For example, the interrogative meaning of indeterminate phrases in Japanese come from the question particle *ka,* as in (3.38). On the other hand, when the universal determiner *–mo* 'all' is associated with the indeterminate phrases, the universal reading is obtained, as in (3.39).

(3.38)

```
Taro-wa    nani-o     tazunemasita ka?
Taro-Top   what-Acc   asked        Q
'What did Taro ask?'
```

(3.39)

> [[Dono gakusei-ga   syootaisita]   sensei]-<u>mo</u>   odotta.
> which student-Nom   invited   teacher -мо   danced
> 'For every student x, the teacher(s) that x had invited danced.'

Adopting Hamblin (1973)'s semantics for *wh*-phrases as a set of alternatives, she claims that indeterminate phrases generates sets of individuals. The set of alternatives created by the indeterminate expands until the first operator of the relevant kind, such as the question particle *ka* and the universal particle *mo*. The first encountered particle then takes sets of alternatives and generates singleton sets. This expansion is not subject to any islands, but the association of the indeterminate and the particle is argued to be strictly local, in that a *wh*-word should be linked to the closest quantifiers and it is impossible to be connected with a higher-up quantifier by skipping the intervening particle. The absorption of alternatives by the first question marker then makes the sets of alternatives no longer accessible by higher particles.

This general interpretive system of indeterminate phrases in Japanese yields mixed island effects. As for the *wh*-island, there is an intervening question particle –*ka* at the embedded clause between the indeterminate and the sentence-final question marker –*ka*, as in (3.40a). Since the embedded question particle is the closest one to the indeterminate phrase, this particle takes the sets of alternatives, creating the *wh*-island effect. On the other hand, constructions such as complex noun phrases and adjunct clauses lack such intervening relevant operator in the island domain, as represented in (3.40b). This thus permits the long-distance association between the indeterminate *wh*-word and the matrix particle.

(3.40)

a. *[..... [..... indeterminate .....]-ka/mo .....]-ka/mo

b.   [..... [..... indeterminate .....]_{CNP/Adjunct} .....]-ka/mo

The syntax-semantics mapping of the *wh*-questions in Japanese offers a uniform account for the mixed island effects in Japanese. This account is particularly noteworthy in that the "island puzzle" (i.e. *wh*-island effects, but no CNPC or adjunct island effects) in Japanese, which is different from the island effects in other languages such as English and Chinese, is explained by the morphosyntactic constructions specific to Japanese (i.e. the association of the indeterminates and the particles (e.g. *–ka* and *–mo*). However, this raises some questions about how this analysis can be extended to explain island effects in other languages which also have indeterminate *wh*-words and similar types of particles, such as Chinese and Korean.

3.3.2.2.Processing account (Sprouse et al. 2011)

Another type of non-movement account of island effects with *wh*-in-situ is a processing account. As discussed in Chapter 2, one of the major approaches to island effects in *wh*-movement languages is the processing account. However, most previous studies of island effects in *wh*-in-situ languages take grammar approaches. To the best of my knowledge, there is only one published study that approaches island effects in *wh*-in-situ languages from a processing perspective. Before we discuss this study, let us first provide some background on processing *wh*-questions in *wh*-in-situ languages.

Although there has not been much research on processing island effects in *wh*-in-situ languages, research on processing *wh*-questions in *wh*-in-situ languages is relatively well-established. Empirical evidence so far has suggested that processing *wh*-questions in *wh*-in-situ languages is in many ways similar to that in *wh*-movement languages. One main characteristic of processing *wh*-questions in *wh*-movement languages is the Active Filler Strategy (Frazier and Clifton, 1989). The parser initiates a forward search for the gap site upon encountering the *wh*-word, and actively identifies the gap position to complete the *wh*-dependency as soon as possible.

This active search mechanism of the parser in processing *wh*-questions is also reported in *wh*-in-situ languages (e.g. Miyamoto and Takahashi 2000, Aoshima, Phillips and Weinberg 2004, Ueno and Kluender 2009). However, there is a main difference in processing *wh*-questions between the two types of languages. That is what the parser looks for. In questions involving overt *wh*-movement, a moved *wh*-word forms a dependency with its gap, and scope is unambiguously marked by the position of the *wh*-word (Spec CP). Thus, all the parser needs to identify is its gap position for semantic information. On the other hand, in *wh*-in-situ languages the location of the *wh*-word in-situ shows its grammatical function within the clause, but not scope. Thus, the dependency exists between a *wh*-word and a scope marker (i.e. a question particle), and the parser actively searches for a scope-marker, instead of a gap. This process is reported to be similar to the Active Filler strategy, in that the parser tries to complete the dependency between a *wh*-in-situ and a scope marker as soon as possible by actively searching for the scope marker (i.e. Active Scope Marking strategy, Sprouse et al. 2011).

One study that demonstrates the Active Scope Marking strategy in processing *wh*-questions in *wh*-in-situ languages is by Miyamoto and Takahashi (2002). In a self-paced reading experiment, they found that *wh*-questions with an embedded question particle, as in (3.41), were read faster than *wh*-questions with a *that*-complementizer at the embedded verb position, as in (3.42).

(3.41) John-wa [Mary-ga nani-o   katta-ka]   iimasita-ka?
            -Top   -Nom what-Acc bought-Q said-Q
        'Does John say [what Mary bought __]?

(3.42) John-wa [Mary-ga nani-o   katta-to]   iimasita-ka?
            -Top   -Nom what-Acc bought-*that* said-Q
        'What does John say [Mary bought __]?

They argue that this indicates a dependency between a *wh*-word and a related Q-particle. Since readers want to complete this dependency between a *wh*-word in-situ and a scope marker as soon as possible, they expect to encounter a question particle as soon as possible. This expectation is satisfied in the case like (3.41) where a question marker is located within the same clause as the *wh*-word, and thus, no particular delay in the reading time is predicted. On the other hand, in the question with a *that*-complementizer, as in (3.42), this expectation is violated. Since the parser expects to find a relevant scope marker at the embedded verb position, its absence results in a slower reading time at the embedded verb location.

Building on the similarities and differences in processing *wh*-questions between *wh*-movement and *wh*-in-situ languages, a recent experimental study by Sprouse et al. (2011) approaches island effects in Japanese from a processing point of view. Four types of islands in Japanese are investigated in a series of acceptability

judgment experiments: *whether*-island, CNPC island, subject island, and adjunct island. The island effects in Japanese are, however, not the main focus of the study, but simply to confirm their proposal for experimental results on reverse island effects in multiple *wh*-questions in English.

Restricting ourselves to the part directly relevant to this discussion on island effects in *wh*-in-situ languages, we see that they tested four types of island effects in multiple *wh*-questions, using a factorial definition of islands, as discussed in Section 2.3,: *whether*-island, CNPC island, subject island, and adjunct island, with formal acceptability judgment tasks. The general claim established in the previous literature is that multiple *wh*-questions in English do not show island effects. The results revealed no classic island effect, but instead showed an interesting pattern: reverse island effects in *whether*- and adjunct island. Specifically, single *wh*-questions with non-island structure (*that*-clause) were more acceptable than those with island structures, and this difference between the two conditions depending on the presence/absence of island structure were expected to be similar for multiple *wh*-questions. However, the results showed that the difference between single *wh*-questions differed by the island/non-island embedded clauses was larger than the difference between multiple *wh*-questions differed by the island/non-island embedded clauses (i.e. reverse island effects). This is illustrated in Figure 3.1.
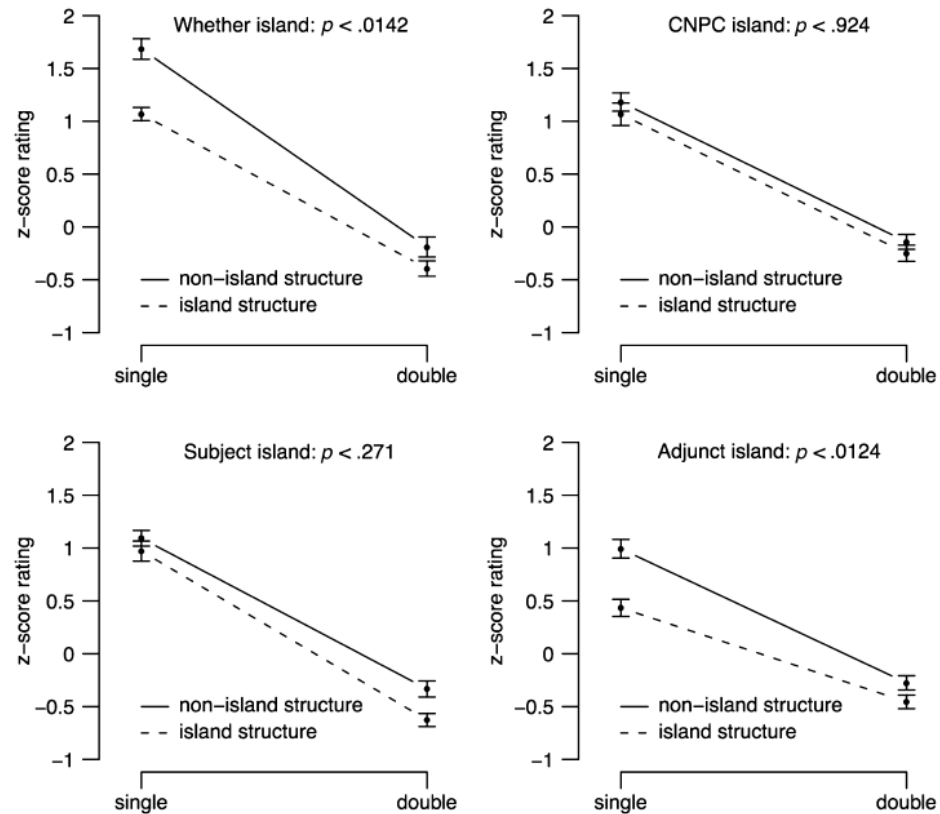
Figure 3.1. Island effects in English multiple *wh*-questions.

They claim that the unexpected reverse *whether-* and adjunct island effects in multiple *wh*-questions (i.e. increase in acceptability when the in-situ *wh*-phrase appears inside a *whether*-island or adjunct-island structure) are the consequences of the parsing processes in real-time comprehension of multiple *wh*-questions. A *wh*-in-situ in a multiple *wh*-question in English takes the same scope as a displaced *wh*-phrase in Spec CP, and thus the parser should use the moved *wh*-element to identify scope of the *wh*-in-situ. This search for the displaced *wh*-element in multiple *wh*-questions is similar to the forward search for a gap in a single *wh*-question, but with

different directionality (i.e. back-ward search: from the *wh*-in-situ to the sentence-initial *wh*-word).

As in processing a single *wh*-question in English, the parser tries to complete this back-ward search as soon as possible, by reactivating and searching through previously parsed material. The Spec CP is the syntactic position that could hold a potential licensor, and the Spec CP of the embedded island clause is the first possible positon for the licensor. Regarding the first Spec CP position, there is a difference between *whether*- and adjunct island constructions, and CNPC and subject islands. In *whether*- and adjunct islands, the embedded Spec CP is filled by *whether* and *if*, respectively. Since they are morphosyntactically similar to *wh*-words, the parser considers *whether* and *if* as "good enough" candidates for scope marking purposes, and completes the search. On the other hand, in CNPC and subject islands, the sentence-medial Spec CP is either empty or filled by *that,* and thus such "good enough" parsing is impossible.

In order to confirm their accounts on the reversed island effects in multiple *wh*-questions, Sprouse et al. tested island effects in Japanese, with a prediction of the absence of such reverse island effects in Japanese, given the different directionality in parsing between a single *wh*-question in Japanese and multiple *wh*-questions in English. Processing a single *wh*-question in Japanese involves the forward search for the scope marker, and no costly reactivation of previously parsed material is necessary. On the other hand, the backward search in multiple *wh*-questions in English requires reactivation of previously parsed material. Using a factorial definition of islands, as discussed in Section 2.3, the experiments employed two main experimental factors,

Length and Structure. The first factor Length tests the distance effect between the *wh*-word and its gap (i.e. short vs. long). Since Japanese is a *wh*-in-situ language, this factor differentiates the location of the *wh*-word (i.e. matrix clause vs. embedded clause). The second factor is Structure, which tests the role of the embedded structure type (i.e. island vs. non-island). The stimuli of the island violating condition of each island type are presented in (3.43).

(3.43) a. *whether*-island

Satoko-ga   Shingo-ga   nani-o   shita-kadooka kiita-no?
Satoko-NOM Shingo-NOM what-ACC did-WHETHER asked-Q
'What did Satoko ask whether Shingo did?''

b. CNPC

Kanako-ga   Satoshi-ga   nani-o   kaeru-toiu yoso-o   tateta-no?
Kanako-NOM Satoshi-NOM what-ACC change-C prediction-ACC made-Q
'What did Kanako make the prediction that Satoshi would change?'

c. Subject island

Satoru-ga   dare-nitsuiteno-kiji-ga   roodoosha-niyoru hantaiundo-o
Satoru-NOM   who-about-article-NOM working class-by   protest-ACC
okoshita-to   itta-no?
caused-C   said-Q
'Who did Saturu say that the article about caused the protest by the working class?'

d. Adjunct island

Takeshi-ga   nani-o   katta-ra   Keiko-ga   yorokobu-no?
Takeshi-NOM   what-ACC bought-COND Keiko-NOM be-happy-Q
'What would Keiko be happy if Takeshi bought?'

Overall, the results revealed neither the super-additive (i.e. classic island effects) nor sub-additive island effects, confirming their prediction. However, there was unexpected reversal in the acceptability of conditions for the adjunct island. Both of the conditions with an adjunct clause were rated higher than the non-island-

structure (declarative) conditions, showing a significant interaction of the two factors and the main effect of Structure for the adjunct island. Such effect was not observed in other types of islands. The results of the four island types are graphed in Figure 3.2.
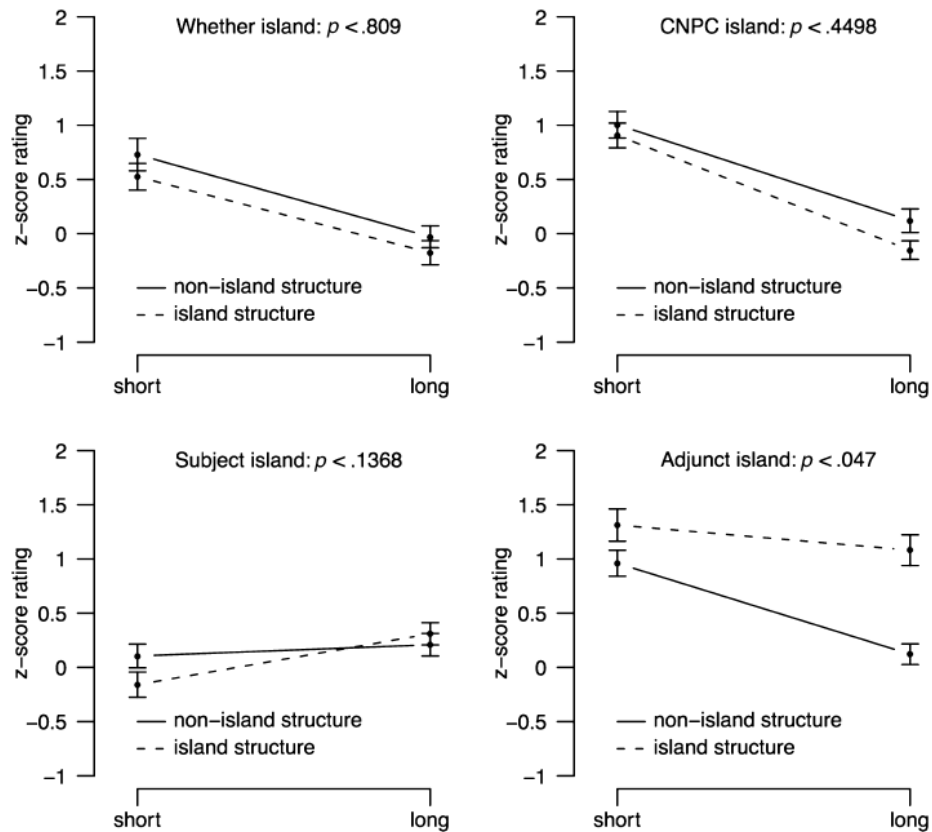
Figure 3.2. Island effects with Japanese single *wh*-questions.

They considered this unexpected reversal in the acceptability of the adjunct island configuration as a confound effect in the adjunct island stimuli. Given the preference for sentence-initial conditional clauses than embedded conditional clauses in Japanese, all the adjunct island stimuli contained the sentence-initial adjunct. This preference for the sentence-initial adjunct was argued to be responsible for the higher

ratings of the conditions with adjunct islands, compared to those with non-island structures.

As for the rest of the results, unfortunately no specific discussion was provided in the paper, since the main purpose of the experiments on island effects in Japanese was to confirm their backward processing account for the reverse island effects in multiple *wh*-questions in English. Thus, it is unclear what their prediction would be about the existence of island effects in Japanese, setting apart from the prediction that Japanese would not show the reverse island effects.

However, given that they did not raise any objection to their results, but simply mentioned their results "corroborated previous results… no classic CNPC or subject island effects," they might agree with their results, predicting no island effects in Japanese. In particular, Sprouse et al. assume that processing single *wh*-questions in Japanese is less costly, compared to English since the in-situ *wh*-phrase in Japanese does not need to be encoded in working memory as its grammatical function is already given by its position and/or the case marker. As a consequence, there is no need for retrieval and integration when the parser finds a scope marker. In contrast, the *wh*-phrase in English should be encoded in working memory, and retrieved and integrated at the gap location since its grammatical function is not given. Sprouse et al. argue that these differences in the encoding and retrieval requirements of the *wh*-phrase between the two languages might result in different degrees of processing difficulties (i.e. less processing costs in Japanese, compared to English).

However, no discussion was given on how these relatively smaller processing costs would relate with island effects in Japanese. Thus it is still unclear what their

prediction on the island effects in Japanese would be. One possibility is that Sprouse et al. might predict for the absence of island effects in Japanese and Korean, based on their assumption that processing *wh*-questions in Japanese is less costly since a *wh*-word in-situ is not encoded in working memory. On the other hand, based on previous research demonstrating the processing costs in the association of a *wh*-word in-situ and a questions marker in Japanese, as the parser would have to keep track of a dependency until the question particle (e.g. Ueno and Kluender 2009), they might also predict island effects in Japanese and Korean.

Independently of that though, the fact that island effects in Japanese were experimentally tested and approached from the processing perspective is a major contribution of this study. In particular, their finding (i.e. no *wh*-island effect in Japanese) is contradictory to the increasing consensus on the presence of the *wh*-island effect in Japanese, as discussed in Section 3.2.1, and also to many different analyses of island effects in *wh*-in-situ languages that assume for the existence of the *wh*-island effects in Japanese, as seen in Section 3.3.1-3.3.2. This thus shows the complexity of the issue of island effects in *wh*-in-situ languages, and suggests the need for more experimental investigation of island effects in various types of *wh*-in-situ languages.

3.3.3. Summary

Five studies on island effects in *wh*-in-situ languages were discussed in this Section. They are largely divided into two types: (partial-)movement accounts vs. non-movement accounts. First, Huang (1982), Watanabe (1992, 2001), and Tsai (1994, 1997, 1999) argue that *wh*-questions in (some) *wh*-in-situ languages involve (partial-)

movement. Specifically, Huang (1982) argues that *wh*-in-situ undergoes covert movement at the LF level, and this covert movement is free from Subjacency, and thus no island effect is predicted in *wh*-in-situ languages.

On the other hand, Watanabe (1992, 2001) claims that *wh*-questions in *wh*-in-situ languages involve overt movement, as in *wh*-movement languages, but what undergoes movement is not a *wh*-phrase, but a phonetically empty operator. Particularly in Japanese, the operator is generated in Spec DP, and moves to Spec CP. Since this movement of the operator happens at the overt syntax, it is argued to be subject to Subjacency. The overt movement of the operator from Spec of the *wh*-phrase to Spec CP by escaping an embedded *wh*-clause yields *wh*-island effects in Japanese.

Tsai's (1994, 1997, 1999) analysis also assumes (partial-)movement in some *wh*-in-situ languages, but it differs from Huang's and Watanabe's in a crucial way that while Huang and Watanabe argue that movement of some kinds of element is a main mechanism of *wh*-questions in all languages, Tsai claims that *wh*-questions in languages primarily make use of unselective binding between a Q-operator and a *wh*-word, and thus movement is the last option. Tsai argues that languages differ in the place where the operator is generated, and the different height of the operator in languages is responsible for cross-linguistic variation in *wh*-movement mechanisms and island effects. Thus, some *wh*-in-situ languages involve movement in some instances, such as movement of a *wh*-operator in Japanese, while some *wh*-in-situ languages do not use any movement, such as Chinese. This consequently yields

different types of island effects in *wh*-in-situ languages (e.g. absence of island effects in Chinese vs. *wh*-island effects in Japanese).

The other two studies, Shimoyama (2001, 2006) and Sprouse et al. (2011), take non-movement approaches to *wh*-questions in *wh*-in-situ languages. The former is a semantic account, and the latter is a processing account. First, Shimoyama (2001, 2006) explains mixed island effects in Japanese (i.e. presence of *wh*-islands vs. absence of Complex NP and adjunct islands) as a consequence of an interpretive system. Adopting Hamblin's (1973) semantics for *wh*-phrases as set of alternatives, Shimoyama claims that indeterminate phrases (e.g. *wh*-phrases) in Japanese create infinite sets of individuals, and this set creation expands until the first relevant operator (e.g. a question marker) takes the sets of alternatives and generates singleton sets. This absorption by the first question marker inside the interrogative clause makes the sets of alternatives no longer accessible by higher particles, creating the *wh*-island effect. On the other hand, complex NP and adjunct clauses lack such an operator inside the clause and thus allow a long-distance association between the indeterminate phrase and the matrix particle, therefore yielding no island violation.

Sprouse et al. (2001) approach island effects from a processing perspective. In formal acceptability tasks, they tested four types of island effects (i.e. *whether*-island, CNPC island, subject island, and adjunct island) in multiple *wh*-questions in English and in single *wh*-questions in Japanese. The results yielded reverse *whether*- and adjunct island effects but no CNPC and subject island effects in multiple *wh*-questions in English, and no island effects in Japanese. The results in multiple *wh*-questions in English were explained by the "good enough" processing strategy in parser's

backward search for the scope marker (i.e. a displaced *wh*-phrase in Spec CP). Due to limited parsing resources, the parser completes this backward search by connecting the *wh*-in-situ with *whether* and *if* in *whether-* and adjunct islands, respectively, by considering them as good enough candidates for scope marking purpose. In CNPC and subject islands, the sentence-medial Spec CP is either empty or filled by *that,* and thus such "good enough" parsing is impossible. The possibility of good enough parsing is argued to be responsible for two different types of island effects between *whether-* and adjunct islands, and CNPC and subject islands. In Japanese, on the other hand, since the direction of the search for a scope marker is forward, not backward, no such reverse island effect is expected in any type of islands.

3.4.   Conclusion

As discussed in Section 3.2.1, the status of island effects in Korean is unclear, especially regarding the existence of *wh*-island effects. Some argue for the presence of the *wh*-island effects, while others argue against it. In this chapter, five different approaches to *wh*-in-situ and islands in *wh*-in-situ languages were discussed. What could we then conclude from these various accounts regarding island effects in Korean? What predictions would they make for the island effects in Korean?

First, Huang (1982) would predict the absence of island effects in Korean. According to Huang (1982), all *wh*-words in *wh*-in-situ languages undergo covert movement, which is immune from Subjacency. Thus, a *wh*-word in-situ in Korean would also be expected to involve covert movement, and exhibit no island effects.

On the other hand, Watanabe's operator movement proposal (1992, 2001), Tsai's unselective binding theory (1994, 1997, 1999), and Shimoyama's semantic approach (2001, 2006) would all predict at least *wh*-island effects in Korean. Although the specifics of each account are different, all of these three analyses predict the *wh*-island effect in Japanese based on the morphosyntactic properties of *wh*-words in Japanese. Specifically, they consider a *wh*-word in Japanese as a variable that needs to be quantified, and the relation between the quantifier and the *wh*-word is responsible for the *wh*-island effect in Japanese. Since Korean is similar to Japanese regarding the mophosyntactic properties of a *wh*-word (e.g. the use of both local (e.g. existential quantifier *–nka*) and non-local (e.g. question marker *–ka*) quantificational particles with a *wh*-word), they would all predict the *wh*-island in Korean.

As for Sprouse et al. (2011), it is difficult to make a prediction regarding island effects in Korean since no specific prediction from the processing perspective of island effects was given even for island effects in Japanese they tested. However, Sprouse et al. argue that processing *wh*-questions with *wh*-words in-situ in Japanese is less costly compared to those with *wh*-movement as in English since *wh*-words in-situ does not need to be encoded and retrieved in parsing *wh*-questions as their grammatical roles are already given by the case marker and/or the location of the *wh*-words in-situ in the sentence. Thus, if their argument is on the right track, we might expect also for Korean these relatively small processing costs in parsing *wh*-in-situ questions, which might then lead to no particular island effects in Korean.

To conclude, the contradictory predictions of various accounts for island effects in Korean indicate that the status of island effects in Korean is still unclear.

Some analyses predict island effects, but others do not. It thus strongly points to the need for an experimental work on island effects in Korean in order to find out what the facts are. In Chapter 5, we test island effects in Korean using formal acceptability judgement tasks. The experimental results and the predictions of these various analyses for island effects in Korean are disused in Chapter 5.

Chapter 4: Island Effects in Language Acquisition

4.1.Introduction

One of main issues on the topic of island phenomena is the learnability problem: despite the apparent absence of sufficient input, children still figure out the complex and subtle details of island phenomena. Children clearly get evidence that there is *wh*-movement and that this operates over more than one clause (e.g. "What did you think that John ate?"). In addition, children get evidence that there are structures, such as *wh*-clauses and adjunct clauses (e.g. "Mary cried when Tom hugged her."). However, there is nothing obvious in the input that tell them that *wh*-movement out of one of these structures is impossible. Nevertheless, children know that *wh*-movement out of these island domains is impossible and never violate this. This is known as the poverty of the stimulus problem and/or underdetermination (Chomsky 1965, 1980).

Various accounts of poverty of the stimulus effects in island effects have been proposed, and among these, four particular approaches are discussed in this chapter (Section 4.3). Briefly mentioning these four analyses, the first account is the UG approach (Chomsky 1973). In the traditional UG account, island effects are explained as violations of certain grammatical constraints, and these island constraints are claimed to be innate. The poverty of the stimulus argument in island phenomena has thus served as a strong motivation for an innate, domain-specific universal grammar (UG) which includes island constraints. Learning of island constraints is unnecessary under this approach.

Newer accounts of island phenomena (e.g. accounts within minimalism (Chomsky 1995)) argue that island effects are the result of how a computational

system operates and not something specific to language or grammar, and therefore not part of UG (for an overview, see, Richards 2008). This means island effects should be present in all speakers, since all speakers have a computational system, and learnability should not be an issue.

Another proposal for the learning paradox of island effects is the claim that island effects are a reflection of limited working memory capacity (e.g. Kluender and Kutas 1993, Hofmeister and Sag 2010). Therefore, island effects naturally arise in all humans, and no special grammatical constraints are required. Thus, all speakers who can process the island constructions should show island effects.

The fourth approach to the learnability problems of island phenomena is an input-driven view, which argues that island constraints can be learned from the input using a domain-general learning strategy (Culicover and Jackendoff 2005, Pearl and Sprouse 2011, 2013). This approach assumes no specific island constraints but it requires sufficient input of the language for the island to be learned. Thus, the poverty of the stimulus problem in this case is only apparent.

As the sources of island effects are not completely clear yet (e.g. island effects might be due to properties of grammar or processing, or something else), I will consider these various approaches to the learnability problems in island phenomena to better understand the island effects and the poverty of the stimulus problems in language acquisition. In doing so, this dissertation specifically focuses on the development of island effects in sequential Korean-English bilinguals in the U.S (i.e. heritage speakers) in their two languages (i.e. heritage Korean and L2 English). This

population is particularly important, as their perturbed learning environment may help us to evaluate various theories of islands and language acquisition.

The following Section 4.2 presents some of characteristics of heritage speakers, specifically the status of input, and cross-linguistic influence in the development of their two languages. In Section 4.3 the four different approaches to island effects and their predictions for the island phenomena in heritage (and L2) speakers are discussed.

4.2. Characteristics of Heritage Speakers

4.2.1. Definition of Heritage Speakers

The first challenge we encounter in exploring island phenomena in the heritage population is how we define heritage speakers. Since characteristics and learning environment of heritage speakers vary greatly from speaker to speaker, it is challenging to define heritage speakers (for a general overview on heritage language acquisition, see Polinsky and Kagan 2007, Benmamoun et al. 2010, 2013).

In this dissertation, we adopt the following definition of heritage speakers provided by Benmamoun et al. (2013): "a heritage speaker is an early bilingual who grew up hearing (and speaking) the heritage language (L1) and the majority language (L2) either simultaneously or sequentially in early childhood (that is, roughly up to age 5; see Schwartz 2004, Unsworth 2005), but for whom L2 became the primary language at some point during childhood (at, around, or after the onset of schooling)." As the definition indicates, heritage speakers are early bilinguals, but they are often differentiated, particularly in the research in the United States and Canada, from child bilinguals who grew up in a community where both of the languages are more or less

equally used. Heritage speakers usually refer to bilinguals who grew up in a community where their heritage language and the society language are in a minority-majority relationship, in that the heritage language is the minority language of the community and the other language is the community language, such as in immigrant communities. This dissertation specifically focuses on English-dominant sequential heritage speakers of Korean in the U.S.

4.2.2. Reduced Input

One major characteristic that defines heritage speakers is reduced language input. Unfortunately, there is no existing study or corpus data that shows the exact nature of the input in heritage language acquisition, but generally the input of heritage speakers is significantly reduced, not only for their heritage language, but also for the society language. Because heritage speakers divide their time between two languages, the amount of time that they are exposed to each is less than what would occur with a monolingual, all of whose time is spent with a single language. In addition to the quantitative restriction in the input, there is also a qualitative restriction. Since the languages of heritage speakers are in a majority–minority relationship, the input of the heritage language is mostly limited to home-/family settings, and thus the input of the heritage language would be both quantitatively and qualitatively restricted.

The input with the heritage language gets even further reduced as they get older. Once heritage speakers start getting more contacts with the dominant language of the society, both their input and their output with their heritage language is typically reduced. The time of their first exposure to the community language varies by speaker,

ranging from birth to early childhood, but in most cases significant exposure starts when they start to go to school. From this point, the amount of input and the use of the society language drastically increase.

A number of studies indicate the restricted and insufficient input of heritage languages and its consequences. Reduced input has been claimed to be a significant factor of non-native outcomes in many heritage speakers (Montrul et al. 2010), such as incomplete acquisition (e.g. Blake 1983, Verhoeven and Boeschoten 1986, Montrul 2002, 2008, Polinsky 2006, 2008, Bolonya 2007, Montrul and Bowles 2009), and attrition, the loss of the grammar after its full development (e.g. Dorian 1978, Vago 1991, Polinsky 1997, 2011, Anderson 1999, Montrul 2002, 2008, Sorace 2004, de Groot 2005). The effects of reduced input in the development of the heritage language are reported to be particularly more pronounced in certain domains of grammar. While the basic and very salient properties of their language (e.g. word order) are more resilient, some domains of mophosyntax and complex syntax, including case markers and relative clauses are reported to be more vulnerable to incomplete acquisition and/or attrition under reduced input (e.g. Montrul et al. 2008, O'Grady et al. 2001, 2011, Polinsky 2011, Bar-Shalom & Zaretsky 2008).

The input of the society language is also possibly reduced for many heritage speakers. Although the society language is the dominant language for the vast majority of heritage speakers, it is still their second language. As we have seen, the exposure to the society language usually starts later in life, not from birth, compared to their heritage language. The exact timing of the first exposure to the society language differs by speakers, but significant exposure is often not until they start school

education. For U.S.-born heritage speakers and those who immigrated as infants, it is usually around the pre-school age (three to four years old), and for children immigrated to the U.S. later than the age four, it is the age of arrival. As a result, their initial exposure to the language is delayed, and once it starts, it is restricted both quantitatively and qualitatively. It is thus reasonable to assume that their acquisition of the society language would be similar to the process of L2 acquisition (i.e. L2 child acquisition), showing some characteristics of L2 acquisition (cf. Montrul 2006, 2008, for possible differences in the outcome of L2 grammar between heritage speakers and L2 speakers).

4.2.3. Influence of the Other Language

Another major difference between the development of heritage speakers and monolingual development is the influence of the other language. It has been well established that development of a phenomenon in one language is often influenced by the same phenomenon in another language, usually in the direction of influence from the dominant language to the weaker language (e.g. Kaufman 1995). The extent to which transfer from the dominant language influences the heritage language is not clear yet, but heritage speakers are reported to make transfer errors from the majority language into the heritage language (e.g. Wei and Lee. 2001, Godson 2003).

The effects of the transfer may vary depending on the phenomena, as some areas are more vulnerable to the influence of the other language (e.g. Hulk and Müller 2000, Montrul 2010). For example, in both standard L2 acquisition, and heritage language acquisition, the syntax–pragmatics interface is reported to be more

vulnerable than the syntax itself (e.g. Sorace 2000, Tsimpli and Sorace 2006, Montrul 2008). In particular, when a phenomenon in two different languages display different grammatical status, transfer errors are more observed (e.g. Odlin 1989, Jarvis 1998, Cook 2003, Serratrice et al. 2009)

Most research on the influence of the other language in heritage speakers has focused on the influence of their society language (L2) on their heritage language (e.g. Montrul 2010, Montrul and Ionin 2010, 2012, Polinsky 2011) while the opposite direction, from the heritage language to the second language has not been investigated yet. Although the society language is the dominant language for most heritage speakers, it is not impossible to observe transfer effects from the heritage language to the society language, particularly for sequential heritage speakers since the input and learning environments of the society language are generally different in these speakers, compared to monolingual speakers, showing L2 characteristics.

4.3. Various Approaches to the Learnability Problem of Island Phenomena

As we saw in section 4.1, the poverty of the stimulus problem refers to the fact that children learn a language even though the evidence from experience is limited. In other words, the input underdetermines speakers' linguistic knowledge. Island effects are such a case. There is no direct input of island phenomena in the environment, but speakers nonetheless display the island effects.

We have seen that the learning environment for heritage speakers is different in important ways from the environment in monolingual development, especially regarding the quality and/or quantity of the input, and the influence of the other

language. This property of the heritage population provides an interesting test ground for exploring the learnability problem and the nature of island phenomena, as these differences might conceivably have an effect on island phenomena. For example, it is possible that their two different languages interact and influence the development of island effects in each of their language, especially if the two languages of heritage speakers show different types of island effects, such as an island effect is present in one language while absent in another language. In the following sections, I will discuss what different approaches to island phenomena would lead us to expect about this. Four different accounts are discussed: traditional Universal Grammar approach (Section 4.3.1), Minimalist account (Section 4.3.2), processing account (Section 4.3.3), and Input-driven account (Section 4.3.4).

4.3.1. Traditional Universal Grammar Account

The classical generative approach to island effects (specifically, before the Minimalist program, Chomsky 1995) claims that island effects arise from violating specific grammatical island constraints (e.g. Subjacency, Chomsky 1973, 1986). These island constraints are a part of domain-specific universal grammar (UG), which is genetically encoded with the specific principles and parameters of language.

This UG argument of island effects has been widely employed in various areas of language acquisition studies on island phenomena as a main explanation for the lack of direct evidence of island effects in learning environment. It claims that since children are equipped with innate linguistic knowledge (principles) which they can use

to help interpret the linguistic input (parameters), no learning problem exists with island effects, and all speakers are predicted to show island effects.

However, UG accounts of islands would also predict no island effects if a learner has no access to UG. Since island constraints are available to speakers through UG, if a speaker does not have an access to UG, s/he may show the absence of island effects. In fact, island phenomena have been a test case to investigate whether one's grammar is governed by UG or not, particularly in second language acquisition studies. There are largely two opposite positions on this issue. Some argue that L2 knowledge is constrained by UG (e.g. White 1989; Schwartz and Sprouse 1994, 1996, Epstein, Flynn and Martohardjono 1996), while others argue that L2 is fundamentally different from L1 with no access to UG (i.e. the fundamental difference hypothesis (Bley-Vroman 1989, 1990)). These two different positions on the issue of UG accessibility in second language acquisition predict different types of outcomes regarding the island effects in L2 speakers (and possibly in heritage speakers).

First, those who argue that L2 grammar is governed by UG would predict the same learning process of island effects for heritage and L2 speakers (e.g. Epstein, Flynn and Martohardjono 1996, White and Juffs 1998, Juffs 2005). There is no reason to suppose that the input is more or less informative about island effects for heritage speakers and L2 speakers than for native speakers, since the data on island effects is unavailable to the speaker regardless of his/her learning environment. This means that for all speakers, island effects follow from their innate linguistic knowledge (UG). Thus, the uniformity of the process of acquiring sensitivity to islands is predicted for the heritage and L2 groups with no particular learning problem and/or individual

variation for heritage and L2 groups regardless of differences in the learning environment. This position has been supported by L2 speakers' native-like island effects in previous literature (e.g. White and Juffs 1998, Rothman and Iverson 2013).

On the other hand, those who argue that not all speakers have an access to UG would predict an absence of island effects in speakers without an access to UG (e.g. Bley-Vroman, Felix, & Ioup 1988, Johnson & Newport 1991). Specifically, this position claims that UG is not available after a certain period in life (e.g. a critical/sensitive period: a time of high sensitivity early in life, followed by a sharp decline and then low sensitivity through the rest of the lifespan), and linguistic properties that are not instantiated during the times when access to UG is available (i.e. childhood), they are not available later when the UG is not available. Thus, adult L2 speakers with an L1 in which the properties of islands do not operate are expected to lack an island effect in the L2. On the other hand, child L2 leaners are predicted to show island effects since they are likely to have access to UG if the availability of UG is strongly constrained by age of acquisition.

To sum up, the traditional UG accounts which claim island effects as consequences of violating specific island constraints (e.g. subjacency) would predict two different types of outcomes in heritage and L2 speakers' island effects, depending on one's assumption about the UG availability in these populations. Those who assume that UG is available to all speakers, for example, regardless of the age of acquisition, would predict native-like island effects in heritage and L2 speakers. On the other hand, ones who argue for the unavailability of UG in some speakers, particularly for adult L2 speakers would predict no islands in those speakers.

4.3.2. Minimalist Approach: Computational Efficiency

In the Minimalist program, the content of UG is kept to a minimum and new types of analyses have emerged in which islands are the result of limitations of humans' computational mechanisms (e.g. Chomsky 2005). These Minimalist grammatical accounts claim that island effects arise due to principles of efficient computation, not due to specific island constraints in the grammar.

Chomsky (2005) identified three factors as crucial components of design and acquisition of language.

1. Genetic endowment, apparently nearly uniform for the species, which interprets part of the environment as linguistic experience
2. Experience, which leads to variation, within a fairly narrow range
3. Principles not specific to the faculty of language.

The first factor is Universal Grammar, the genetic endowment for language, of which the role in language acquisition is assumed to be maximally empty, with lack of language-specific principles and parameters, but with a universal inventory of formal features from which speakers makes a selection in each language (Chomsky 2000). The second factor is the experience in the linguistic environment that provides information relevant to the selection of features of the exposed language. The third factor is principles of efficient computation, which the Minimalist Program emphasizes as a primary factor of language design. The third factor is a domain-general property, the natural principles of computational efficiency present in all humans.

The concept of computational efficiency is distinguished from ease of processing (Chomsky 2005). For example, consider a *wh*-question in (4.1a), with its full derivational representation in (4.1b) showing copies of moved constituents *who* and *did* (the copies are italicized).

(4.1) a. Who did Mary like?
     b. [Who$_{ii}$ did$_i$ Mary *did*$_i$ like *who*$_{ii}$]?

According to the copy theory of movement, all moved constituents leave copies in their original and intermediate positions, and the copies are carried to the semantic interface, which are not deleted, but just unpronounced, as represented in (4.1b). Processing would be easier if all the copies were pronounced, but leaving copies would require additional cost of phonological computation, and Chomsky (2005) argues that "overwhelmingly" the latter wins. This is a difference between the computational efficiency and processing ease.

This third factor is what the newer version of accounts of island phenomena under the Minimalist program are based on. The successful acquisition of islands is not attributed to the success/failure of accessing an overly specified UG that has parameters, but to "virtual conceptual necessity," the way a computational system works. Children naturally select patterns which meet the principles of efficient computation, and thus no positive evidence is required. Therefore, under the newer version of grammar accounts of island phenomena, healthy developing speakers should all show sensitivity to islands, with very little or no variation among speakers and languages. One would then predict that heritage and L2 speakers would also be subject to this third factor, since it is a domain-general property that is true of all

humans regardless of their learning environments. Therefore, native speakers, heritage speakers and L2 speakers would all be uniform with regard to islands, in that they should all show an island effect in one way or another.

4.3.3. Processing Account: Domain-general cognitive principles (Processing costs)

As discussed in Section 2.2, the processing approach to island effects attributes island effects to resource limitations on processing, not to grammatical constraints (e.g. Pritchett 1991, Kluender and Kutas 1993, Kluender 1998, 2004, Hofmeister and Sag. 2010). The main claim is that in processing filler-gap dependencies, holding a *wh*-filler in working memory and simultaneously crossing the island clause boundary surpasses one's cognitive resources. This then makes the filler-gap association inside the island difficult, which leads to a degradation of acceptability in island structures (i.e. island effects).

Regarding learnability issues in island effects, the processing view of island effects thus predicts that speakers with a functioning processor will show island effects with little or no influence of language background and experience, such as the amount of input and age of acquisition. However, the processing view would predict some variation in island effects depending on speakers' parsing ability. If bilinguals process sentences in the native-like fashion (assuming that they are no better in processing filler-gap dependencies than native speakers), they should show native-like island effects. On the other hand, if bilinguals process sentences differently from native controls, there might be some differences on island effects between bilinguals and native speakers.

Unfortunately, the processing mechanisms of heritage and L2 speakers are not very well understood yet, especially for heritage speakers. Some argue that L2 sentence processing is fundamentally different from L1 sentence processing in that the L2 parser relies more on nonstructural information like lexical meaning, while native speakers process on a structural level (e.g. Papadopoulou and Clahsen 2003, Clahsen and Felser 2006). In contrast, others argue that L2 speakers utilize similar processing strategies as native speakers, especially when the task encourages for them to use specific information (e.g. McDonald 2006, Williams 2006). Then, under the first position, which argues for differences between native and L2 processing, we would not expect native-like island effects in L2 speakers. On the other hand, if L2 speakers' processing is similar to natives', L2 speakers are predicted to show native-like island effects.

Furthermore, since the processing view argues that island effects arise as a result of limited parsing capacity, a speaker with more processing resources might be expected to show weaker island effects compared to a speaker with fewer processing resources. Then, we might predict some differences between heritage/L2 populations and native speakers on their island effects. If we assume that heritage and L2 speakers may require overall higher processing resources in processing heritage and L2 languages, since heritage and L2 speakers might need to devote a lot of resources just to handle basic processing needs, they would have fewer resources to handle the island violations, and this would lead to stronger island effects in these groups compared to native speakers'.

In sum, the processing view predicts that there will be island effect differences between bilinguals and native speakers. If heritage/L2 populations process sentences in a non-native-like way, non-native-like island effects are expected. On the hand, if their processing of heritage/L2 languages is native-like, we would predict native-like island effects. However, even if their processing is native-like, if heritage/L2 populations have more limited resources to process islands (because even basic processing might consume more resources in their L2/heritage language processing), we might observe stronger island effects, compared to native speakers'.

4.3.4. Input-driven Account: Domain-general Learning Strategy

Another approach to the learnability problem takes island phenomena to be input-driven (e.g. Culicover and Jackendoff 2005, Pearl and Sprouse 2013). Under this view, acquisition is a process of tracking, analyzing, and generalizing patterns of the language input in the environment, relying on a domain-general cognitive ability (e.g. statistical learning). Learners then use the generalization as a basis to produce and comprehend sentences beyond experience, while prohibiting configurations which are not warranted by it (e.g. Elman et al. 1996, MacWhinney 1999, Tomasello 2000, Elman 2005, O'Grady 2003, 2008, Goldberg 2007, Lieven and Tomasello 2008).

Island phenomena have not been much discussed by the input-based view of language acquisition. Only a few studies attempt to explain the poverty of the stimulus problems of island effects from the input-driven view (e.g. Culicover and Jackendoff 2005, Pearl and Sprouse 2013). For example, Pearl and Sprouse (2013) claim that it is, in principle, possible to derive island effects from the input using a simple algorithm

that parses *wh*-dependencies into sequences of container nodes and calculates the probability of the trigrams of container node sequences. Based on a corpus analysis of 148,784 utterances of child-directed speech (CHILDES corpus, MacWhinney 2000), Pearl and Sprouse propose a computational model of a statistical learning strategy that is able to derive acceptability patterns of four island types in English (i.e. complex NP island, subject island, *whether*-island, adjunct island). The specific learning procedure is that learners first keep track of the structural path of the fronted *wh*-phrase from the gap, defined as a sequence of "container node" (i.e. XPs that dominate the gap left by extraction), as well as the lexical item that introduces CP, such as complementizers *that* and *whether*. Then, they calculate the probabilities of possible structural paths by identifying the frequency of trigrams of the container node sequence. Using this learning algorithm, learners generate an acceptability preference for *wh*-dependencies, which categorized island configurations as very unacceptable in their grammar.

Under this view, the input plays a major role in the acquisition of island effects and having native-like sensitivity to island effects is directly related to the type of input which native learners are exposed to. Then, if the input someone receives is not quantitatively and/or qualitatively the same as that of native speakers, the outcome regarding island effects would perhaps not be the same either, since in order for learners to display the same type of sensitivity to island effects, they should at least be getting a similar enough input for them to make the same type of generalization about the possible/impossible *wh*-dependencies.

Then, we would predict possible differences in island effects between heritage and L2 populations and native controls. There are many factors at play in heritage and

L2 acquisition that do not arise in native language acquisition. In particular, the input that heritage/L2 speakers receive is possibly restricted both in quantity and quality. This would mean that the types of generalizations that learners reach might be different from natives', which would consequently lead to different island effects between natives and bilinguals. In addition, heritage speakers are notoriously known for the huge variation among themselves in their heritage language in terms of their language profiles such as proficiency and language experience. This variation in learners' language environments might yield different types of island effects among themselves (e.g. different speed of development, different types of island effects, etc.).

4.4.Summary of Predictions for Heritage Speakers

There are four different types of accounts of island effects that I have examined here: traditional UG-based accounts, contemporary minimalist grammar accounts, processing accounts, and input-driven accounts. First, the traditional UG accounts claim that there are specific island constraints, and violation of such constraints leads to island effects. The minimalist grammar accounts, on the other hand, emphasizes the role of principles of efficient computation in island effects, claiming that island effects arise from this domain general property, which is available to all humans. Next, the processing accounts explain island effects as a result of processing limitations, not due to specific island constraints. Lastly, the input-driven view proposes that island effects are derived from the input by using a domain-general learning strategy.

The implications and predictions of these accounts for island effects in heritage and L2 populations can be largely divided into two types: native-like island effects vs. possible differences between natives and bilinguals. First, the minimalist account would predict for native-like island effects in these populations. Island effects follow from basic properties of a computational system, thus it is hard to imagine anyone could not have island effects.

The other three accounts, on the other hand, would allow for possibilities of differences in island effects between natives and bilinguals, and/or within groups. First, the traditional UG account would predict native-like island effects if bilinguals have an access to UG. If they do not, non-native-like island effects are expected. Next, the processing view would predict native-like island effects if heritage and L2 speakers process sentences in the native-like fashion. If their processing is different from natives, however, non-native-like island effect is predicted. In addition, if bilinguals consume more resources than native controls even in basic processing, their island effects might be stronger than native's. Lastly, the input-driven accounts would predict possible variation between populations with different types of input, not only between natives and bilinguals, but also among bilingual themselves.

Chapter 5: Experiments on Island Effects in Korean

This chapter tests the two main research questions of this dissertation in a series of experiments: (i) does Korean exhibit island effects? (ii) do heritage speakers of Korean show native-like behavior in this regard? As mentioned in the previous chapters, the status of island effects in Korean and other cross-linguistically related *wh*-in-situ languages have been unclear, despite its importance for us to better understand the nature of islands. Also, an ongoing question in heritage language research is in which properties of the language heritage speakers are non-native-like, and what factors might be responsible for this. Thus these are important questions, and the experiments in this chapter would answer these questions.

Four formal acceptability experiments were conducted on *wh*-island (*whether*-island) and adjunct island effects with both native and heritage speakers of Korean. Experiment 1 (Section 5.2) and Experiment 2 (Section 5.3) investigate *wh*-island and adjunct island effects, respectively, with canonically ordered embedded clauses. Section 5.4 summarizes the results of Experiments 1-2. In Sections 5.5 (Experiment 3) and 5.6 (Experiment 4), we replicate Experiments 1-2 with scrambled embedded clauses to the beginning of the sentence. Experiments 1 through 4 are summarized in Section 5.7, and discussed in Section 5.8.

5.1.Experiment 1: Canonical *Wh*-Islands in Korean

   5.1.1.   Participants

Twenty-eight English-dominant heritage speakers of Korean, all students at UCSD, participated for course credit. 33% of the heritage participants were US-born

and 67% were Korean-born and moved to the U.S. from Korea before age 7 (M: 3 years old, SD: 2.7). Their mean age at the time of testing was 20 (range: 18-25, SD: 1.8). 57% of the heritage speakers reported that Korean was their mother tongue, 33% reported English, and the remaining 10% reported both languages. 86% of the parents spoke only Korean with them, and 14 % spoke both languages. As a control group, 48 native speakers of Korean who were residing in Korea at the time of testing participated online (M: 28 years old, range: 20-34, SD: 3.7).

After the experiment, participants took a Korean proficiency test. The proficiency test consisted of a cloze test, and multiple choice questions on synonym-antonym. The proficiency test results indicated that heritage speakers (M: 78%, range: 50-100%, SD: 16.7) were significantly less proficient than native speakers (M: 96%, range: 88-100%, SD: 3.1) (F (1, 74) = 59.1, p < .0001).

5.1.2. Stimuli

Stimuli consisted of question-answer pairs, preceded by a context. All question sentences were biclausal. They differed as to the *Location* of the *wh*-word (matrix vs. embedded clause) and the *Structure* of the embedded clause (declarative (non-island) vs. interrogative (island)). Answers were either "*wh*-answers" or "yes/no answers". "*Wh*-answers" were appropriate for a direct *wh*-question interpretation of the preceding question, while "yes/no answers" were appropriate for a yes/no question interpretation. The acceptability of *wh*-answers thus would reflect the possibility of the island-violating interpretation when a *wh*-word is interpreted as a *wh*-question word with scope outside the embedded clause. On the other hand, when the *wh*-word is

interpreted as an indefinite pronoun, or as a true *wh*-word with scope over only the embedded clause (yielding an indirect question), a yes/no question results.

There were thus three factors (Location of *wh*-word, Structure of embedded clause, Answer type), with a total of eight conditions. Sample stimuli are provided in (5.1)-(5.8). In (5.1)-(5.2), the *wh*-word is in the matrix clause and the embedded clause is declarative, while in (5.3)-(5.4), the embedded clause is interrogative. In (5.5)-(5.6), the *wh*-word is in an embedded clause that is declarative, while in (5.7)-(5.8), the embedded clause is interrogative.

(5.1) Q: **Nwukwu**-ka [Obama-ka Mary-ul manna-ss-ta-**ko**]   tul-ess-**ni**?
       who -Nom   -Nom   -Acc meet-Past-Decl-that hear-Past-Q
      'Who heard that Obama met Mary?' or
      'Did somebody hear that Obama met Mary?'
   A: *WH*-ANSWER: Hillary-ka 'Hillary'

(5.2) Q: Same as (5.1).
   A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.3) Q: **Nwukwu**-ka [Obama-ka Mary-ul manna-ss-nun-**ci**]   tul-ess-**ni**?
      who -Nom   -Nom   -Acc meet-Past-Adn-Q hear-Past-Q
      'Who heard whether Obama met Mary?' or
      'Did somebody hear whether Obama met Mary?'
   A: *WH*-ANSWER: Hillary-ka 'Hillary'

(5.4) Q: Same as (5.3).
   A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.5) Q: Mary-nun [Obama-ka **nwukwu**-ul manna-ss-ta-**ko**]   tul-ess-**ni**?
        -Top   -Nom who   -Acc meet-Past-Decl-that hear-Past-Q
      'Who did Mary hear that Obama met?' or
      'Did Mary hear that Obama met somebody?'
   A: *WH*-ANSWER: Hillary-lul 'Hillary'

(5.6) Q: Same as (5.5).
   A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.7) Q: Mary-nun [Obama-ka **nwukwu**-ul manna-ss-nun-**ci**] tul-ess-**ni**?
          -Top   -Nom who   -Acc meet-Past-Adn-Q hear-Past-Q
     'Who did Mary hear whether Obama met?' or
     'Did Mary hear who Obama met?'
    A: *WH*-ANSWER: Hillary-lul 'Hillary'

(5.8) Q: Same as (5.7).
    A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

All question-answer pairs were preceded by a context consisting of a situation (e.g. "at the White House") and a list of people involved in the situation (e.g. "Mary, Obama, Hillary"). These contexts were designed to make the *wh*-answer pragmatically plausible, even when this interpretation of the question would violate an island. All experimental stimuli were in Korean, but the English translation was also provided for the context part for the heritage speakers.

40 sets of experimental sentences were distributed using a Latin Square design among eight lists consisting of five tokens of each of the eight conditions. Each list included 63 fillers, for an experimental/filler ratio of 1:1.5. All lists were randomized.

In 30 of the 40 sets, the matrix verb was matched across all conditions in the set. In the remaining 10 sets, however, one verb is used with declarative complements and another verb with interrogative complements (e.g. *sayngkakhata* 'think' with declaratives and *kungkumhata* 'wonder' with interrogatives. This was due to the limited number of verbs (e.g. *tutta* 'hear') that can take both declarative and interrogative complements. The *wh*-word *nwukwu* 'who' was used in all stimuli.

5.1.3. Method

The experiments were conducted in the Experimental Syntax Lab at UCSD for heritage speakers, and online for native speakers. Subjects were instructed to rate the acceptability of the answer as a first response to the question, using a 7-point scale (with 1 "very bad" and 7 "very good").

상황 Situation: 미국 백악관 방문 visiting the White House
등장인물 People: 오바마 Obama, 매리 Mary, and 힐러리 Hillary
질문 Q: 누가 오바마가 매리를 만났다고 들었니?
대답 A: 힐러리가

	1	2	3	4	5	6	7	
very bad	◎	◎	◎	◎	◎	◎	◎	very good

Figure 5.1. An example of the experiment presentation in experiment 1

5.1.4. Analysis

Acceptability scores from each participant were z-score transformed prior to analysis, and a series of repeated-measures ANOVAs were conducted on the z-score results. Each group's data were separated by answer type, and separate repeated measures ANOVAs were run for each answer type in each group, with Location of *wh*-word (matrix vs. embedded) and Structure of embedded clause (non-island 'declarative' vs. island "interrogative") as within-subjects variables, and 'subject' (F1) and 'item' (F2) as random factors. Differences-in-differences scores were calculated for each participant from the z-score for the *wh*-answer type, since the acceptability of *wh*-answers is the case where the question is interpreted as a *wh*-question, which would more directly reflect the acceptability of island effects,.

5.1.5. Results

The results are plotted in Figure 5.2. (error bars in all figures represent SE). The first two graphs are natives' results and the following two graphs are heritage speakers'. In both groups, the left graph represents the acceptability of *wh*-answers and the right graph shows that of yes/no answers.
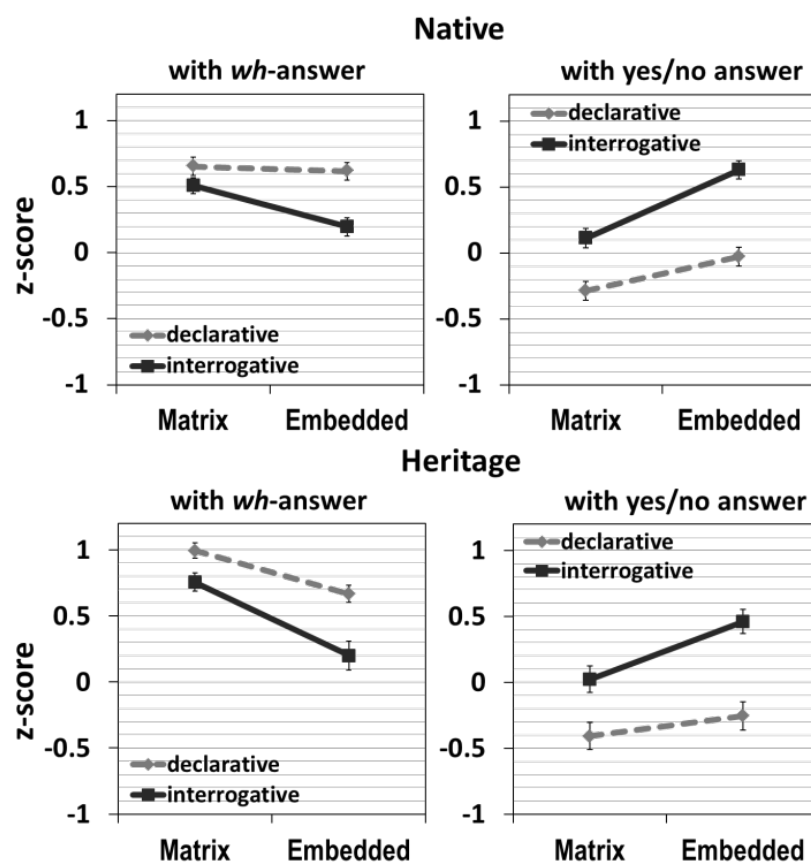
Figure 5.2. Results of Experiment 1

First, with *wh*-answers, in the results of both groups, when a *wh*-word is located in the matrix clause, the two types of structures were rated similarly, but with an embedded *wh*-word, the declarative condition was preferred over the interrogative condition, indicating dispreference for the matrix *wh*-scope of the embedded *wh*-word, that is the *wh*-island effect. This was also shown by significant main effects for

Location (native: F1 (1, 47) = 10.17, p = .003, F2 (1, 39) = 15.22, p < .0001; heritage: F1 (1, 27) = 27.66, p < .0001, F2 (1, 39) = 44.14, p < .0001), and Structure (native: F1 (1, 47) = 29.83, p < .0001, F2 (1, 39) = 28.12, p < .0001; heritage: F1 (1, 27) = 48.86, p < .0001, F2 (1, 39) = 32.57, p < .0001). The interaction between these two factors was significant for natives (F1 (1, 47) = 16.17, p < .0001, F2 (1, 39) = 7.13, p = .011), and marginal for heritage speakers (F1 (1, 27) = 3.47, p = .07, F2 (1, 39) = 3.41, p = .07).

The differences-in-differences (DD) scores with *wh*-answers, which indicates the island effect sizes (i.e. DD = D1 (Non-Island/Embedded - Island/Embedded) – D2 (Non-Island/Matrix - Island/Matrix), in both groups were positive (Native: .28 (SD: .48), Heritage: .23 (SD: .65)), indicating a super-additive *wh*-island effect in both groups. A one-way ANOVA with DD-score as a dependent factor, and Group as a fixed factor yielded no significant difference between the two groups (p = .71).

With yes/no answers, the pattern was reversed, with higher acceptability with embedded *wh*-words, than with matrix *wh*-words. Crucially, the condition with an embedded *wh*-word inside a *wh*-clause was preferred to be answered with yes/no answers, more than in any other conditions, indicating a *wh*-island effect. Both groups displayed main effects for Location (native: F1 (1, 47) = 33.64, p < .0001, F2 (1, 39) = 39.21, p < .0001; heritage: F1 (1, 27) = 18.08, p < .0001, F2 (1, 39) = 19.74, p < .0001), and Structure (native: F1 (1, 47) = 76.08, p < .0001, F2 (1, 39) = 61.83, p < .0001; heritage: F1 (1, 27) = 54.66, p < .0001, F2 (1, 39) = 71.96, p < .0001). In addition, for natives, the interaction of Location and Structure was significant in the subjects analysis and close to significant in the items analysis (F1 (1, 47) = 5.04, p

= .03, F2 (1, 39) = 3.89, p = .056), while for heritage speakers, the interaction approached significance in both types of analysis (F1 (1, 27) = 3.89, p = .059, F2 (1, 39) = 3.15, p = .08).

In sum, these results suggest a very clear *wh*-island effect in Korean for the natives. That is, when the *wh*-word is located within an embedded interrogative clause, the *wh*-answer is strongly dispreferred and a yes/no answer is strongly preferred, thus suggesting that the *wh*-word is not able to scope out of the embedded interrogative clause. For heritage speakers, the situation is less clear. They exhibit a numerically similar pattern suggestive of a *wh*-island effect, but this effect does not reach significance. We return to this issue in Experiment 3, where we explore a different way of testing for the existence of a *wh*-island effect in the two populations.

5.2. Experiment 2: Acceptability of Canonical Adjunct-Islands in Korean

5.2.1. Participants, Method, and Analysis

The participants, method, and analysis of the results were the same as in Experiment 1.

5.2.2. Stimuli

The basic design of the experiment is the same as in Experiment 1, consisting of a total of 8 conditions, reflecting three factors: Location of *wh*-word (matrix vs. embedded) x Structure of embedded clause (complement (non-island) vs. adjunct (island)) x Answer type (*wh*-answer vs. yes/no-answer). What distinguishes this

experiment from the previous one is that here we are contrasting embedded complement clauses with embedded adjunct clauses.

All 8 conditions in this experiment were lexically matched except for the matrix verb, which had to differ between complement clauses and adjunct clauses for selectional reasons (e.g. *tutta* 'hear' in complement conditions vs. *natanata* 'appear' in adjunct conditions).

As in Experiment 1, 40 sets of experimental sentences were distributed using a Latin Square design among eight lists consisting of five tokens of each of the eight conditions. Each list included 63 fillers, for an experimental/filler ratio of 1:1.5. All lists were randomized. The *wh*-word *nwukwu* 'who' was used in all stimuli. Sample stimuli are provided in (5.9)-(5.16).

(5.9) Q: **Nwukwu**-ka [Obama-ka Mary-ul manna-ss-ta-**ko**]   tul-ess-**ni**?
        who -Nom   -Nom   -Acc meet-Past-Decl-that hear-Past-Q
        'Who heard that Obama met Mary?' or
        'Did somebody hear that Obama met Mary?'
     A: *WH*-ANSWER: Hillary-ka 'Hillary'

(5.10) Q: Same as (5.9).
       A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.11) Q: **Nwukwu**-ka [Obama-ka Mary-ul manna-ss-ul-**ttay**]   natana-ss-**ni**?
         who -Nom   -Nom   -Acc meet -Past-Adn-when appear-Past-Q
        'Who appeared when Obama met Mary?' or
        'Did somebody appear when Obama met Mary?'
      A: *WH*-ANSWER: Hillary-ka 'Hillary'

(5.12) Q: Same as (5.11).
       A: YES-NO ANSWER: Ney, natana-ss-eyo 'Yes, appeared'

(5.13) Q: Mary-nun [Obama-ka **nwukwu**-ul manna-ss-ta-**ko**]   tul-ess-**ni**?
                -Top   -Nom who   -Acc   meet-Past-Decl-that hear-Past-Q
        'Who did Mary hear that Obama met?' or
        'Did Mary hear that Obama met somebody?'
      A: *WH*-ANSWER: Hillary-lul 'Hillary'

(5.14) Q: Same as (5.13).
       A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.15) Q: Mary-nun [Obama-ka **nwukwu**-ul manna-ss-ul-**ttay**]   natana-ss-**ni**?
                -Top   -Nom who   -Acc meet-Past-Adn-when appear-Past-Q
        'Who did Mary appear when Obama met?' or
        'Did Mary appear when Obama met somebody?'
      A: *WH*-ANSWER: Hillary-lul 'Hillary'

(5.16) Q: Same as (5.15).
       A: YES-NO ANSWER: Ney, natana-ss-eyo 'Yes, appeared'

   5.2.3. Results

    In Figure 5.3., the first two graphs represent natives', and the following two graphs are heritage speakers' results. In each set of graphs, the first graph shows the results with the *wh*-answer, and the second graph displays the results with the yes/no answer.
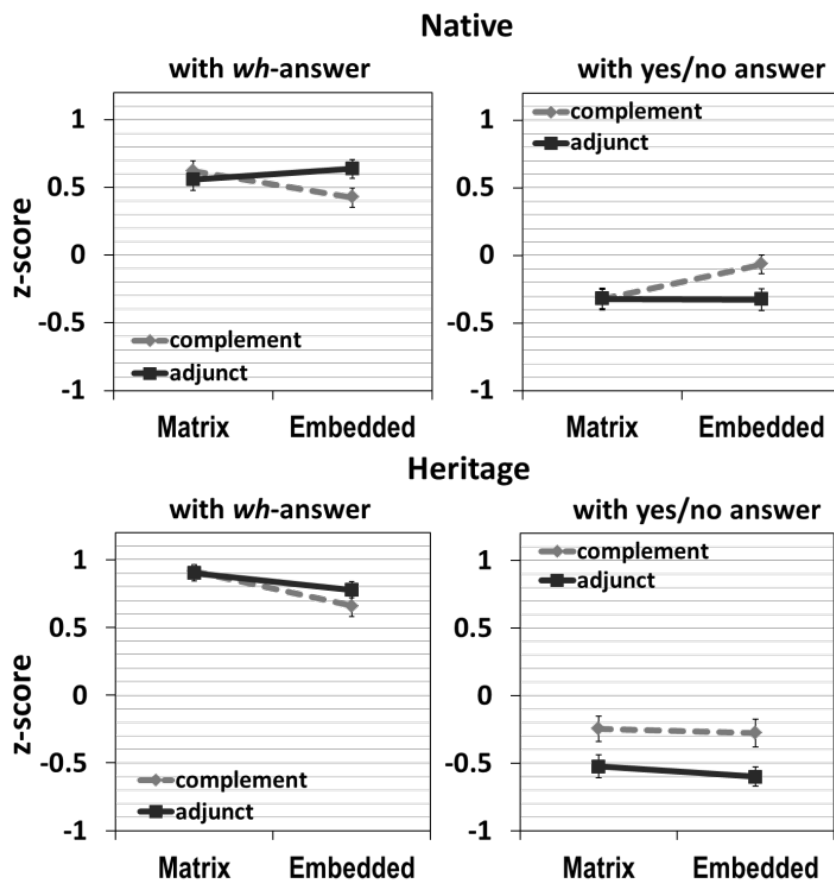
Figure 5.3. Results of Experiment 2

The acceptability of the adjunct clause conditions did not change much depending on the location of the *wh*-word with both types of answers in both groups, indicating the absence of adjunct island effects. First, for the heritage speakers, a *wh*-word within an adjunct clause does not result in significantly decreased acceptability with *wh*-answers or increased acceptability with yes/no answers, as may be seen in the lack of an interaction between Structure and Location (with *wh*-answer: $F_1 (1, 27) = 1.49$, p = .23, $F_2 (1, 39) = 1.61$, p = .21; with yes/no answer: $F_1 (1, 27) = .14$, p = .71, $F_2 (1, 39) = .19$, p = .66).

The results are similar for the native speakers in that there is no evidence of any adjunct island effect. However, the native group showed a main effect of Structure on the yes/no answers (F1 (1, 47) = 8.52, p = .005, F2 (1, 39) = 8.25, p = .007), as well as a mostly significant interaction of Structure and Location with both types of answers (with *wh*-answer: F1 (1, 47) = 12.05, p = .001, F2 (1, 39) = 4.54, p = .039; with yes/no answer: F1 (1, 47) = 6.31, p = .016, F2 (1, 39) = 3.04, p = .089). Nevertheless, the direction of the interaction was the opposite of what one would expect for a classic island effect: the condition in which the *wh*-word is located within an adjunct clause was rated the highest out of the four conditions with *wh*-answers, and the lowest with yes/no answers. There is thus no sign of an adjunct island effect for this group.

The differences-in-differences (DD) scores with *wh*-answer were also negative in both groups (native controls: -.28 (SD: .56), heritage speakers: -.13 (SD: .57)), with no significant difference between the groups. This confirms again no super-additive adjunct island effects in Korean for both groups.

In sum, the reverse interaction of Location and Structure in the native group and the absence of interaction in the heritage group thus very strongly suggest that there are no adjunct island effects in Korean for either group of speakers.

5.3. Interim Summary

In Experiments 1 and 2 with canonically ordered embedded interrogative and adjunct clauses, we found *wh*-island effects, but no adjunct island effects in Korean. The *wh*-island violating condition in Experiment 1 was the least acceptable compared

to other conditions, while the adjunct island violating condition was rated similarly with its counterparts. The results of the native and heritage groups were similar, thus suggesting that the development of (non-)island effects is largely independent of the learning environment.

In Experiments 3 and 4, we will attempt to replicate these results with different groups of participants and different types of stimuli. The embedded clauses in these experiments will be scrambled to a sentence-initial position. Since this is a natural position for embedded clauses in Korean, and the preferred position for adjunct clauses, it is possible that this will allow for a fairer test for the presence of island effects.

5.4. Experiment 3: Acceptability of Scrambled *Wh*-Islands in Korean

5.4.1. Participants

Nineteen English-dominant heritage speakers of Korean, all students at UCSD, participated for course credit. 27% of the heritage participants were US-born and 73% were Korean-born and moved to the U.S. from Korea before age 7 (M: 3 years old, SD: 2.7). Their mean age at the time of testing was 20 (range: 19-23, SD: 1.2). 53% of the heritage speakers reported that Korean was their mother tongue, 21% reported English, and the remaining 26% reported both languages. 85% of the parents spoke only Korean with them, and 15% spoke both languages. 48 native speakers of Korean residing in Korea served as a control group (M: 26 years old, range: 20-37, SD: 4.8).

After the experiment, participants took the Korean proficiency test, the same one used in Experiments 1 and 2. The proficiency test results implied that heritage

speakers (M: 78%, range: 51-94%, SD: 13.6) were significantly less proficient than native speakers (M: 96%, range: 88-100%, SD: 3.6) (F (1, 65) = 76.2, p < .0001).

5.4.2. Stimuli, Method, and Analysis

The stimuli differed from those in Experiment 1 only by the location of the embedded clauses: the embedded clauses in this experiment were sentence-initial, whereas those in Experiment 1 were in their canonical (center-embedded) position. There were 8 experimental conditions reflecting 3 factors, just as in Experiment 1: Location of *wh*-word (matrix clause vs. embedded clause) x Structure of embedded clause (declarative vs. interrogative) x Answer type (*wh*-answer vs. yes/no-answer). Sample stimuli are provided in (5.17)-(5.24). The methods and analysis of the results were the same as in Experiment 1.

(5.17) Q: [Obama-ka Mary-ul manna-ss-ta-**ko**]   **nwukwu**-ka tul-ess-**ni**?
             -Nom   -Acc meet-Past-Decl-that who   -Nom hear-Past-Q
     'Who heard that Obama met Mary?' or
     'Did somebody hear that Obama met Mary?'
   A: *WH*-ANSWER: Hillary-ka 'Hillary'

(5.18) Q: Same as (5.17).
    A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.19) Q: [Obama-ka Mary-ul manna-ss-nun-**ci**] **nwukwu**-ka tul-ess-**ni**?
             -Nom   -Acc meet-Past-Adn-Q who -Nom   hear-Past-Q
     'Who heard whether Obama met Mary?' or
     'Did somebody hear whether Obama met Mary?'
   A: *WH*-ANSWER: Hillary-ka 'Hillary'

(5.20) Q: Same as in (5.19).
    A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard.'

(5.21) Q: [Obama-ka **nwukwu**-ul manna-ss-ta-**ko**] Mary-ka tul-ess-**ni**?
  -Nom who   -Acc meet-Past-Decl-that   -Nom hear-Past-Q
  'Who did Mary hear that Obama met?' or
  'Did Mary hear that Obama met somebody?'
 A: *WH*-ANSWER: Hillary-lul 'Hillary'

(5.22) Q: Same as (5.21).
 A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.23) Q: [Obama-ka **nwukwu**-ul manna-ss-nun-**ci**] Mary-ka tul-ess-**ni**?
  -Nom who   -Acc meet-Past-Adn-Q   -Nom hear-Past-Q
  'Who did Mary hear whether Obama met?' or
  'Did Mary hear who Obama met?'
 A: *WH*-ANSWER: Hillary-lul 'Hillary'

(5.24) Q: Same as in (5.23).
 A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard.'

5.4.3.   Results

Similar to the results in Experiment 1 on the *wh*-island effect with a canonically ordered interrogative clause, results in Experiment 3, presented in Figure 5.4., showed the *wh*-island effect with a sentence-initial interrogative clause in both native and heritage groups, but the effect was more robust in Experiment 3. In the results with *wh*-answer, there was no effect of the complement clause type when the *wh*-word is located in the matrix clause, in that all questions with a matrix *wh*-word were rated similarly regardless of the types of embedded clauses.

On the other hand, with an embedded *wh*-word, the island condition was significantly less preferred than the declarative condition. Also, the questions with an interrogative clause showed a distinctive acceptability depending on the location of the *wh*-word, that is the island violating condition was much less acceptable than its

counterpart. This all suggests the *wh*-island effect in Korean, which is also supported by the statistical results as in the following.

First, natives exhibited main effects of Location (with *wh*-answers (F1 (1, 47) = 183.01, p < .0001, F2 (1, 39) = 260.41, p < .0001); with yes/no answers (F1 (1, 47) = 85.11, p < .0001, F2 (1, 39) = 167.63, p < .0001), and Structure (with *wh*-answers (F1 (1, 47) = 48.57, p < .0001, F2 (1, 39) = 63.24, p < .0001); with yes/no answers (F1 (1, 47) = 28.67, p < .0001, F2 (1, 39) = 29.80, p < .0001), as well as a significant interaction of Location and Structure (with *wh*-answers, F1 (1, 47) = 42.46, p < .0001, F2 (1, 39) = 42.15, p < .0001; with yes/no answers, F1 (1, 47) = 6.12, p = .017, F2 (1, 39) = 5.86, p = .02).
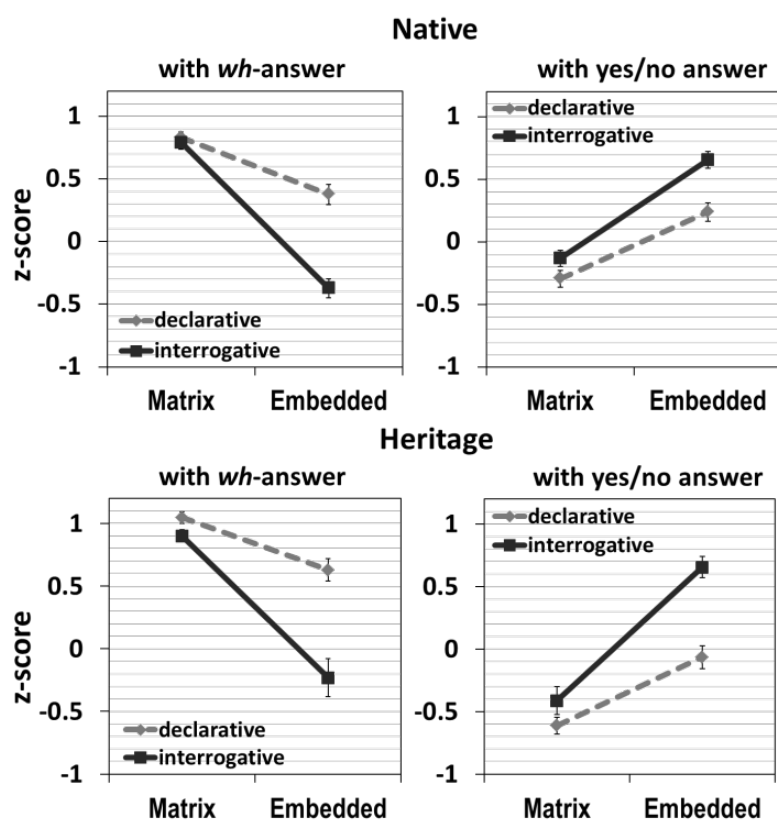
Figure 5.4. Results of Experiment 3

Heritage speakers displayed very similar results, showing main effects of Location (with *wh*-answers ($F1$ $(1, 18) = 59.53$, $p < .0001$, $F2$ $(1, 39) = 68.70$, $p < .0001$); with yes/no answers ($F1$ $(1, 18) = 87.09$, $p < .0001$, $F2$ $(1, 39) = 67.79$, $p < .0001$)), and Structure (with *wh*-answers ($F1$ $(1, 18) = 48.64$, $p < .0001$, $F2$ $(1, 39) = 47.29$, $p < .0001$); with yes/no answers ($F1$ $(1, 18) = 101.65$, $p < .0001$, $F2$ $(1, 39) = 34.28$, $p < .0001$)), as well as a significant interaction of Location and Structure (with *wh*-answers, $F1$ $(1, 18) = 26.33$, $p < .0001$, $F2$ $(1, 39) = 42.15$, $p < .0001$; with yes/no answers, $F1$ $(1, 18) = 17.30$, $p = .002$, $F2$ $(1, 39) = 12.45$, $p = .001$).

The two groups' island effect size with *wh*-answers, indicated by the differences-in-differences (DD) scores, were very similar to each other (native: .71 (SD: .75), heritage: .72 (SD: .61)).

The significant interaction between Location and Structure suggests a strong *wh*-island effect in Korean for both groups. When the *wh*-word is within an embedded interrogative clause, acceptability drops for the *wh*-answer and rises for the yes/no answer, as we would expect if the *wh*-word is unable to take scope out of that clause.

5.5. Experiment 4: Acceptability of Scrambled Adjunct-Islands in Korean

5.5.1. Participants

The participants in this experiment were the same as in Experiment 3.

5.5.2. Stimuli, Method, and Analysis

The stimuli in this experiment were the same as those in Experiment 2, but with sentence-initial embedded clauses. There was a total of 3 factors with 8

conditions: Location of *wh*-word (matrix clause vs. embedded clause) x Structure of embedded clause (complement vs. adjunct) x Answer type (*wh*-answer vs. yes/no-answer). Sample stimuli are presented in (5.25)-(5.32). The method and analysis were identical to Experiment 2.

(5.25) Q: [Obama-ka Mary-ul manna-ss-ta-**ko**]   **nwukwu**-ka tul-ess-**ni**?
             -Nom   -Acc meet-Past-Decl-that who   -Nom hear-Past-Q
     'Who heard that Obama met Mary?' or
     'Did somebody hear that Obama met Mary?'
   A: *WH*-ANSWER: Hillary-ka 'Hillary'

(5.26) Q: Same as (5.25).
   A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.27) Q: [Obama-ka Mary-ul manna-ss-ul-**ttay**]   **nwukwu**-ka   natana-ss-**ni**?
              -Nom   -Acc meet-Past-Adn-when who   -Nom appear-Past-Q
     'Who appeared when Obama met Mary?' or
     'Did somebody appear when Obama met Mary?'
   A: *WH*-ANSWER: Hillary-ka 'Hillary'

(5.28) Q: Same as in (5.27).
   A: YES-NO ANSWER: Ney, natana-ss-eyo 'Yes, appeared'

(5.29) Q: [Obama-ka **nwukwu**-ul manna-ss-ta-**ko**]   Mary-ka tul-ess-**ni**?
             -Nom who   -Acc meet-Past-Decl-that -Nom hear-Past-Q
     'Who did Mary hear that Obama met?' or
     'Did Mary hear that Obama met somebody?'
   A: *WH*-ANSWER: Hillary-lul 'Hillary'

(5.30) Q: Same as (5.29).
   A: YES-NO ANSWER: Ney, tul-ess-eyo 'Yes, heard'

(5.31) Q: [Obama-ka **nwukwu**-ul manna-ss-ul-**ttay**]   Mary-ka natana-ss-**ni**?
             -Nom who   -Acc meet-Past-Adn-when -Nom appear-Past-Q
     'Who did Mary appear when Obama met?' or
     'Did Mary appear when Obama met somebody?'
   A: *WH*-ANSWER: Hillary-lul 'Hillary'

(5.32) Q: Same as in (5.31).
   A: YES-NO ANSWER: Ney, natana-ss-eyo 'Yes, appeared'

5.5.3. Results

As plotted in Figure 5.5., no adjunct island effect was found in either group. Both complement and adjunct clauses received similar acceptability. First, native speakers showed a significant main effect of Location with both *wh*-answers (F1 (1, 47) = 35.02, p < .0001, F2 (1, 39) = 40.09, p < .0001) and yes/no answers (F1 (1, 47) = 39.79, p < .0001, F2 (1, 39) = 47.91, p < .0001). Heritage speakers also revealed a main effect of Location, but the effect was significant only with *wh*-answers (F1 (1, 18) = 10.28, p = .005, F2 (1, 39) = 27.99, p < .0001) and marginal with yes/no answers (F1 (1, 18) = 3.26, p = .088, F2 (1, 39) = 3.99, p = .053). Crucially, neither a main effect of Structure nor an interaction between Location and Structure was significant with either answer type for either group. The differences-in-differences (DD) scores with *wh*-answers were very close to zero in both groups (native: - .06 (SD: .78), heritage: -.09 (SD: .57)).
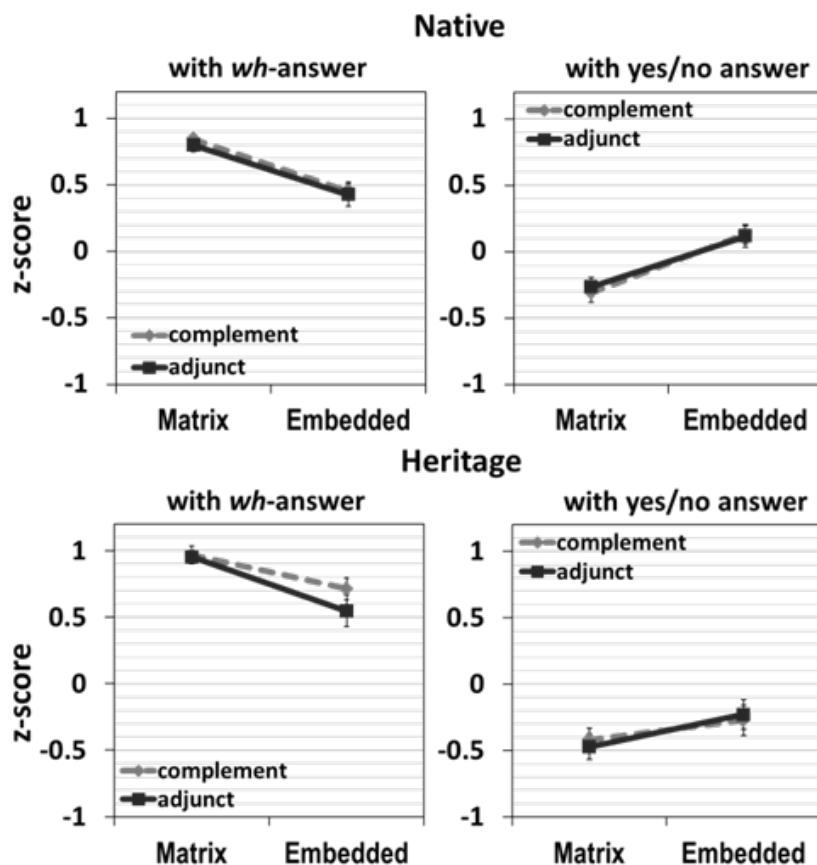
Figure 5.5. Results of Experiment 4

The results here provide further support for the conclusion reached in Experiment 2 that there are no adjunct island effects in Korean for either group. The lack of an interaction between Location and Structure suggests that there is no restriction on *wh*-words in adjunct clauses taking wide scope, i.e. that there is no adjunct island.

5.6. Summary of the Results in Experiments 1-4

Statistical results of *wh*-answers in Experiments 1-4 are summarized in Table 5.1. As mentioned in Section 5.1.2, the results of *wh*-answers reflect the acceptability

of the direct *wh*-question reading where all the *wh*-words are interpreted as *wh*-question words. On the other hand, the results of yes/no answers, specifically with *that*-clauses, indicate the preferred reading of a *wh*-word, either as a question word or as an existential pronoun (i.e. someone) with a *that*-complement clause, while with an interrogative clause, yes/no answers are when the *wh*-word is interpreted either as an indefinite pronoun, or as a true *wh*-word with scope over only the embedded clause (yielding an indirect question). For this reason, direct comparison of the acceptability of yes/no answers between a declarative clause and an interrogative clause may not be very meaningful with regard to the issue of island effects in Korean. Thus, the evaluation of island effects in Korean will be primarily based on the results of the *wh*-answers here.

Table 5.1. Results Summary of *Wh*-answer in Experiments 1-4.
✓ means 'significant' (p <.05), # means 'marginal' (p <.1), ✗ means 'insignificant' (p >.1), by-subject analysis on the left, by-item analysis on the right.

Group		Native controls	Heritage speakers
N		48	28
Exp.1	Structure	✓ / ✓	✓ / ✓
Canonically ordered	Location	✓ / ✓	✓ / ✓
Whether-**island**	Interaction	✓ / ✓	# / #
	z-score (island condition)	.19	.22
	DD score	.28	.23
Exp.2	Structure	✗ / ✗	✗ / ✗
Canonically ordered	Location	✗ / ✗	✗ / ✗
Adjunct-island	Interaction	✓ / ✓	✗ / ✗
	z-score (island condition)	.66	.77
	DD score	-.28	-.13
N		48	19
Exp.3	Structure	✓ / ✓	✓ / ✓
Scrambled	Location	✓ / ✓	✓ / ✓
Whether-**island**	Interaction	✓ / ✓	✓ / ✓
	z-score (island condition)	-.37	-.06
	DD score	.71	.72
Exp.4	Structure	✗ / ✗	✗ / ✗
Scrambled	Location	✓ / ✓	✓ / ✓
Adjunct island	Interaction	✗ / ✗	✗ / ✗
	z-score (island condition)	.42	.55
	DD score	-.06	-.09

Overall, the results of native and heritage speakers were similar in that both groups showed *wh*-island effects in Experiments 1 and 3, but no adjunct island effects in Experiments 2 and 4. In both Experiments 1 and 3, the condition in which the *wh*-word was within the embedded *wh*-clause was noticeably worse than other conditions, indicating *wh*-island effects, which was shown by a significant interaction between the two factors, Location of *wh*-word (matrix or embedded clause) and Embedded clause type (non-island or island) (cf. marginal for heritage speakers in Exp. 1). On the other hand, in Experiments 2 and 4, the acceptablity of the island-violating condition (i.e.

Embedded *wh*-word inside the adjunct clause) was similar to its counterpart with the embedded *that*-clause, and no significant interaction of the two factors was found (cf. native speakers in Exp. 2).

5.7. Discussion

The two research questions mentioned in the introduction to this chapter can now be answered. The first question was "Does Korean exhibit island effects?" The four acceptability judgment tasks yielded an interesting and reasonable pattern of results: a robust island effect with *wh*-clauses in Korean, though not with adjunct clauses. This suggests that it is possible to probe island effects in Korean experimentally, despite the difficulties discussed in Chapter 3. We did this here by presenting question-answer pairs as stimuli and then measuring the acceptability not of the *wh*-question itself (which would not yield useful results in Korean), but of the answer, given a particular context. This differs substantially from standard acceptability experiments with *wh*-movement languages, but it allows us to get judgments on specific interpretations of *wh*-questions, and the results we obtained are interesting. This suggests that the method is valid.

The second research question was "Do heritage speakers of Korean show native-like island effects in Korean?" The four experiments in this study paint a very similar picture for native and heritage speakers: both show a robust island effect with interrogative clauses, but not adjunct clauses. This is an interesting and potentially surprising result, given the important differences between the two groups with regard to the environment in acquisition. At a broad level, it lends support to processing-

based accounts and recent grammar-based accounts in the minimalism framework, that attribute island phenomena to indefeasible properties of the processor and/or the grammar, while it gives some reason to doubt analyses in which island phenomena derive directly from the input. These findings, both separately and together, are valuable information to better understand the island phenomena and language acquisition.

Each of these research questions is discussed in more detail in the following sections.

5.7.1. Island effects in Korean

First, the experimental results on island effects in Korean revealed a robust island effect with interrogative clauses in Korean, but not with adjunct clauses, with both canonically ordered and scrambled sentences. These findings are contradictory to the traditional belief that there is no island effect with *wh*-in-situ (e.g. Huang 1982), while they confirm the increasing consensus that some *wh*-in-situ languages, specifically Korean and Japanese, display some island effects, particularly *wh*-island effects. This consequently supports the analyses that argue for the presence of island effects in *wh*-in-situ languages (e.g. Lee 1982, Han 1992, Hong 2004b for Korean; Nishigauchi 1990, Watanabe 1992 for Japanese) while it casts some doubt on analyses that argue against the presence of island effects in *wh*-in-situ language (e.g. Suh 1987, Choi 2006, Hwang 2007 for Korean; Ishihara 2002, Sprouse et al. 2011 for Japanese).

In particular, among the five analyses on island effects in *wh*-in-situ languages discussed in Chapter 3, the findings here are compatible with Watanabe's operator

movement proposal (1992, 2001), Tsai's unselective binding theory (1994, 1997, 1999), and Shimoyama's semantic approach (2001, 2006), while the results do not fit well with Haung's LF movement account (1982), and some experimental findings on island effects in Japanese in Sprouse et al. (2011). Although none of them make specific predictions about island effects in Korean, the first three studies assume the presence of *wh*-island effects in Japanese, while the latter two studies predict, or found an absence of island effects in Japanese, respectively.

One main difference between the first three studies (Watanabe's operator movement proposal, Tsai's unselective binding theory, and Shimoyama's semantic approach) and Huang's LF movement theory is that the first three assume that *wh*-words in Japanese are indeterminate phrases (Kuroda 1965) without quantificational force, while Huang's LF movement theory assumes that *wh*-in-situ phrases are quantifiers, which need to move to the scope positions at LF. Although the specifics of each analysis are different, the first three studies use the language-specific morphosyntactic characteristics of *wh*-words as a starting point to account for island effects in Japanese.

As our results are compatible with their claim of the presence of *wh*-island effects in Japanese, and there are many similarities in morphosyntactic properties of *wh*-words between Korean and Japanese, we also consider the indeterminate nature of *wh*-words in Korean as a source for our results on island effects in Korean. As presented in Sections 3.1.3. and 3.1.4, *wh*-expressions in Korean have been argued to be variable expressions that require appropriate operators to bind them, such as existential or question particles (e.g. Kim 1989, Nishigauchi 1990, Aoun and Li 1993,

2003, Cole and Hermon 1998, Kim 2000, Hong 2004a, Choi 2009). For a *wh*-word to be interpreted as a true *wh*-word, it must be bound by a (clause-final) question marker. In addition, the scope of a *wh*-question word is determined by the location of the question marker, not by the location of the *wh*-word. Thus, the relation between the *wh*-word and the quantificational element (e.g. question marker) may be the source of the presence of a *wh*-island and the absence of an adjunct island in Korean.

Specifically, we assume that there is a locality constraint in the association of a *wh*-word with an operator. That is the *wh*-word should be bound by the closest operator in structure. This locality restriction in binding of a *wh*-word by an operator may derive the asymmetry in island effects in Korean: the presence of *wh*-island effects and the absence of adjunct island effects. An interrogative clause has a question marker inside the clause, but an adjunct clause does not. The local question marker in interrogative clauses would appear to be preventing the *wh*-word from taking scope outside of such clauses. In clauses without question markers, such as embedded declarative or adjunct clauses, the *wh*-word will not be prevented from taking scope out of the clause. This could then be what is behind the contrast between the *wh*-island effects seen in Experiments 1 and 3, and the lack of adjunct island effects seen in Experiments 2 and 4.

If an analysis like this is on the right track, it then remains to ask why *wh*-words show this locality effect. That is, what forces the *wh*-word to be bound by the local question marker (in the embedded clause), rather than by a more distant one (in the matrix clause), when both are available? Among various proposals, we consider two possibilities here. One is that proposed by Shimoyama (2006) for Japanese, as

presented in Section 3.3.2.1, and another is from the processing perspective of island effects, as discussed in Sections 2.2.2 and 3.3.2.2.

First, adopting Hamblin's (1973) semantics for *wh*-phrases as a set of alternatives, Shimoyama claims that indeterminate phrases (e.g. *wh*-phrases) in Japanese create infinite sets of individuals, and this set creation expands until the first relevant operator (e.g. a question marker) takes the sets of alternatives and generates singleton sets. This absorption by the first question marker inside the interrogative clause makes the sets of alternatives no longer accessible by higher particles, creating the *wh*-island effect. On the other hand, adjunct clauses lack such an operator inside the clause and thus allow a long-distance association between the indeterminate phrase and the matrix particle, therefore yielding no island violation.

Another possible approach is to analyze the relation between the *wh*-word and the question marker in processing terms. As discussed in Section 3.3.2.2, the *wh*-word and the question marker have been argued to form a dependency in *wh*-in-situ languages that is similar to the more familiar filler-gap dependency in *wh*-movement languages, and this dependency should be completed as soon as possible (e.g. Miyamoto and Takahashi 2002, Aoshima et al. 2003, Ueno and Kluender 2009, Sprouse et al. 2011). In other words, when the processor encounters a *wh*-word, it anticipates a scope marker (i.e. question particle) so that it may complete the *wh*-scope dependency as soon as possible, in a way similar to the Active Filler strategy in *wh*-movement languages, in which the processor begins searching for a gap as soon as the *wh*-word is encountered (e.g. Crain and Fodor 1985, Stowe 1986, Frazier and Clifton 1989). As a result, the parser prefers to associate the *wh*-phrase with the closest scope

marker. In interrogative clauses, the question particle located at the end of the clause is the closest target, and thus the search is complete when this is encountered, resulting in the *wh*-island effect seen in Experiments 1 and 3. In adjunct clauses, on the other hand, there is no such question marker and the scope marker search continues until it is resolved outside of the adjunct clause. This leads to the lack of an island effect with adjunct clauses, as seen in Experiments 2 and 4.

This line of analysis for the presence of a *wh*-island effect and the absence of an adjunct island effect in Korean would predict a similar type of island effects in Japanese. However, no island effect was found in Japanese in Sprouse et al. (2011). Does this mean then these analyses are not on the right track? What might be responsible for the absence of island effects in Japanese in their results, but the *wh*-island effect in Korean in this study? One possibility is that despite many similarities in *wh*-questions between Korean and Japanese, the two languages might differ regarding island effects. Japanese might simply lack island effects, while Korean might have the *wh*-island effects, indicating different underlying mechanisms of island effects between the two languages.

The other possibility is that different methods in the two studies might derive the different types of island effects in the two languages. In Spouse et al., acceptability judgements were collected in the same way as acceptability is gathered with *wh*-movement languages like English (i.e. participants rate the acceptability of a *wh*-question itself). On the other hand, in the current study, participants judged the acceptability of the answer to the *wh*-question, not the question. Because the scope of a *wh*-phrase in-situ is often ambiguous in *wh*-in-situ languages, as discussed in Section

3.2.2, it is difficult tell whether an embedded *wh*-word inside an island configuration takes matrix scope, violating possible island constraints, or embedded scope by getting judgements of the island configuration itself. It is thus possible that the results in Sprouse et al. might not be a good representation of possible island effects in Japanese. It would thus perhaps be worthwhile to apply to Japanese the techniques used here in order to see if a *wh*-island effect in Japanese would become evident in this way.

Another question that arises with regard to our results is whether they would change if we manipulated the prosody of the *wh*-island stimuli, since some researchers have claimed that island effects in *wh*-in-situ languages like Japanese may disappear with a certain kind of prosody (e.g. Ishihara 2002, Kitagawa 2005). It has been argued, for instance, that in (Tokyo) Japanese both matrix and subordinate *wh*-scope interpretations are possible in potentially ambiguous *wh*-interrogative clauses (e.g. *wh*-island constructions in this study), by using two distinct types of prosody, each of which induces either matrix or embedded *wh*-scope.

Since the experiments in this study were conducted with written stimuli only, it is possible that our results would be different if participants heard auditory stimuli with prosody that favored a *wh*-island-violating interpretation (i.e. matrix scope for a *wh*-word in an embedded interrogative clause). Even so, however, it is not obvious that the evidence for a *wh*-island in Korean would be overturned in this case. It has been reported, for instance, that the relationship between prosody and *wh*-scope varies significantly among speakers (e.g. in Korean, Jun and Oh. 1996; in Japanese, Kitagawa and Hirose 2012), and even in cases where the stimuli are accompanied by a

prosody favoring matrix scope, embedded scope is still more readily available and preferred over matrix scope, (e.g. Hirose and Kitagawa 2010).

In addition, it is not yet clear how much improvement in the acceptability of the matrix scope reading we might get by supplying an appropriate prosody in Korean. Impressionistically, however, it appears that although a certain prosodic contour may reduce *wh*-island effects, it does not eliminate them (cf. Hwang 2007). In this regard, the prosodic effect in Korean may be similar to the effect of D-linking on island violations in *wh*-movement languages: these generally improve with D-linked *wh*-phrases, but not to the point where the effect of the island is eliminated (e.g. Kluender 1998, Hofmeister et al. 2010, Goodall 2015).

Another question concerns the effects of the matrix verbs in our stimuli. As pointed out by Satoshi Tomioka (p.c.), some of these could be factive verbs, and in that case, we could be capturing more an effect of factive islands (e.g. Rooryck 1992, Szabolcsi and Zwarts 1993) than of *wh*-islands. This is indeed a possibility, since factive verbs were used in some of the stimuli in Experiments 1 and 3 (e.g. *tutta* 'hear'). However, it seems unlikely that this is driving the effect, because in 30 of the 40 sets of stimuli in Experiments 1 and 3, the same matrix verbs were used across all 8 conditions. If we were witnessing pure factive island effects, we would expect to see these in both embedded declaratives and embedded interrogatives, with no significant interaction between Location and Structure. These are not the results that we obtained, however.

5.7.2.　Island effects in heritage Korean speakers

We are now ready to discuss the second research question – island effects in heritage Korean speakers. In all four experiments, native and heritage speakers showed essentially identical results: the presence of *wh*-island effects and the absence of adjunct islands. In Experiments 1 and 3, when the *wh*-word is located inside an interrogative clause, the acceptability of the *wh*-answer was significantly lower than those in other conditions, indicating the impossibility of matrix *wh*-scope interpretation (i.e. *wh*-island effect). On the other hand, in Experiments 2 and 4, both complement and adjunct clauses were rated very similarly, showing no adjunct island effects.

This is an interesting and potentially surprising result, given the important differences between the two groups with regard to their childhood environment, such as possibly reduced input, and influence of the L2, as discussed in Section 4.2. One might have expected that this subtle distinction between *wh*-islands and adjunct (non-) islands in Korean would be lost in heritage speakers, based on previous studies (e.g. Polinsky 2011) reporting that complex structures and long-distance dependencies are particularly vulnerable in heritage language acquisition. This expectation would be heightened in analyses in which island effects follow directly from the child's input (e.g. Culicover and Jackendoff 2005, Pearl and Sprouse 2013). As mentioned above, the language environment for child heritage speakers can differ greatly from that of monolingual native speakers, so given such analyses, one could reasonably expect heritage and native speakers to differ substantially in their island behavior. Contrary to

these predictions, our results demonstrate that heritage speakers showed native-like island effects in Korean.

So why might heritage speakers preserve this native-like distinction between *wh*-islands and adjunct (non-)islands? In Section 5.7.1, we suggest that the general processing and semantic mechanism in the association of the *wh*-word with its proper operator may be the source of the asymmetry on island effects in Korean. That is, a *wh*-word should be bound by the closest operator, and the presence of the question marker within an interrogative clause yields a *wh*-island effect by restricting the *wh*-word from taking its scope outside of the clause, while the non-island status of adjunct clauses results from the lack of such a marker/interaction (e.g. Shimoyama 2001, 2006, Miyamoto and Takahashi 2002). This locality restriction in the association of the *wh*-word and the operator is governed by capacity constraints on working memory (Kluender 1998, Hofmeister & Sag 2010) or by fundamental properties of the grammar (Rizzi 2006, Shimoyama 2006).

Under these analyses, these island effects (or the lack of certain island effects in Korean) are not learned (or even learnable) and should be unavoidable. *Wh*-island violations are beyond the ability of native speakers because of the semantic or parsing process that would be required. In order to have a matrix *wh*-scope outside of the *wh*-clause (i.e. *wh*-island violating interpretation), a *wh*-word should be associated with a question marker in the matrix clause. This means speakers have to ignore the closest operator inside the embedded clause, which would not be allowed considering limited processing resources and/or restrictions on grammar. Thus, there is no reason to expect that heritage speakers would surpass them in this. With adjunct clauses, in

contrast, nothing prevents either the native or the heritage speakers from computing wide-scope readings for the *wh*-word. Therefore, the heritage speakers' knowledge of English and their different learning environments, such as possible differences in the quality/quantity of the input, should play little role here.

Another possible explanation for the absence of adjunct island effects in heritage speakers is that they tend to rate all sentences as being high in acceptability (a so-called "yes-bias"). However, this possibility seems very unlikely in this case, for two reasons. First, the raw acceptability scores were transformed to z-scores, which helps to reduce individual differences in the use of the scale. Second, if the lack of adjunct islands were due to a yes-bias, we would expect the same result with *wh*-islands, but as we have seen, this does not obtain.

There are some remaining questions that need to be addressed. First, in Experiment 1 with a canonically ordered embedded clause, the heritage speakers did not show a significant interaction of the two experimental factors, Location and Structure, but only a marginal effect. However, in Experiment 3 with a sentence-initial embedded clause, they exhibited a significant interaction. In fact, native controls also showed more robust *wh*-island effect in Experiment 3 than in Experiment 1. What might be responsible for this difference? We assume that the different degrees of processing difficulties in parsing these two types of structures might be responsible for this. Specifically, the different parsing difficulties between these two constructions may arise due to the differences regarding the existence of an intervening element between a *wh*-word and its possible operator. These two constructions are schematized in (5.33-5.34).

(5.33) Canonically ordered embedded *wh*-clause
    a. Matrix *wh*-word   [Who-nom [CP NP-nom NP-acc … QM] … QM]?
    b. Embedded *wh*-word [NP-top [CP NP-nom who-acc … QM] QM]?

(5.34) Scrambled embedded *wh*-clause
    a. Matrix *wh*-word   [[CP NP-nom NP-acc   … QM] who-nom QM]?
    b. Embedded *wh*-word [[CP NP-nom who-acc … QM] NP-nom QM]?

First, with a canonically ordered *wh*-clause, the embedded question marker intervenes between the matrix *wh*-subject and the matrix question marker, as in (5.33a). Although the matrix question marker is the proper operator that the matrix *wh*-word should be associated with, the intervening embedded question marker between them might interrupt the correct association by tempting the parser to associate the matrix *wh*-word with the embedded question marker, which is the first question marker that the parser encounters after the *wh*-word. Based on the parser's desire to finish the scope marker search as soon as possible, it is possible that some speakers might be led to this incorrect association of the matrix *wh*-word and the embedded question marker. This would then lead to an embedded *wh*-question reading rather than a matrix *wh*-question reading, which would consequently lower the acceptability of *wh*-answers.

Such confusion, however, is not present with a scrambled embedded *wh*-clause, where the matrix *wh*-word occurs right before the matrix question particle, as in (5.34a). Since the very first question marker is the one which it is supposed to be associated with, the sentence would be doubtlessly interpreted as a matrix *wh*-question. This difference between the two constructions then might yield higher acceptability of the *wh*-answer in the scrambled case than in the canonically ordered counterpart.

The situation may be the opposite with an embedded *wh*-word, as in (5.33b – 5.34b). In both types of constructions, the embedded question marker appears in the same clause as the *wh*-word is in, and thus the parser associate the two without any interruption. However, there is a difference between the two types of structures, regarding the presence of an intervening element. In the canonically ordered condition, as in (5.33b), no element is present between the embedded question marker and the matrix question marker, each attached to the embedded and the matrix verb, respectively. On the other hand, in the scrambled case, as in (5.34b), the matrix subject intervenes between the two question markers. Then, it is possible that the matrix subject between the two question markers in the scrambled condition might help readers to confirm that the association of the *wh*-word with the embedded question marker is correct, by breaking the two clauses more clearly. The effect would be more prominent with those who are less confident about the right scope marker for the *wh*-word. On the other hand, no such confirmation is available in the canonical condition as nothing intervenes between the two question markers. This difference then might yield higher acceptability of *wh*-answers in the canonical condition compared to the scrambled condition.

Together, the difference in the acceptability of *wh*-answers between the matrix *wh*-word condition and the embedded *wh*-word condition would be larger with a scrambled embedded clause than with a canonically ordered clause. On the other hand, with a *that*-clause, since no embedded question marker is present, no such confusion is expected in the association of the *wh*-word and the proper scope marker. Thus, these structural differences depending on the location of the embedded *wh*-clause might be

responsible for the marginally significant interaction in the canonically ordered structure, but the significant interaction in the scrambled structure in heritage speakers.

In addition, one may question whether the target-like island effects might simply be the results of their lack of knowledge on the verb-final particles. Specifically, the lack of adjunct island effects in heritage speakers might be due to their ignorance of the adjunct clause marker –*ttay*, rather than the true reflection of island effects. If heritage speakers did not pay attention to the adjunct clause marker, and interpreted the clause as a *that*-complement, the *that*-clause and the adjunct clause would be rated the same, which would appear as no adjunct island effects.

Although this scenario may not be impossible, especially when considering previous research that demonstrates heritage speakers' particular difficulties with morphology (e.g. Bar-Shalom and Zaretsky 2008), this seems unlikely. Native-like *wh*-island effect in heritage speakers indicate that they were able to identify the question particle –*ci* and the *that*-complementizer –*ko* at the end of the embedded clause. There is thus no good reason to assume that heritage speakers would not, as the particle -*ttay* 'when' in the adjunct clause is relatively high-frequency. Therefore, the native-like island effects in heritage speakers here seem difficult to attribute to their inability to recognize such particles.

To conclude, we argue that the presence of the *wh*-island effect and the absence of the adjunct island effect in Korean are natural consequences of the general restrictions on semantic mapping and processing in the association of the *wh*-word and the operator. Thus, the two different types of island effects in Korean are naturally

available to speakers, and do not have to be learned. Given this reasoning, we might also expect other types of bilinguals to perform similarly.

Chapter 6: Experiments on Island Effects in English

6.1. Introduction

The experiments on island effects in Korean reported in Chapter 5 have shown that Korean exhibits *wh*-island effects but no adjunct islands, and the results of both Korean-English bilinguals (heritage speakers of Korean) and native speakers of Korean were similar. This is an interesting and potentially surprising result, given the important differences between the two groups with regard to their childhood language environment (e.g. more limited input in heritage language acquisition) and cross-linguistic variation in island effects.

This result is compatible with analyses that attribute island phenomena to indefeasible properties of the processor and/or grammar. Under this view, native speakers are unable to perform certain types of processing or semantic/syntactic computation, and there is no reason to expect that heritage speakers would surpass them in this. Consequently, heritage speakers' learning environment and knowledge of English should play little role here. We would then also expect various types of populations (e.g. L2 speakers) to show native-like island effects in all languages, regardless of their language backgrounds and learning environments. On the other hand, if island effects in languages and/or the two types of islands are governed by different types of mechanisms, different types of results would be possible. For example, if *wh*-islands are universal and adjunct islands are not, then we might expect various types of populations to show the native-like *wh*-island effect in languages, but not necessarily for the adjunct island.

Particularly as for L2 speakers, most previous L2 acquisition studies on island effects have assumed that *wh*-in-situ languages like Korean do not show island effects, and thus L2 acquisition of island effects in English in learners with L1 *wh*-in-situ languages cannot be a result of transfer from their L1. However, as found in this dissertation, Korean displays the *wh*-island effect. Thus, it is possible that L1 Korean learners of L2 English might transfer the island effects in Korean to English, showing, for example, the *wh*-island effect, but not the adjunct island effect in English. especially when considering previous studies on transfer effects demonstrating more transfer errors when a phenomenon displays different grammatical status in learners' two different languages (e.g. Odlin 1989, Jarvis 1998, Cook 2003, Sorace 2009, Serratrice et al. 2009).

The situation could be similar for heritage speakers of Korean. Although the society language is the dominant language for most heritage speakers, it is not yet clear whether heritage speakers would also show native-like island effects in their society language. As discussed in Section 4.2, the input and learning environments of the society language in heritage speakers are possibly different from those in monolingual speakers. For example, the quantity and/or quality of the input in the society language might be reduced for many heritage speakers as heritage speakers divide their time between two languages. In addition, the exposure to the society language usually starts later in life, not from birth. Thus, it is possible that heritage speakers' acquisition of the society language would not be the same as the process of first language acquisition, showing non-native-like characteristics in their dominant languages.

We test these possibilities in this chapter by examining Korean-English bilinguals on the *whether*-island (Experiment 5), the *wh*-island (Experiment 6), and three types of adjunct islands (Experiments 7-9) in English. Section 6.2 reports five experiments on island effects in English. The results are discussed in Section 6.3.

6.2. Experiments

 6.2.1. Participants

Sixty-three Korean-English bilinguals and sixty native speakers of English participated in the experiments. Bilinguals were either US-born or Korea-born who moved to the U.S. between ages 0 to 14. Based on their ages of arrival to the U.S. bilinguals were divided into three groups: 1) Heritage (AoA 0-5), 2) Early (AoA 6-10), and 3) Late (AoA 11-14). The first group (AoA 0-5), named 'Heritage' are heritage speakers of Korean, who grew up hearing and speaking their first language, Korean, at home but whose dominant language changed to the socially majority language, English (Valdés 2000). The second group (AoA 6-10), named 'Early,' are early learners of L2 English who started learning English as their second language upon their arrival to the U.S. (cf. child second language acquirers, e.g. Schwartz 2004, Meisel 2008). The last group, 'Late' (AoA 11-14), are second language learners of English whose AoA to the U.S. was relatively late compared to the other groups. The particular age ranges for each group in this study were decided by considering available number of subjects enough to form a group, and previous studies on age effects in bilingual language acquisition (e.g. Long 1990, Schwartz 2003, Meisel 2008).

All participants took an English proficiency test after the experiment session. The proficiency test consisted of a multiple-choice vocabulary section and two cloze passages. A one-way ANOVA, with proficiency score as a dependent variable and Group (i.e. Native, Heritage, Early, and Late) as a between-subjects factor showed a significant effect of Group ($F (3, 119) = 12.89$, $p < .0001$). Post-hoc comparisons (Bonferroni) yielded a significant difference in proficiency scores between the Late group and the other three groups (i.e. Native, Heritage, and Early). The mean percentage of correct answers of the proficiency test is reported in Table 6.1, along with participants' language background information.

Table 6.1. Participant Information

Group		Native	Heritage	Early	Late
N		60	19	22	22
AoA	Mean (SD) Range		1 year (1.8) 0-5	8 years (1.5) 6-10	12 years (.09) 11-14
Current age	Mean (SD) Range	21years (2.7) 18-36	20 years (2.1) 18-25	21 years (2.4) 18-30	22 years (4) 18-37
Length of Residence in the U.S.	Mean (SD) Range		19 years (2.8) 14-25	13 years (2.2) 9-20	10 years (4.1) 7-25
Proficiency test scores	Mean (SD) Range	80.8% (4.1) 68.6-88.6	78.3% (5.2) 71.4-85.7	78.2% (5.3) 65.7-82.9	71.7% (9.9) 51.4-82.9

Since the statistical results that the Late group was significantly less proficient than the other groups might suggest a possible relationship between proficiency scores and AoA, a correlational analysis between proficiency scores and AoA was performed for bilinguals. It revealed a significant correlation between proficiency scores and AoA ($r = -.33$, $N = 63$, $p = .009$, two tails). A linear regression analysis was also

performed using proficiency scores as a dependent value, and AoA as an independent factor. The results indicated that about 11 % of proficiency scores were predictable from AoA ($R^2 = 0.11$, $F (1, 61) = 7.18$, $p = 0.009$, $\beta = - 0.53$, $t = -2.68$), as plotted in Figure 6.1.

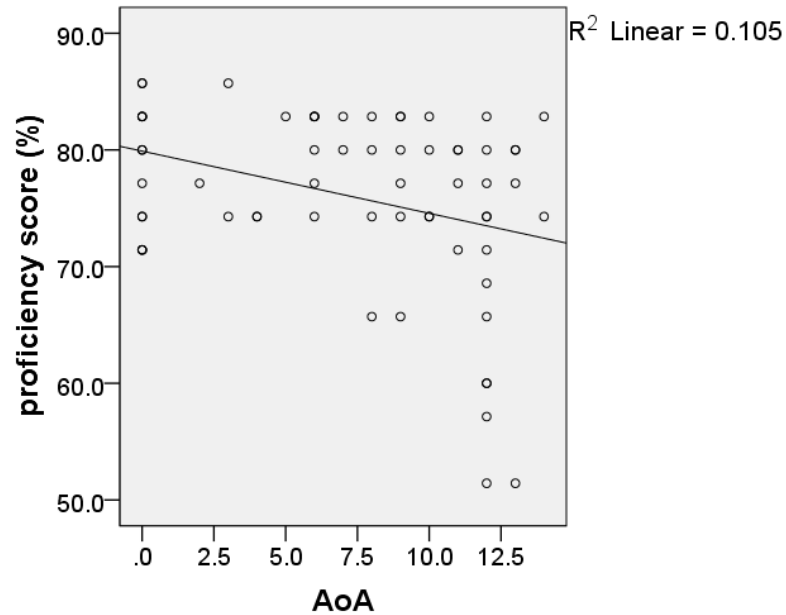Figure 6.1. Scatterplots and correlations between proficiency scores (%) and AoA

6.2.2. Methods

Five-sub experiments (Experiments 5-9), using a 7-point scale acceptability judgment task, were conducted on a computer at the Experimental Syntax Lab at UCSD. Subjects were instructed not to analyze the sentence, but to give their first reaction by rating how good or bad the sentence sounded to them.

6.2.3. Materials

Five different types of islands were tested in each sub-experiment: *whether*-island (Experiment 5), *wh*-island (*who*) (Experiment 6), and three types of adjunct islands (i.e. *when* (Experiment 7), *because* (Experiment 8), and *before/after* (Experiment 9)). For each island type, a 2 x 2 design was used, with two factors, Structure (i.e. Non-Island (*that*-clause) vs. Island-clause), and Extraction domain (i.e. Matrix clause vs. Embedded clause). Condition 1 (i.e. Non-island/Matrix) is the base line, without a long-distance dependency and an island structure, which would be the most acceptable condition among the four conditions. Condition 2 (i.e. Non-island/Embedded) is also without an island structure, but involves a long-distance dependency. A comparison of Conditions 1 and 2 would indicate the effect of long-distance movement (a *locality effect*) since the two conditions differ only in the distance of the *wh*-dependency. Condition 3 (i.e. Island/Matrix) contains an island structure, but with a matrix *wh*-extraction. A comparison of Conditions 1 and 3 would indicate the effect of the embedded clause type, as the two conditions differ only by the type of the embedded clause (a *structure effect*). Condition 4 is an island-violating condition (i.e. Island/Embedded), with an island structure and a long-distance dependency. The interaction of the two factors would indicate island effects. Sample stimuli for Experiments 5-9 are presented in Tables 6.2.-6.6., respectively.

Table 6.2. Example of Stimuli in Experiment 5: *whether*-island

	Structure	Extraction	Example
1	Non-Island	Matrix clause	**Who ___ thought [that Lisa bothered Mary]?**
2	Non-Island	Embedded clause	**Who did Mary think [that Lisa bothered ___]?**
3	Island	Matrix clause	**Who ___wondered [whether James liked Suzy]?**
4	Island	Embedded clause	**Who did Suzy wonder [whether James liked ___]?**

Table 6.3. Example of Stimuli in Experiment 6: *wh*-island (*who*)

	Structure	Extraction	Example
1	Non-Island	Matrix clause	**Who ___ thought [that Lisa bothered Mary]?**
2	Non-Island	Embedded clause	**Who did Mary think [that Lisa bothered ___]?**
3	Island	Matrix clause	**Who ___heard [who irritated George]?**
4	Island	Embedded clause	**Who did George hear [who irritated ___]?**

Table 6.4. Example of Stimuli in Experiment 7: adjunct-island (*when*)

	Structure	Extraction	Example
1	Non-Island	Matrix clause	**Who ___ thought [that Lisa bothered Mary]?**
2	Non-Island	Embedded clause	**Who did Mary think [that Lisa bothered ___]?**
3	Island	Matrix clause	**Who ___ cheered [when John beat Dan]?**
4	Island	Embedded clause	**Who did Dan cheer [when John beat ___]?**

Table 6.5. Example of Stimuli in Experiment 8: adjunct-island (*because*)

	Structure	Extraction	Example
1	Non-Island	Matrix clause	**Who ___ thought [that Lisa bothered Mary]?**
2	Non-Island	Embedded clause	**Who did Mary think [that Lisa bothered ___]?**
3	Island	Matrix clause	**Who ___ wept [because Tom hit Lucy]?**
4	Island	Embedded clause	**Who did Lucy weep [because Tom hit ___]?**

Table 6.6. Example of Stimuli in Experiment 9: adjunct-island (*before/after*)

	Structure	Extraction	Example
1	Non-Island	Matrix clause	**Who ___ thought [that Lisa bothered Mary]?**
2	Non-Island	Embedded clause	**Who did Mary think [that Lisa bothered ___]?**
3	Island	Matrix clause	**Who ___ resigned [after Gabe hired Andy]?**
4	Island	Embedded clause	**Who did Andy resign [after Gabe hired ___]?**

Since all five sub-experiments included the same structures of Conditions 1 and 2 (Non-Island structure) as a part of the 2 x 2 experimental design, five tokens per each Condition 1 and Condition 2 were created and used for all five experiments. As for Condition 3 and Condition 4, five tokens were created for each condition and for each of the five sub-experiments. This means that each of the five sub-experiments differed only by the experimental items of Conditions 3 and 4. There were thus a total of 12 experimental conditions and 60 experimental sentences (i.e. 5 tokens for each of

12 conditions) in the whole experiment. The 60 target tokens were combined with 45 filler items, yielding a total of 105 test items: 10 *that*-clauses (i.e. 5 tokens per each Condition 1 and Condition 2) + 50 Island sentences (i.e. 5 tokens per each Condition 3 and Condition 4 (i.e. 10 sentences) x 5 island types) + 45 fillers (=25 acceptable sentences + 20 unacceptable ones). In order to encourage participants to use the full range of the 7-point scale, the filler items consisted of either fully acceptable or unacceptable sentences, such as agreement errors (e.g. *The boys walks everyday*; *this books...*) or a filled-gap construction (e.g. *wh*-constructions with no gap; ungrammatical short *wh*-questions). Stimuli were distributed into 2 lists using a Latin Square procedure, and 2 reversed orders for each of the 2 lists were additionally created, yielding a total of 4 lists.

6.2.4. Analysis

Raw acceptability scores were z-score transformed prior to statistical analysis. A series of repeated measures ANOVA with two factors, Extraction and Structure, were performed both by-subject and by-item analyses for each group.

In addition, differences-in-differences (DD) scores (DD = D1 (Non-Island/Embedded - Island/Embedded) – D2 (Non-Island/Matrix - Island/Matrix) (e.g. Maxwell & Delaney 2003, Sprouse et al. 2012) were calculated from the z-score transformed ratings to compare island effect sizes between groups. Then, to check a relation of island effects with bilinguals' Age of Arrivals (AoA), and proficiency, correlational analyses were performed on each participant's island effect size (DD scores), proficiency scores, and AoA.

6.2.5.   Results of Experiment 5: *Whether*-Island

The z-score transformed mean acceptability ratings and DD scores are
summarized in Table 6.7, and plotted in Figure 6.2. Table 6.8 reports the statistical
results of repeated measures ANOVA.

Table 6.7. Mean ratings of each condition for each group in Experiment 5

	Native controls	Heritage (AoA 0-5)	Early (AoA 6-10)	Late (AoA 11-14)
1. Non-Island / Matrix	0.77	0.84	0.90	0.73
2. Non-Island / Embedded	0.21	0.08	-0.01	-0.24
3. Island / Matrix	0.67	0.62	0.59	0.54
4. Island / Embedded	-0.71	-0.63	-0.69	-0.40
DD scores	0.82	0.49	0.37	-0.05

Table 6.8. Results of Repeated measures ANOVA for *whether*-island

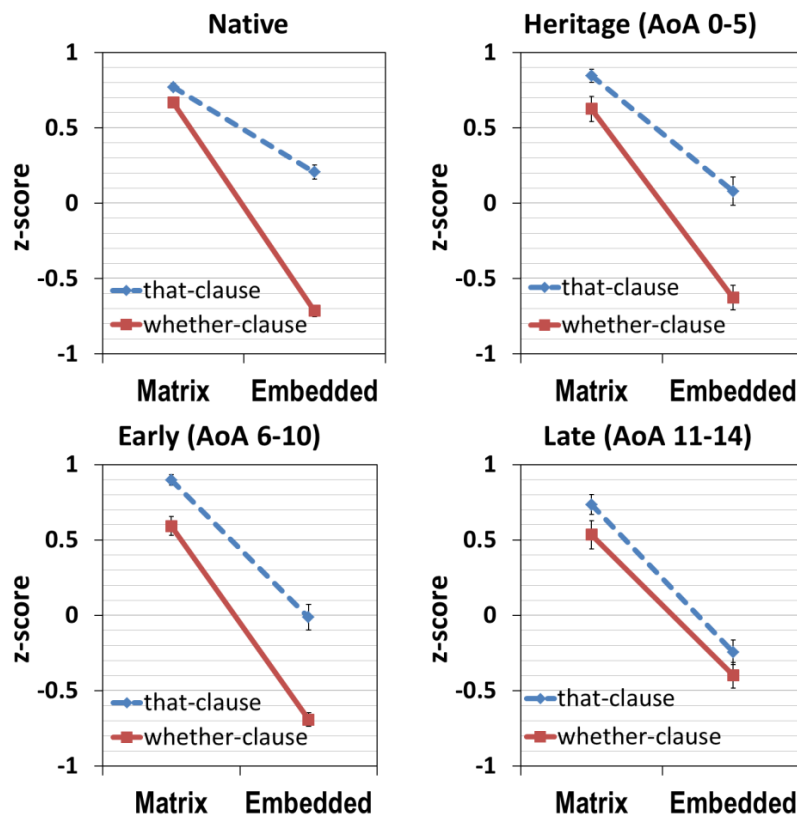|	Structure	Extraction	Structure x Extraction
Native	F1(1,59)=167.18,p<.0001 F2(1,9) =30.41, p<.0001	F1(1,59)=762.43,p<.0001 F2(1,9)=226.53, p<.0001	F1(1,59)=177.14,p<.0001 F2(1,9)=22.15, p=.001
Heritage	F1(1,18)=35.27, p<.0001 F2(1,9) =29.29, p<.0001	F1(1,18)=207.43,p<.0001 F2(1,9)=186.18, p<.0001	F1(1,18)=8.12, p=.011 F2(1,9)=10.04, p=.011
Early	F1(1,21)=83.45, p<.0001 F2(1,9) =23.24, p=.001	F1(1,21)=235.93,p<.0001 F2(1,9)=234.93, p<.0001	F1(1,21)=9.25, p=.006 F2(1,9)=5.39, p=.045
Late	F1(1,21)=3.35, p=.081 F2(1,9) =1.63, p=.23	F1(1,21)=134.82,p<.0001 F2(1,9)=162.01, p<.0001	F1(1,21)=.09, p=.76 F2(1,9)=.09, p=.76

Figure 6.2. Results of *whether*-island of each group

The results of repeated measures ANOVA showed significant main effects of both Structure and Extraction, and a significant interaction of the two factors in all groups except the Late group. In the Late group, only the main effect of Extraction was significant, while neither the main effect of Structure nor the interaction of Extraction and Structure was significant. Also, Differences-in-Differences (DD) scores were positive in all groups except in the Late group. This suggests the *whether*-island effect in all groups except in the Late group.

However, the island effect size, indicated by DD scores, seemed to be significantly different between groups. A one-way ANOVA, with DD score as a dependent factor and Group (i.e. Native, Heritage, Early, and Late) as an independent

factor, showed a significant difference between groups (F (3, 119) = 12.54, p < .0001).

Post-hoc comparisons (Bonferroni) further revealed that the significant group

difference centered on the differences between the native group and the Early group (p

= .02), between the native group and the Late group (p < .0001), and the Heritage

group and the Late group (p = .03).

In order to check any possible relation between the island effect size and AoA

in bilinguals, a correlational analysis was run on the DD scores of each bilingual

participant. The results showed a negative correlation between DD scores and AoA

around at chance (r = -.25, N = 63, p = .048, two tails), with a decrease of the DD

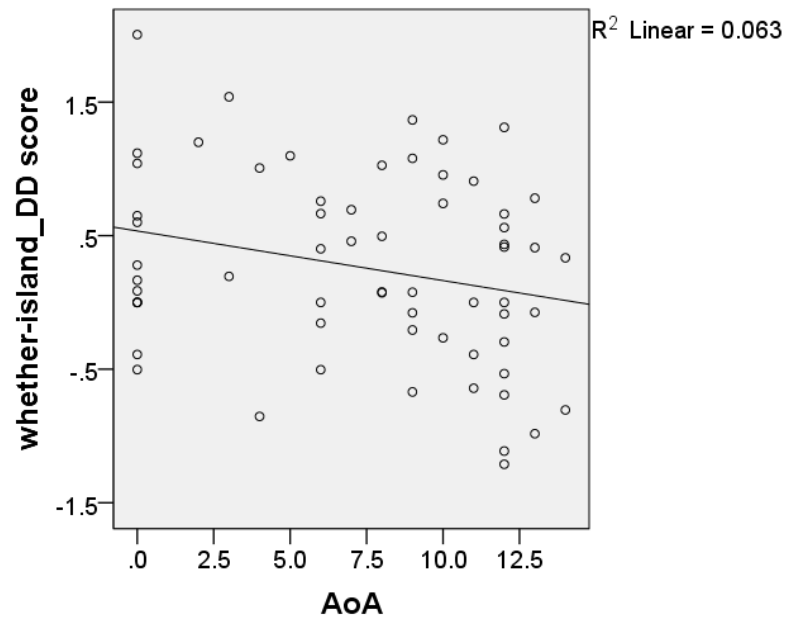scores as AoA increases, as represented in Figure 6.3.

Figure 6.3. Correlation between DD scores and AoA for *whether*-island

Another correlational analysis on proficiency scores and DD scores also revealed a significant correlation between DD scores and proficiency scores (r = .32, p = .01), as plotted in Figure 6.4. This implies the effect of proficiency on the *whether*-island effect size: more proficient speakers showed the stronger *whether*-island effect.
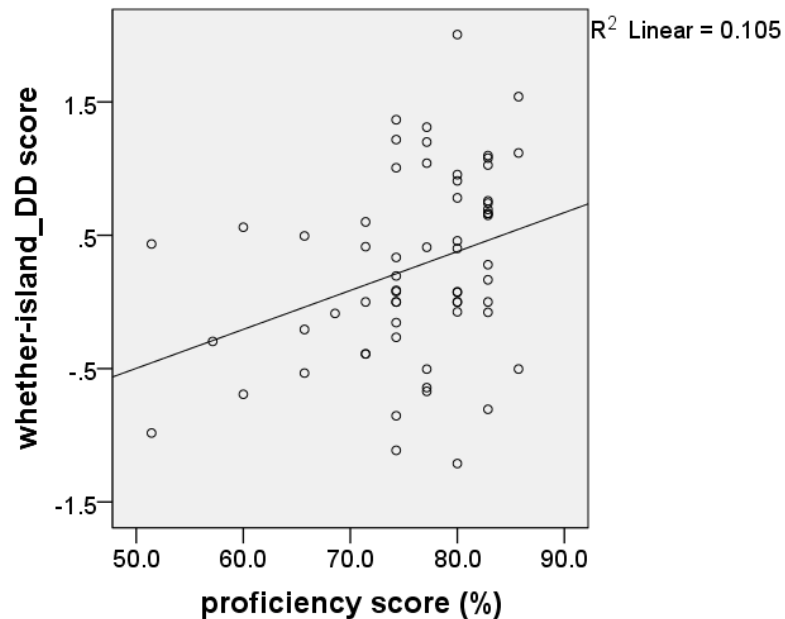
Figure 6.4. Correlation between DD scores and proficiency scores for *whether*-island

As shown in Section 6.2.1, since the proficiency test score negatively correlates with AoA in bilinguals, the significant negative correlation between DD scores and AoA could be a reflection of the relation between DD scores and proficiency scores, rather than the effect of AoA on DD scores. In order to check this possibility, we removed the data of bilinguals whose mean proficiency scores were above 2 standard deviations from the bilingual group's mean proficiency score (i.e. M: 76%, SD:7.8). This process eliminated 5 subjects from the Late group, whose

proficiency scores were lower than 65%. Correlation analyses on this trimmed data

showed no significant relation between proficiency and AoA. However, there was still

a significant correlation between DD scores and AoA (r = .29, N = 58, p = .03, two

tails). This indicates the effect of AoA on the size of the *whether*-island, in that early

arrivals tend to show the stronger *whether*-island effect than the late arrivals.

The relatively low z-score of the Condition 2 (Non-Island/Embedded) in the

Late group, compared to other groups may indicate their particular difficulty with a

long-distance dependency. In order to test this possibility, the size of the dependency

length effect (i.e. short vs. long) was calculated by comparing non-island constructions

(i.e. extracting the z-score of Condition 2 (i.e. Non-Island/Embedded) from that of

Condition 1 (i.e. Non-Island/Matrix)). As presented in Table 6.9, the length effect

increased with the increase of AoA.

Table 6.9. Dependency length effect: z-score differences between Condition 1 and Condition 2

	Native controls	Heritage (AoA 0-5)	Early (AoA 6-10)	Late (AoA 11-14)
Dependency length effect: z-score differences	0.56	0.77	0.91	0.97

An ANOVA using Group as a between factor, and planned post-hoc tests on

the dependency length effect showed a significant effect of Group (F1(3,119)=7.04,

p<.0001), and the difference resided specifically between native controls and the Early

group, and between native controls and the Late group. ANOVAs, using Group as a

between-subject factor, with planned post-hoc tests on the z-score of each Condition 1

and Condition 2 in native controls and bilinguals also revealed no significant effect of

group in Condition 1 (Non-Island/Matrix), but a significant effect of Group in

Condition 2 (Non-Island/Embedded) ($F1(3,119) = 7.99$, p < .0001) with a significant difference between the Late group and the rest of groups. This suggests that later arrivals in general had more difficulty with a long-distance *wh*-dependency than early arrivals, especially bilinguals in the Late group.

In sum, all groups except the Late group showed the *whether*-island effect. There appears to be a negative correlation between AoA and the island effect size, but a positive relation between proficiency and the island effect size in bilinguals. The *whether*-island effect size was smaller in the later arrivals and less proficient bilinguals than early arrivals and more proficient ones, respectively. In particular, these correlations of the island effect size with AoA and proficiency of bilinguals seem to be mainly caused by the particular difficulty with long-distance dependencies in the later arrivals.

6.2.6. Results of Experiment 6: *Wh*-Island (*who*) in English

The mean z-score ratings of the four test conditions and DD scores for each group are shown in Table 6.10, and plotted in Figure 6.5. The results of repeated measures ANOVA are summarized in Table 6.11

Table 6.10. Mean ratings of each condition for each group in Experiment 6.

	Native controls	Heritage (AoA 0-5)	Early (AoA 6-10)	Late (AoA 11-14)
1. Non-Island / Matrix	0.77	0.84	0.90	0.73
2. Non-Island / Embedded	0.21	0.08	-0.01	-0.24
3. Island / Matrix	0.10	0.06	0.16	0.01
4. Island / Embedded	-0.87	-0.85	-0.88	-0.73
DD scores	0.40	0.14	0.13	-0.24

Table 6.11. Results of Repeated Measures ANOVA for *wh*-island

	Structure	Extraction	Structure x Extraction
Native	F1(1,59)=703.75,p<.0001	F1(1,59)=547.59,p<.0001	F1(1,59)=29.24,p<.0001
	F2(1,9)=108.47, p<.0001	F2(1,9)=60.58, p<.0001	F2(1,9)=7.51, p=.023
Heritage	F1(1,18)=128.56,p<.0001	F1(1,18)=214.48,p<.0001	F1(1,18)=.96, p=.34
	F2(1,9)=139.46, p<.0001	F2(1,9)=66.93, p<.0001	F2(1,9)=1.17, p=.31
Early	F1(1,21)=93.41,p<.0001	F1(1,21)=305.74,p<.0001	F1(1,21)=.72, p=.41
	F2(1,9)=86.68, p<.0001	F2(1,9)=177.95, p<.0001	F2(1,9)=1.28, p=.29
Late	F1(1,21)=48.14,p<.0001	F1(1,21)=76.34, p<.0001	F1(1,21)=3.55, p=.73
	F2(1,9)=57.57, p<.0001	F2(1,9)=224.82, p<.0001	F2(1,9)=2.78, p=.13
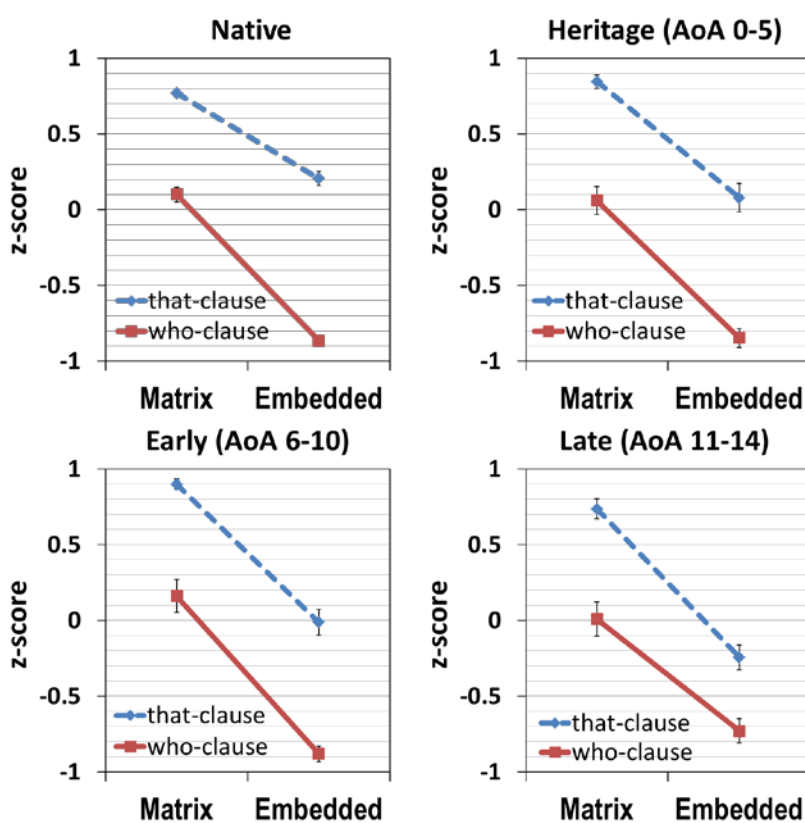
Figure 6.5. Acceptability of *wh*-island in each group

Repeated measures ANOVA revealed statistically significant main effects of both Structure and Extraction in all groups. The interaction of these two factors, however,

was significant only in the native control group, indicating the presence of the *wh*-island effect in the native group, but the absence of it in the bilinguals.

However, the DD scores were positive showing super-additive island effects in all groups except in the Late group. A one-way ANOVA, with Group as an independent factor, and DD score as a dependent factor, yielded a significant effect of Group on DD scores ($F(3, 119) = 6.04$, $p = .001$), and post-hoc comparisons (Bonferroni) revealed a significant difference only between the native controls and the Late group ($p < .0001$), but no significant difference between other groups.

Since the Late group's DD scores were significantly different from others', there might be a possible relation of the *wh*-island effect size with AoA, and with proficiency scores in bilinguals. To check this, correlational analyses were performed on the DD scores of bilinguals with AoA and proficiency scores. The results showed a significant correlation between DD scores and proficiency ($r = .27$, $N = 63$, $p = .03$, two tails), as plotted in Figures 6.6, but no significant correlation between DD scores and AoA ($p = .12$). More proficient bilinguals showed a stronger *wh*-island effect than less proficient ones.
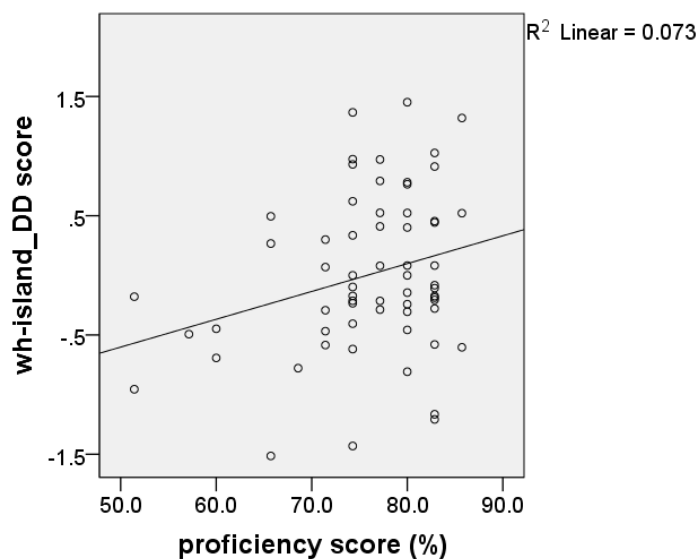
Figure 6.6. Correlation between DD scores and proficiency scores for *wh*-island.

In sum, only the native controls showed the *wh*-island effect. None of the bilingual groups showed a significant interaction, but there was found a positive relation between the island effects size and proficiency in bilinguals in that more proficient speakers tend to show a stronger *wh*-island effect in English.

6.2.7. Results of Experiment 7: Adjunct-Island (*when*) in English

Table 6.12 shows z-scores of each condition and DD-scores in each group, and Table 6.13 reports the results of repeated measures ANOVA. The results are plotted in Figure 6.7.

Table 6.12. Mean ratings of each condition for each group in Experiment 7

	Native Controls	Heritage (AoA 0-5)	Early (AoA 6-10)	Late (AoA 11-14)
1. Non-Island / Matrix	0.77	0.84	0.90	0.73
2. Non-Island / Embedded	0.21	0.08	-0.01	-0.24
3. Island / Matrix	0.85	0.90	0.92	0.83
4. Island / Embedded	-0.96	-0.87	-0.88	-0.66
DD scores	1.25	1.01	0.89	0.50

Table 6.13. Results of Repeated measures ANOVA for adjunct-island (*when*)

	Structure	Extraction	Structure x Extraction
Native	F1(1,59)=181.06,p<.0001 F2(1,9)=97.55, p<.0001	F1(1,59)=1692.42,p<.0001 F2(1,9)=356.87, p<.0001	F1(1,59)=438.42,p<.0001 F2(1,9)=60.52, p<.0001
Heritage	F1(1,18)=59.40, p<.0001 F2(1,9)=44.19, p<.0001	F1(1,18)=610.51, p<.0001 F2(1,9)=222.50, p<.0001	F1(1,18)=59.56, p<.0001 F2(1,9)=31.64, p<.0001
Early	F1(1,21)=58.95, p<.0001 F2(1,9)=23.49, p=.001	F1(1,21)=322.31, p<.0001 F2(1,9)=734.08, p<.0001	F1(1,21)=72.66, p<.0001 F2(1,9)=24.90, p=.001
Late	F1(1,21)=8.42, p=.009 F2(1,9)=1.75, p=.22	F1(1,21)=183.79, p<.0001 F2(1,9)=290.55, p<.0001	F1(1,21)=11.11, p=.003 F2(1,9)=4.42, p=.06
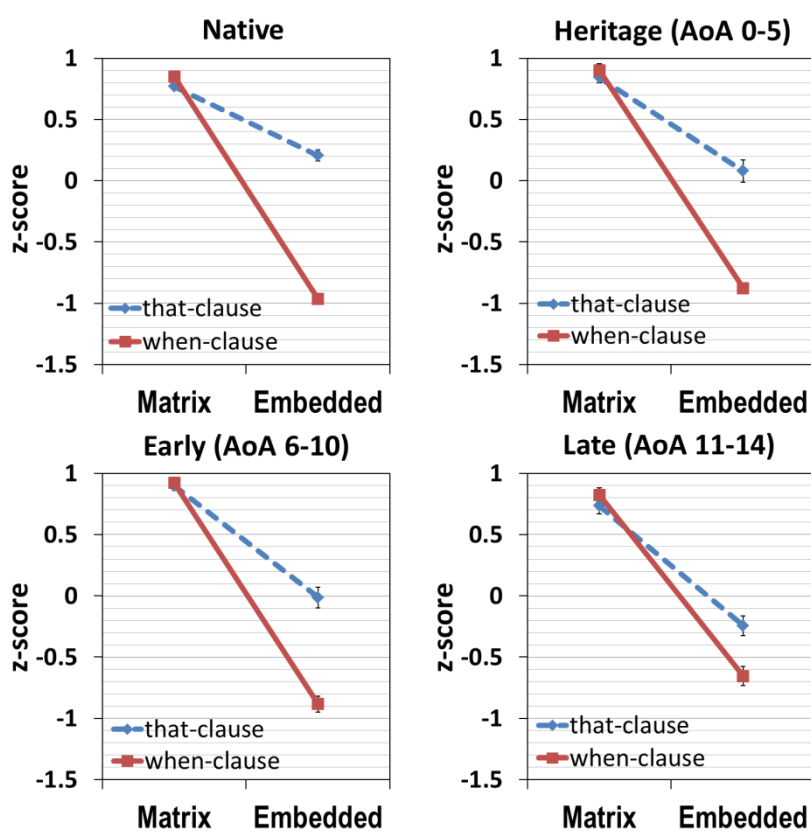
Figure 6.7. Acceptability of adjunct-island (*when*) in each group

The repeated measures ANOVA revealed significant main effects of both Structure and Extraction, and a significant interaction of Structure and Extraction in all groups. However, the effects of Structure and interaction were significant only in the

by-subject analysis in the Late group. This suggests that there is an adjunct island effect in all groups, although the effect in the Late group was seen only in the by-subject analysis.

The differences-in-differences (DD) scores also indicated super-additive adjunct island effects in all groups, but the island effect sizes in bilinguals appeared to decrease as their AoA increased, with the largest DD value in the Heritage group and the smallest in the Late group. A one-way ANOVA, with DD scores as a dependent factor, and Group as an independent factor, yielded a significant effect of Group ($F(3, 119) = 11.034$, $p < .0001$). Post-hoc comparisons (Bonferroni) further showed a significant difference between native controls and the Late group ($p < .0001$), and between the Heritage group and the Late group ($p = .02$), but no significant difference between other groups.

A correlational analyses confirmed this by showing a negative correlation between DD scores and AoA ($r = -.35$, $N = 63$, $p = .003$, two tails), with a decrease of island effect sizes as AoA increased, as shown in Figure 6.8.

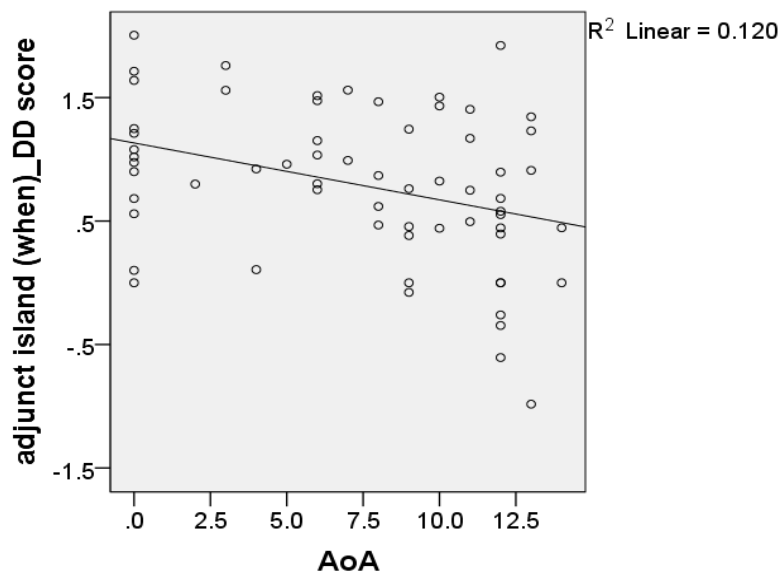Figure 6.8. Correlation between DD scores and AoA for adjunct-island (*when*)

There was also found a correlation between DD scores and proficiency scores in bilinguals (r = .43, N = 63, p < .0001, two tails), as demonstrated in Figure 6.9. As the proficiency score increased, the island effect size also increased.
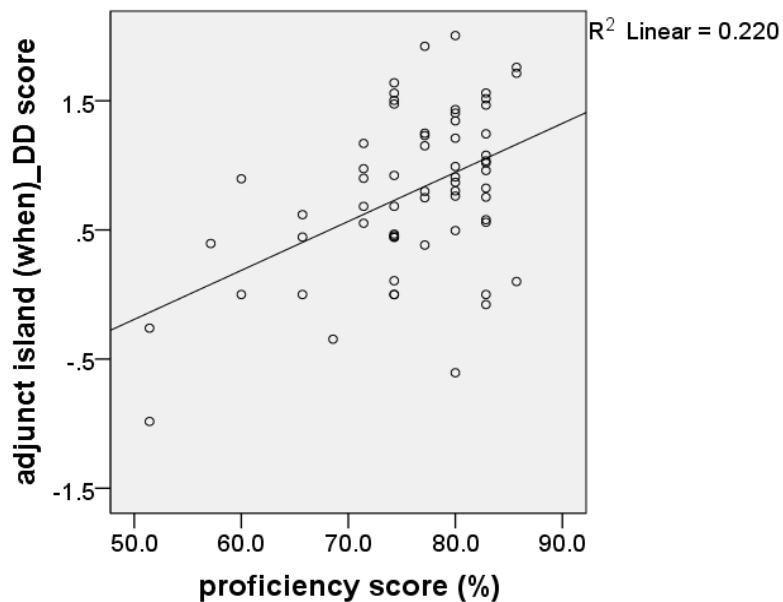

Figure 6.9. Correlation between DD scores and proficiency scores for adjunct-island (*when*)

Since the correlation between AoA and the island effect size might be mainly due to the proficiency difference between the bilingual groups, as suggested by the significant correlation between proficiency and the island effect size, an additional correlation test was run on the proficiency-matched bilinguals (cf. see, Section 6.6.1. for information about the proficiency-matched bilinguals), and the DD scores were still found to be negatively correlated with AoA ($r = -.27$, $N = 58$, $p = .039$, two tails), suggesting the effect of AoA.

Summarizing this section, the results here suggest the presence of the adjunct island effect with a *when*-clause in all groups. The island effect size also correlated with AoA and proficiency in bilinguals. Early arrivals and more proficient bilinguals tend to show the stronger adjunct island effect than Late arrivals and less proficient ones, respectively.

6.2.8. Results of Experiment 8: Adjunct-Island (*because*) in English

Table 6.14 represents z-score transformed means of each condition and DD scores for each group. Table 6.15 summarizes the results of repeated measures ANOVA. The results are plotted in Figure 6.10.

Table 6.14. Mean ratings of each condition for each group in Experiment 8

	Native Controls	Heritage (AoA 0-5)	Early (AoA 6-10)	Late (AoA 11-14)
1. Non-Island / Matrix	0.77	0.84	0.90	0.73
2. Non-Island / Embedded	0.21	0.08	-0.01	-0.24
3. Island / Matrix	0.74	0.65	0.83	0.59
4. Island / Embedded	-1.01	-0.98	-1.01	-0.88
DD scores	1.18	.86	.93	0.49

Table 6.15. Results of Repeated measures ANOVA for adjunct-island (*because*)

	Structure	Extraction	Structure x Extraction
Native	F1(1,59)=286.82,p<.0001	F1(1,59)=1065.04,p<.0001	F1(1,59)=311.47,p<.0001
	F2(1,9)=64.36, p<.0001	F2(1,9)=178.33, p<.0001	F2(1,9)=97.41, p<.0001
Heritage	F1(1,18)=96.04, p<.0001	F1(1,18)=412.29, p<.0001	F1(1,18)=28.22, p<.0001
	F2(1,9)=55.69, p<.0001	F2(1,9)=165.67, p<.0001	F2(1,9)=60.03, p<.0001
Early	F1(1,21)=115.72,p<.0001	F1(1,21)=307.49, p<.0001	F1(1,21)=66.97, p<.0001
	F2(1,9)=76.15, p=.001	F2(1,9)=310.45, p<.0001	F2(1,9)=59.19, p<.0001
Late	F1(1,21)=49.04, p<.0001	F1(1,21)=158.38, p<.0001	F1(1,21)=14.09, p=.001
	F2(1,9)=51.88, p<.0001	F2(1,9)=309.13, p<.0001	F2(1,9)=13.55, p=.005
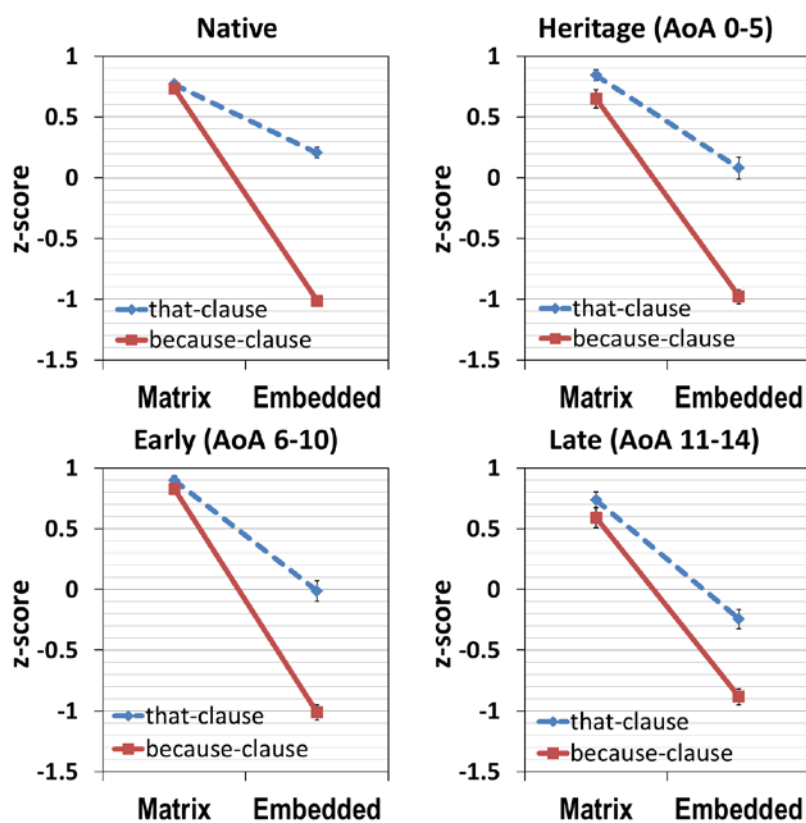
Figure 6.10. Acceptability of adjunct-island (*because*) in each group

The repeated measures ANOVA revealed significant main effects of both Structure and Extraction, and a significant interaction of these two factors for every group, by both subject and item analyses. These results suggest the adjunct island effect with a *because*-clause in all groups.

The positive DD scores in all groups also showed super-additive adjunct island effects, but the island effect size differed between groups. A one-way ANOVA, with Group as the independent variable and DD scores as the dependent factor, revealed a significant difference between groups $(F (3, 119) = 8.14, p < .0001)$. Post-hoc comparisons (Bonferroni) further showed that the effect of Group on DD scores mainly resided in the difference between the native controls and the Late group $(p < .0001)$.

In order to check any relation between DD scores and AoA, as well as between DD scores and proficiency scores in bilinguals, correlational analyses were performed on DD scores. The results showed no significant correlation between DD scores and AoA, but a significant correlation between DD scores and proficiency scores $(r = .368, N = 63, p = .003,$ two tails). Scatterplots in Figures 6.11 display the relation between DD scores and proficiency scores.
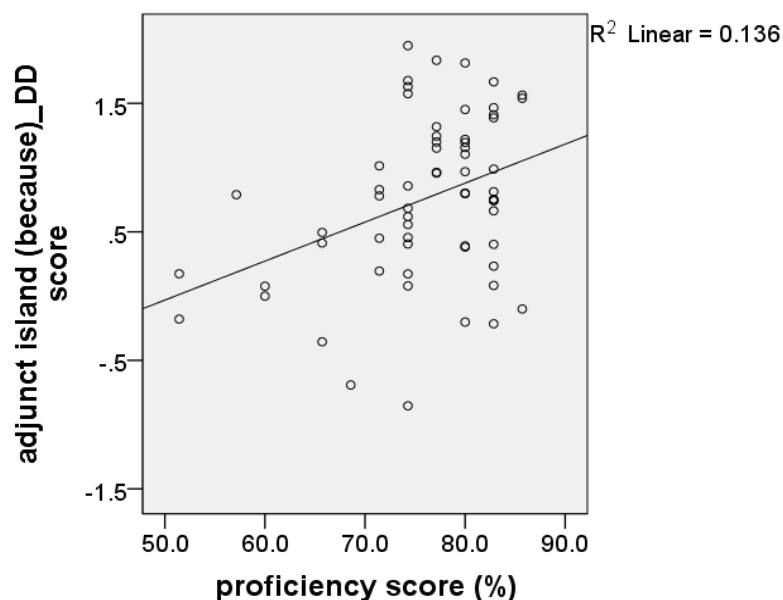

Figure 6.11. Correlation between DD scores and proficiency scores for adjunct-island (*because*)

In sum, this experiment again demonstrated the adjunct island effect in all groups. The island effect size in bilinguals appeared to positively correlate with their proficiency. As the proficiency scores increased, the island effect size also increased. There was no strong relation between the adjunct island effect size with AoA.

6.2.9. Results of Experiment 9: Adjunct-Island (*before/after*) in English

The z-score transformed means of each condition and DD scores in each group are displayed in Table 6.16. The results of Repeated Measures ANOVA in each group are shown in Table 6.17. The results are plotted in Figure 6.12.

Table 6.16. Mean ratings of each condition and DD scores for each group in Experiment 9

	Native Controls	Heritage (AoA 0-5)	Early (AoA 6-10)	Late (AoA 11-14)
1. Non-Island / Matrix	0.77	0.84	0.90	0.73
2. Non-Island / Embedded	0.21	0.08	-0.01	-0.24
3. Island / Matrix	0.62	0.78	0.80	0.76
4. Island / Embedded	-0.87	-0.83	-0.91	-0.68
DD scores	0.93	0.84	0.80	0.46

Table 6.17. Results of Repeated measures ANOVA for adjunct-island (*before/after*)

	Structure	Extraction	Structure x Extraction
Native	$F1(1,59)=266.31, p<.0001$ $F2(1,9)=76.90, \quad p<.0001$	$F1(1,59)=842.12, \; p<.0001$ $F2(1,9)=78.17, \quad p<.0001$	$F1(1,59)=185.61, p<.0001$ $F2(1,9)=26.70, \quad p<.0001$
Heritage	$F1(1,18)=41.03, \; p<.0001$ $F2(1,9)=41.82, \quad p<.0001$	$F1(1,18)=465.67, \; p<.0001$ $F2(1,9)=328.52, \quad p<.0001$	$F1(1,18)=32.67, \; p<.0001$ $F2(1,9)=15.53, \quad p=.003$
Early	$F1(1,21)=55.43, \; p<.0001$ $F2(1,9)=34.29, \quad p<.0001$	$F1(1,21)=267.87, \; p<.0001$ $F2(1,9)=286.59, \quad p<.0001$	$F1(1,21)=33.04, \; p<.0001$ $F2(1,9)=13.18, \quad p=.005$
Late	$F1(1,21)=14.51, \; p=.001$ $F2(1,9)=4.52, \quad p=.062$	$F1(1,21)=148.52, \; p<.0001$ $F2(1,9)=304.14, \quad p<.0001$	$F1(1,21)=13.02, \; p=.002$ $F2(1,9)=4.06, \quad p=.075$
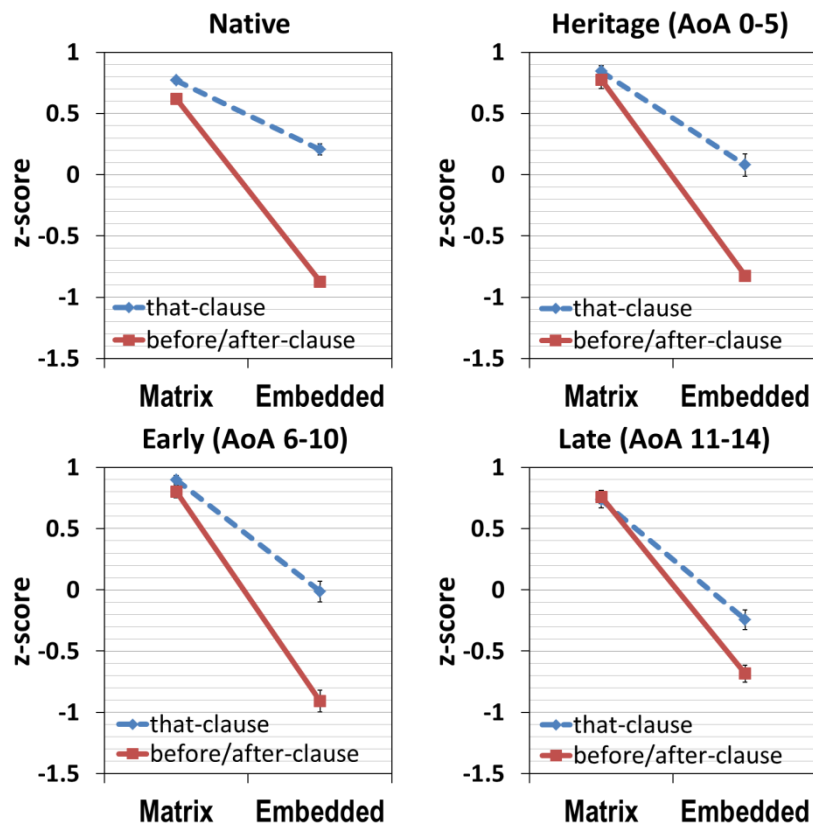
Figure 6.12. Acceptability of adjunct-island (*before/after*) in each group

Repeated measures ANOVA by both subject and item analyses yielded significant main effects of both Structure and Extraction, as well as a significant interaction of Structure and Extraction in all groups except for the Late group. The Late group showed significant main effects of Extraction in both the by-subject and by-item analyses, but the main effect of Structure and the interaction of these two factors were significant only by-subject analysis. This indicates the adjunct island effect with a *before/after* clause in all groups, with a weaker island effect in the Late group compared to other groups.

Positive DD scores in all groups also suggest super-additive island effects, but the effect size was different between the groups, especially between the Late group

and the rest of the groups. A one-way ANOVA showed a significant group difference on DD scores (F (3, 119) = 3.44, p = .019). Post-hoc comparisons (Bonferroni) specifically revealed a significant group difference in DD scores between the native controls and the Late group (p = .009). The smaller island effect size in the Late group compared to others might suggest the effect of AoA or proficiency in bilinguals. However, correlational analyses in bilinguals revealed no meaningful relation of DD scores with either AoA or proficiency scores. Even when proficiency scores were matched across bilinguals, no significant correlation between DD scores and AoA was found.

In sum, all groups showed *before/after* adjunct island effect, but the island effect size in the Late group was much smaller than that in other groups. However, there was no significant correlation between the adjunct island effect size and either AoA or proficiency scores. The performance of Heritage and Early groups was very native-like.

6.2.10 Summary of Result in Experiments 5-9

The results of Experiments 5 – 9 are summarized in Table 6.18.

Table 6.18. Results Summary in Experiments 5 - 9
✓ means 'significant' (p <.05), # means 'marginal' (p <.1), ✗ means 'insignificant' (p >.1), by-subject analysis on the left, by-item analysis on the right. Z-score of island condition.

Group		Native controls	Heritage (AoA 0-5)	Early (AoA 6-10)	Late (AoA 11-14)
N		60	19	22	22
Exp.5 *Whether*-**island**	Structure	✓ / ✓	✓ / ✓	✓ / ✓	# / ✗
	Location	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
	interaction	✓ / ✓	✓ / ✓	✓ / ✓	✗ / ✗
	z-score	-0.71	-0.63	-0.69	-0.40
	DD score	0.82	0.49	0.37	-0.05
Exp.6 **Wh-island** (*who*)	Structure	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
	Location	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
	interaction	✓ / ✓	✗ / ✗	✗ / ✗	✗ / ✗
	z-score	-0.87	-0.85	-0.88	-0.73
	DD score	0.40	0.14	0.13	-0.24
Exp.7 **Adjunct island** (*when*)	Structure	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✗
	Location	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
	interaction	✓ / ✓	✓ / ✓	✓ / ✓	✓ / #
	z-score	-0.96	-0.87	-0.88	-0.66
	DD score	1.25	1.01	0.89	0.50
Exp.8 **Adjunct island** (*because*)	Structure	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
	Location	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
	interaction	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
	z-score	-1.01	-0.98	-1.01	-0.88
	DD score	1.18	0.86	0.93	0.49
Exp.9 **Adjunct island** (*before/after*)	Structure	✓ / ✓	✓ / ✓	✓ / ✓	✓ / #
	Location	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
	interaction	✓ / ✓	✓ / ✓	✓ / ✓	✓ / #
	z-score	-0.87	-0.83	-0.91	-0.68
	DD score	0.93	0.84	0.80	0.46

Summarizing the results of all five experiments, as expected, native controls exhibited evidence of all five types of island effects tested in Experiments 5 – 9, indicated by a significant interaction of the two experimental factors, Extraction (i.e. Matrix vs. Embedded) and Structure (i.e. Non-Island vs. Island) and positive DD scores.

As for the results of bilinguals, first, both Heritage and Early groups showed very similar results to the native controls' in all experiments, except in Experiment 6

on the *wh*-island effect. They showed the *whether*-island effect and all three types of adjunct island effect, but did not show the *wh*-island effect, indicated by the absence of a significant interaction of Structure and Location. On the other hand, the results of the Late group were somewhat different from all other groups. While they showed all three types of adjunct island effects, they did not show the *whether*-island and the *wh*-island, signaled by the absence of the significant interaction between Structure and Location. In addition, in Experiment 5 on the *whether*-island, no main effect of Structure was found in the Late group.

Regarding the effect size for the island, as measured by the DD score, it generally decreases across the four groups as AoA increases, as shown in Figure 6.13. The only exception is the adjunct island (*because*) in Exp. 8, where the Early group is only slightly higher than the Heritage group.
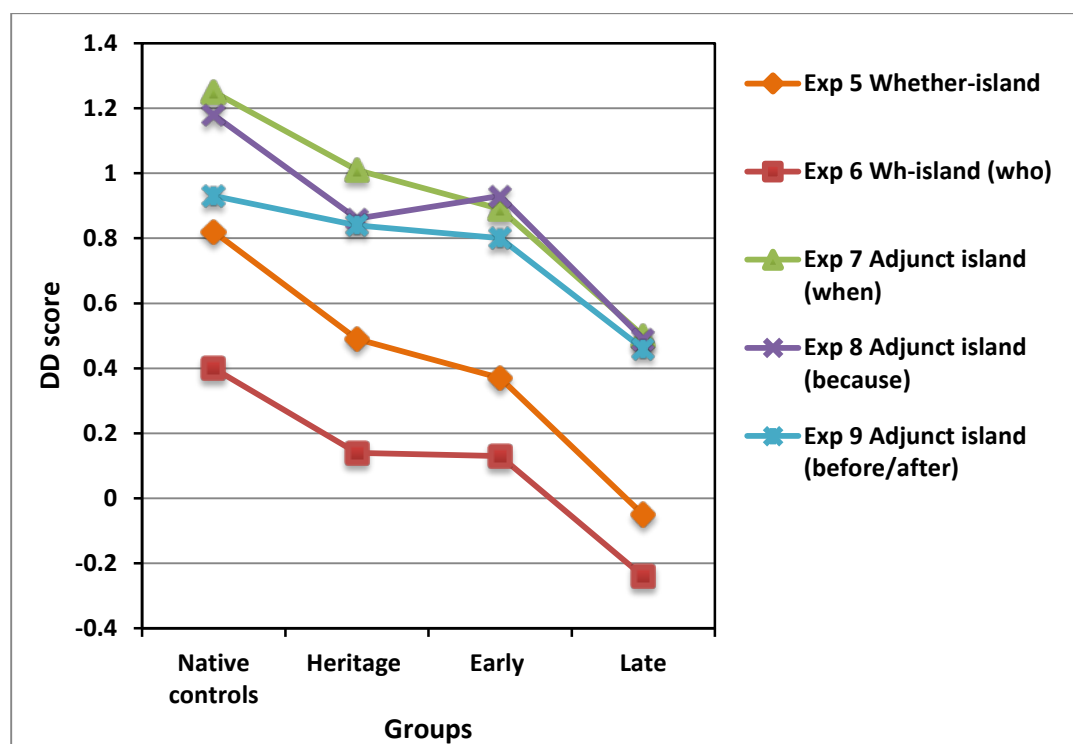

Figure 6.13. Island effect size (i.e. DD-scores) for the five islands in each group

Correlation analyses in each experiment suggest possible effects of AoA and/or proficiency on bilinguals' island effects in English. In all experiments, except Experiment 9 on the *before/after* adjunct island, proficiency scores were positively correlated with the island effects, showing that more proficient speakers displayed stronger island effects than less proficient ones. The effects of AoA on the island effect were significant in Experiment 5 on the *whether*-island and in Experiment 7 on the *when*-adjunct island.

In addition, as represented in Figure 6.14, the size of the dependency length effect (i.e. Condition 1 – Condition 2) in bilinguals, indicating a difficulty with a long-distance extraction, increased as AoA increased, while the structure effect (i.e. Condition 1 – Condition 3) of all different types of islands was about the same in all groups.
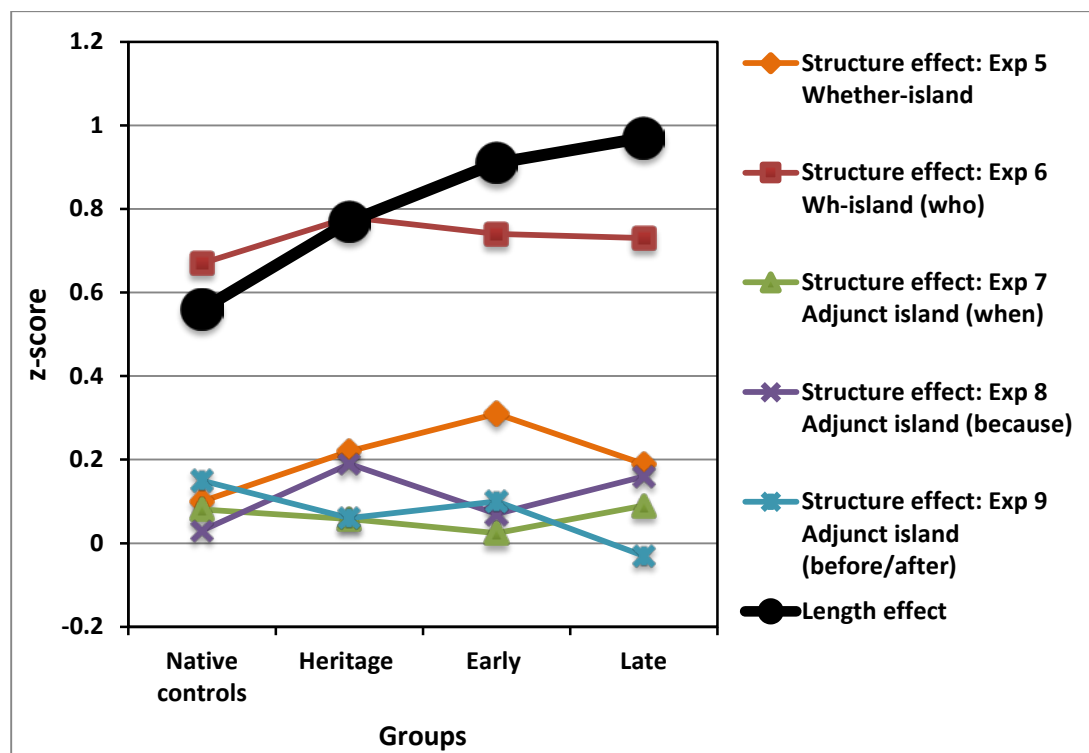

Figure 6.14. Dependency length effect size and Structure effect size in each group

Interestingly, the structure effect of the *wh*-island in Experiment 6 was much bigger than those of other types of islands, while other four types of islands showed similar degrees of structure effects.

6.3. Discussion

The five experiments on the *whether*-island, the *wh*-island, and the adjunct islands with three different types of adjunct clauses (i.e. *when*-clause, *because*-clause, and *before/after*-clause) showed mixed results on island effects in bilinguals, depending on the types of islands and the groups. Regarding the island types, all bilingual groups showed a statistically significant interaction of the adjunct island effects, but either absent or weaker *whether*- and *wh*-island effects. Specifically, none of the bilingual groups showed the *wh*-island, and the *whether*-island effect was absent in the Late group. In addition, there were some differences in each group's island effects. While the results of Heritage and Early groups were similar to native's in most aspects, the Late group's performance was less native-like, displaying either the absence of or generally weaker island effects.

The first question to ask is whether bilinguals' island effects in English we found here are the results of transfer effects from Korean. This is an important question to begin with since transfer effects are commonly observed in bilingual acquisition, especially with late L2 learners. In addition, most L2 studies on island effects in English have assumed no island effects in *wh*-in-situ languages, and thus the possibility of transfer has not been considered. However, as found in Chapter 5,

Korean displays the *whether*-island effect but not the adjunct island effect. Thus, there is a possibility of a transfer effect in Korean-English bilinguals' island effects in English, and if so, we would expect them to display the *whether/wh*-island effect, but not the adjunct islands. Interestingly, the pattern found here was the opposite. All bilinguals showed the adjunct island effects, but not the *wh*-island effect, and the Late group did not show the *whether*-island effect. This suggests that the results here are very unlikely to be the result of transfer from the L1.

Are the results here then predicted by the four different approaches to islands discussed in Chapter 4 (i.e. traditional UG-based accounts, contemporary minimalist grammar accounts, processing accounts, and input-driven accounts)? No particular approach predicts bilinguals' better performance with one type of islands than with another (i.e. more native-like adjunct islands but weaker *whether/wh*-islands). We will explore this asymmetry more deeply below and question whether it even exists, but for now, let us assume that it does exist and ask how the different approaches to islands that we have seen might account for it. Specifically, under the UG accounts, which claim that island effects appear as a result of violating specific island constraints (e.g. Subjacency), the asymmetry in bilinguals' island effects would mean that they have the adjunct island constraints, but not the *whether/wh*-island constraints. However, this possibility that bilinguals have one type of island constraint, but not the other is not expected by this approach since island constraints are predicted to be either all available or unavailable as a result of the access or lack of access to UG, respectively. If one can access UG, then one should show all types of island effects, not just a few types.

Similarly, the minimalist account predicts native-like island effects uniformly in all groups regardless of the types of islands, since island effects are argued to be the results of how a computational system operates and all speakers have a computational system.

Next, under the input-based accounts, having native-like sensitivity to island effects is directly related to the type of input which native learners are exposed to. Thus, native-like adjunct island effects but less-native-like *whether/wh*-island effects would mean that the quality/quantity of the input that would allow bilinguals to generate the acceptability preference for adjunct islands might be different from that for *whether/wh*-islands. In other words, the input of adjunct islands for bilinguals might be more native-like than that of *whether/wh*-islands. Without corpus data, it is difficult to evaluate this possibility, but there seems no particularly good reason to assume that the input of these two types of islands in bilinguals (e.g. the frequency of embedded *whether/wh*-phrases and adjunct phrases) might be different enough to derive different types of generalizations for the acceptability of each of the two types of island configurations.

Lastly, under the processing accounts, which claim that island effects arise when the processing costs of island configurations exceeds available parsing resources, the asymmetry in bilinguals' island effects might mean that a cost of processing *whether/wh*-islands in bilinguals might not be big enough to derive *whether/wh*-islands, while that is large enough to result in adjunct island effects. Or, bilinguals simply did not process the *whether/wh*-islands in a native-like fashion, while they did with adjunct islands. However, the dependency length effect in bilinguals was actually

larger than in natives, which would mean the sum of the two processing costs for all islands might be higher in bilinguals than in natives, which would derive stronger island effects in bilinguals. Also, it seems unlikely that bilinguals' processing would be native-like for one type of island, but not for the other, since all island configurations contain similar structures, a long-distance dependency and a complex island structure.

To summarize, based on the absence of a significant interaction in *whether/wh*-islands in bilinguals, at the beginning we assumed that there was an asymmetry in bilinguals' island effects. However, as discussed above, this makes little sense under any view of islands. What does this suggest then? Let us examine this asymmetry more deeply and see whether this is real.

First, as shown in Figure 6.17, the effect sizes of *whether/wh*-islands were the lowest out of the five types of islands, and this was true not only in bilinguals, but also in natives. Also, differences in the effect sizes between each type of islands were about the same for all islands in all groups. For example, the *whether*-island effect sizes, indicated by DD scores, were approximately the same amount bigger (i.e. about 0.1 - 0.2) than the *wh*-island for all groups, and adjunct island effects were about 0.3 - 0.4 larger than the *wh*-island. Seen in this perspective, the *whether/wh*-island cases for the bilingual groups follow the general pattern. For all of the bilingual groups, the effect sizes of all islands were weaker than for the natives. There is no difference in this regard between the *whether/wh*-islands and the adjunct islands

One might question that bilinguals' weaker *whether/wh*-island effects might be caused by their lack of native-like syntactic representations of *whether/wh*-islands.

However, as shown in Figure 6.18, when we compare Conditions 1 and 3 (i.e. matrix *wh*-questions which differ only by the embedded clause type (a *that*-clause vs. an island clause), which would indicate the effects of island structure, we see that all groups show similar degrees of structure effect for each type of islands. This suggests that bilinguals had native-like syntactic representation and processing costs for all five types of islands, and thus their weaker *whether/wh*-island effects cannot be due to their lack of syntactic knowledge of *whether/wh*-questions.

Another possible explanation for the absence of *wh*-island effects in the bilinguals is that there is a floor effect here. That is, it could be that there is not greater separation between Conditions 2 and 4 in these groups because bilinguals run into the bottom of the scale in Condition 4 and cannot go any lower. This possibility is worth considering, but it seems unlikely, since there are indications that bilingual participants are not placing Condition 4 at the bottom of the scale. The mean raw scores of this condition (i.e. Heritage: 2.23, Early: 2.15, Late: 2.72) are higher than those of ungrammatical fillers (i.e. Heritage: 2.11, Early: 2.10, Late: 2.36), and in the Late group, the mean raw score for this condition in the *wh*-island (2.72) was substantially higher than in the because-adjunct case (2.34).

All of these together thus suggest that the apparent asymmetry between *whether/wh*-islands and adjunct islands in bilinguals is misleading, but just appeared to be true because the *whether/wh*-island effects were the two smallest island effects among the five types of islands, and bilinguals' island effects were overall weaker for all islands than natives.

The question now is what factors might be causing the overall weakening of island effects in bilinguals? There are two possible factors that might be responsible for this. One is the dependency length effect, the cost involved with a long-distance *wh*-dependency. The other is the structure effect, the cost involved with a complex island construction. Common accounts of islands claim that these two factors are involved with acceptability of islands. Specifically, most grammar-based approaches claim that the island effect is the sum of the effects of these two factors and an island constraint. On the other hand, processing theories claim that the island effect is a reflection of processing difficulties of island configurations that exceed the sum of the two costs. This means that under either approach to islands if the effect of one of the factors was different between bilinguals and natives, their island effects also might not be the same.

It turns out that it is mostly the dependency length effect that is involved with the weaker island effects in bilinguals. Interestingly, the effect size for the island in bilinguals decreased as AoA increased, as depicted in Figure 6.17. The island effects of the all five experiments in native speakers were the largest, followed by the Heritage, the Early, and the Late groups. Similarly, as shown in Figure 6.18, the dependency length effect increased as AoA increased, indicating that bilinguals had more difficulty with long-distance dependency than natives, and the difficulty was more prominent in later arrivals. On the other hand, as shown in Figure 6.18, the degrees of structure effects in all islands were similar in all groups regardless of the AoA difference, indicating that bilinguals had native-like syntactic representation and processing costs for all five types of island structures. This then may suggest that the

increased dependency length effect, rather than the structure effect, might play a large role in causing weaker island effects in bilinguals.

Bilinguals' difficulty with a long-distance dependency, indicated by their increased dependency length effect is not particularly surprising, though. Previous studies also have found that heritage/L2 populations have a particular difficulty with long-distance dependencies. (e.g. Polinsky and Kagan 2007, Kim, Montrul, and Yoon. 2009). What is more interesting is that the dependency length effects increased as AoA increased, which signals that later arrivals might experience more difficulties with a long-distance dependency than early arrivals. In fact, the actual acceptability rating of the long-distance question with a *that*-clause was as low as that of the *whether*-island-violating construction in the Late group. Therefore, the smaller difference between these two types of long-distance *wh*-questions which differed by the type of the embedded clause might consequently lead to the weaker interaction in the Late group's *whether*-islands. This possibly different degree of difficulty with long-distance *wh*-dependency between bilinguals might then account for their different island effect sizes.

One thing to note is that later arrivals' particular difficulty with a long-distance dependency, compared to the early arrivals, could also be due to their lower proficiency. Although it is unclear to what extent bilinguals' lower proficiency might be responsible for their increased dependency length effects, given that there was a positive correlation between proficiency and island effect size in bilinguals in all experiments, except in Experiment 9 on the *before/after* adjunct island, proficiency difference between groups might play a large role in their decreased island effects and

the increased dependency length effects. In addition, the effect of L2 proficiency on L2 processing is found to be particularly prominent when L1 and L2 show different properties (e.g. Chen et al. 2007). Considering many differences between Korean and English, especially regarding the existence of *wh*-movement, it might be possible that less proficient L1 Korean speakers of L2 English had a difficulty with processing long-distance *wh*-dependency in English, and they became better as their proficiency increases.

Then, how likely is this possibility? Does it really make sense that as the dependency length effect increases, the island effect (i.e. the interaction) decreases? Given common accounts of islands, under both processing and grammar views of islands, this is really surprising. First, under the processing accounts of islands, which argue that an island effect is a reflection of the combined effect of difficulties in processing a long-distance dependency and a complex structure, the higher dependency length effect in bilinguals would be expected to result in higher island effects, instead of weaker island effects, since the effect of one of the two processing factors is larger. Similarly, the grammatical accounts, which claim that an island effect is the sum of the effects of these two factors and an island constraint, the increasing dependency length effect should combine additively with the structure effect and the island constraint, resulting in an increasing island effect. One exception might be that, another factor, structure effect (i.e. a difficulty with an island structure), might be relatively smaller in bilinguals than natives' so that the combined effect of the two factors might be also smaller in bilinguals than that in natives. However, as discussed above, the effect of structure was found to be similar across all groups in all five

experiments, and thus this would not be the case. In sum, both accounts seem to face problems dealing with the results. It seems mysterious that bilinguals' island effects were weaker, particularly for *whether/wh*-islands, despite their bigger dependency length effect.

In sum, this study revealed many interesting findings. First, the results here showed that all bilinguals displayed clear adjunct island effects, but not *whether/wh*-islands in English. However, when we look at the results more closely, such an asymmetry may not actually be present. Instead, the apparent asymmetry may simply be due to bilinguals' weaker island effects, derived from their special difficulty with a long-distance *wh*-dependency. Interestingly, we found that as AoA increased, island effects in bilinguals decreased while the dependency length effects increased. On the other hand, the structure effect stayed about the same in all groups regardless of AoA. This thus suggests a possible effect of bilinguals' difficulty with a long-distance dependency on their island effects. However, the relation between the increased dependency length effects and the decreased island effects is not explained by either processing or grammar views of islands. Both approaches predict a positive correlation between the island effect size and the dependency length effect, leaving the results unexplained. This mystery thus awaits more research.

Chapter 7: Conclusion

This dissertation contributes to a better understanding of cross-linguistic variation in island effects and the learnability problem in island effects by investigating island effects in Korean and Korean-English bilinguals' sensitivity to islands in Korean and English. In particular, two research questions were asked:

(i)   Does Korean exhibit island effects?

(ii)   Do Korean-English bilinguals show native-like behavior for island effects in both Korean and English?

In order to answer these questions, we conducted a series of formal acceptability judgement experiments on island effects in Korean and English, and the major findings of this study are as follows.

First, specifically regarding the first research question, four experiments on a *whether*-island and an adjunct island (-*ttay* 'when') in Korean in Chapter 5 revealed that Korean exhibited the *whether*-island effect, but no adjunct island effect.

To answer the second research question, experiments on islands in Korean in Chapter 5 showed that Korean-English bilinguals (i.e. heritage speakers of Korean) displayed native-like results for (non-)island effects in Korean, in that they showed a clear *whether*-island effect, but no adjunct island effect. In addition, experiments on *whether/wh*-islands and three types of adjunct islands (i.e. *when*, *because*, and *before/after*) in English in Chapter 6 showed that Korean-English bilinguals, grouped according to their AoA (i.e. Heritage: AoA 0-5, Early: AoA 6-10, and Late: AoA 11-14), all displayed adjunct island effects but either the absence of or weaker *whether/wh*-island effects. Their island effect sizes, measured by DD scores, were in

general smaller than natives', indicating overall weaker island effects in bilinguals. In addition, bilinguals showed greater length effects than native controls, suggesting that they had difficulty with long-distance dependencies. There were particularly positive correlations between AoA and length effects, and negative correlations between AoA and island effect sizes. Specifically, as AoA increased, the length effects increased, signaling that later arrivals might experience more difficulty with long-distance dependencies than early arrivals. On the other hand, island effect sizes decreased as AoA increased, showing weaker island effects in later arrivals than early arrivals. The implications of these findings are discussed in the following sections.

7.1.   Cross-linguistic Similarities and Differences in Island Effects in Korean and English

Traditionally, island effects are believed to be absent in *wh*-in-situ languages since there is no overt extraction (e.g. Huang 1982). However, there also has been growing evidence that some *wh*-in-situ languages do show island effects. Korean/Japanese is one of them, but the exact status of islands in Korean/Japanese has been controversial. This suggests that finding out the exact status of island effects in Korean would be an important first step.

However, some properties of *wh*-constructions in Korean, specifically ambiguities in the interpretation of a *wh*-word and *wh*-scope assignment in Korean, raise difficult methodological concerns. Since we cannot be sure how subjects are interpreting stimuli (i.e. matrix scope vs. embedded scope; *wh*-question word vs. indefinite word), their acceptability judgments will not be meaningful, and we cannot

directly transfer methodologies used for *wh*-movement languages to the investigation in Korean. This thus makes the experimental investigation of island effects in Korean very difficult, but despite this, this dissertation demonstrates that an experimental approach to acceptability in Korean *wh*-questions is possible, and there is value in the approach. Experiments on the *whether*-island and the adjunct island in Korean revealed that Korean *wh*-questions show the *whether*-island effects, but not adjunct island effects.

This asymmetry in island effects in Korean was analyzed as a natural consequence of combinations of processing and semantic-discourse structure, particularly regarding restrictions on processing and semantic mapping in the association of a *wh*-word and the operator in Korean. A *wh*-phrase in Korean, an indeterminate phrase, needs to be bound by a proper licensor, and the operator-variable dependency between a *wh*-phrase and an operator is subject to a locality restriction, and violating such a restriction leads to an island effect.

Specifically, the *whether*-island and the adjunct island in Korean differ regarding the presence/absence of a licensor (i.e. question marker) within the clause. A *whether*-phrase contains a question marker, while an adjunct phrase does not. The question marker inside a *whether*-phrase thus would restrict the embedded *wh*-word from taking matrix scope, creating the *whether*-island, while the absence of such marker within an adjunct clause would allow matrix *wh*-scope, yielding the absence of the adjunct island.

The finding here is thus contradictory to the traditional belief that an island effect is a particular property of *wh*-movement and thus *wh*-in-situ languages lack

island effects. The existence of the *whether*-island in Korean demonstrates that there is no such correlation between a *wh*-movement parameter and the existence of island effects. Regardless of the presence of *wh*-movement, languages may exhibit an island effect, and the types of islands a language exhibits may differ between languages.

The results of the experiments on islands in English in Chapter 6 showed what we would normally expect for island effects in English. English showed the *whether/wh*-islands and all three types of adjunct islands (i.e. *when*, *because*, and *before/after*).

Comparing the two languages, for the *wh*-island cases, the two languages behave similarly. Both languages exhibit the *wh*-island cases. There is a similarity in the analyses too. Although the two languages use different mechanisms (i.e. *wh*-movement vs. *wh*-in-situ), there is a single locality principle on an operator-variable dependency operating in both languages. A *wh*-word in languages forms some kinds of a dependency with something in a sentence, and this dependency is subject to a locality restriction, and violating this locality restriction may lead to island effects. The two languages differ in that in *wh*-movement languages, the moved *wh*-word and its trace forms a dependency, while in *wh*-in-situ languages, a *wh*-word in-situ and a scope marker/licensor (e.g. a question marker) builds such a dependency.

For the adjunct island cases, the two languages seem to be very different. English displays all types of adjunct islands, while Korean does not show the adjunct island. The different status of adjunct islands between the two languages might be that the two languages have different types of operator-variable dependencies, and that they have different numbers of dependencies in adjunct clauses. Specifically, for

Korean, this must be because there is no intervening operator involved (unlike *wh-* islands). For English, it must be that there is something bad about movement out of that configuration, which doesn't affect Korean, since there is no movement there. This is of course one possibility, and needs to be explored further with more experimental data, for example, by experimentally testing other types of islands (e.g. subject island), and/or different types of adjunct islands (e.g. headed by *because*), and compare them with the results in this dissertation.

7.2.   Island Effects in Korean-English Bilinguals

First, in the experiments on island effects in Korean in Chapter 5, Korean-English bilinguals displayed native-like results on (non-)island effects in Korean. They all showed the *whether*-island effect, but no adjunct island effect, even though Korean and English are very different in adjunct islands.

Next, the experiments in English in Chapter 6 tested Korean-English bilinguals, grouped by their AoA (i.e. Heritage (AoA 0-5), Early (AoA 6-10), and Late (AoA 11-14)). First, the results showed native-like adjunct islands (i.e. *when*, *because*, and *before/after*). This is particularly noteworthy given that Korean and English are very different regarding adjunct islands, and a transfer effect from one language to the other is commonly observed in bilingual acquisition. However, the picture was a bit different for the *whether/wh*-islands. The effects were either weak or absent in bilinguals. The Late group did not show the *whether*-island, and all bilingual groups did not reveal the *whether*-island.

Nonetheless, although the bilinguals look different than the natives regarding the *whether/wh*-islands, this appears to be due to the fact that island effects generally get weaker in the bilinguals, and not because they lack *whether/wh*-islands. The weaker island effects in bilinguals seemed to be due to their special difficulty with a long-distance *wh*-dependency. Interestingly, there was a negative correlation between AoA and island effects in bilinguals, but a positive correlation between AoA and length effects. However, the structure effects were similar between groups. This all may indicate a possible effect of bilinguals' difficulty with a long-distance dependency on their island effects. This affects all islands, but since the two *wh*-islands are already very weak even for the natives, they largely disappear for the bilinguals. The bilinguals thus differ from the natives in the acceptability of long-distance extraction, but we don't find evidence of differences in islands themselves.

Overall, then, we get a very high degree of uniformity in island behavior between the natives and the bilinguals, in both Korean and English. The question now is what this means.

In Chapter 4, four different approaches to the learnability problems in island phenomena and their predictions for island effects in bilinguals were discussed. In summary, traditional UG-based accounts (Chomsky 1973) assume island effects as violations of certain innate grammatical constraints, which are available to all speakers. Next, the contemporary minimalist grammar accounts (Chomsky 1995) explain island effects as the result of basic properties of a computational system, not something specific to language or grammar. They thus predict the presence of island effects in all speakers regardless of differences in their learning environments. The processing

accounts claim island effects as a result of limited working memory capacity (e.g. Kluender and Kutas 1993a,b, Hofmeister and Sag 2010). Therefore, island effects were expected to be found in all speakers who can process the island constructions. These above three accounts all assume that the input would not play a big role in having island effects. However, input-driven accounts assume that island constraints can be learned from the input using a domain-general learning strategy (Culicover and Jackendoff 2005, Pearl and Sprouse 2012, 2013). They thus allow for some variation in speakers depending on their learning environments.

Our results seem to be compatible with the first three accounts that do not attribute islands effects to the environment, and thus predict that everyone should show island effects, regardless of their environment. On the other hand, the prediction made by the input-driven accounts, which bilinguals might show differences in their island effects because the input plays an important role in island effects, is not confirmed by the results here. Remember that bilinguals here have all various types of learning environments. In particular, heritage speakers are claimed to have restricted and insufficient input of heritage languages, and also of their society language, and are also notorious for variation among speakers. Thus, under the input-driven view, one could reasonably expect bilinguals and native speakers to differ substantially in their island behavior. However, the results showed that island effects in bilinguals were almost identical to native speakers in both Korean and English despite the potentially large difference in input and differences in island effects in English and Korean.

This all then may suggests that island effects are the result of indefeasible properties of the processor and/or the grammar, and it gives some reason to doubt

analyses in which island phenomena derive directly from the input. At a larger level, this dissertation shows how formal acceptability experiments, by allowing fine-grained comparisons across different populations, may be used to explore the linguistic ability of heritage speakers more deeply. In addition, the basic fact uncovered here, that native and heritage speakers show remarkably similar island behavior despite their differing linguistic environments in childhood, shows how the study of these populations may inform ongoing discussions about the nature of island phenomena.

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