Crossover Effects in Second Language Acquisition:

A View from German-English and Korean-English Interlanguage Grammar

Youngjae An

PhD

University of York

Language and Linguistic Science

October 2017

Abstract

This thesis investigates first languages (L1) influence on second language (L2) acquisition of long-distance wh-movement and related constraints governed by Universal Grammar. It thus seeks to integrate L2 syntactic knowledge into L2 knowledge at the syntax-semantics interface in order to find out more about the nature of L2 acquisition, thesis extends its body of research into L2 processing at the syntax-semantics interface. That being so, it allows us not only to explore an ultimate issue of whether L2 speakers have access to Universal Grammar but also to consider how grammar and meaning interact in real time. To this end, this thesis examines crossover phenomena in L2 English, by speakers of German and Korean. A series of experiments are employed in this research: an acceptability judgement task, a truth-value judgement task, and a self-paced reading task. Experiment 1 investigates whether L2 speakers have acquired syntactic knowledge of long-distance wh-movement in English. This experiment, in particular, examines whether L2 speakers are sensitive to locality conditions on wh-movement. Experiment 2 identifies whether semantic knowledge is facilitated by syntactic knowledge in L2 acquisition. Experiment 3–4 examine whether L2 speakers make use of syntax-semantics interface knowledge during online processing. The findings from Experiment 1–4 suggest that that L1 does not influence acquisition and processing of L2.

List of contents

List of Figures

List of Tables

Acknowledgements

My PhD was not on the normal trajectory, and this thesis would not have been possible without my supervisor, Dr Heather Marsden. Thank you is not enough for all of your guidance, encouragement, support, and understanding over the past five years.

This thesis would not have existed without the participants. I would like to thank each and every one of the participants who took part in the experiments that were extremely time-consuming. I would also like to thank Dr Kook-Hee Gil, Dr Tom Rankin, and Professor Melinda Whong for their help with the participant recruitment.

I would like to say a very big thank you to Chandeera Gunawardena for his friendship. I would also thank Pastor Sun Jin Kim for his empathy and for his support. Both made my stay at York less lonely than it could have been.

Finally and most importantly, Mum and Dad, words are not enough to convey what is in my heart, but thank you for being my parents. Also I cannot say real enough thanks to my brother, Woo Seung, and my sister, Sun Ok. I am lucky enough to have them as my brother and my sister.

Author's declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.

Chapter 1

Second Language Acquisition and Processing at the Syntax-Semantics Interface

1.1 Introduction

One of the fundamental issues in second language (L2) acquisition research, since its inception, has been the search for a principled explanation of how grammar and meaning interact in the course of L2 development. Of particular interest I have is how L2 speakers acquire the ability to comprehend the allowed and disallowed meaning of a complex wh-question in English, which is constrained by syntactic principles. One of the well-known constraints is crossover (Postal, 1971), where possible coreference is excluded between a wh-word and a pronoun in (1a), while the coreference is permitted in (1b).

(1) a. Who$_i$ does he$_{*i/j}$ think t_i loves Yengmi?

b. Who$_i$ t_i thinks he$_{i/j}$ loves Yengmi?

This is held to be because in (1a) the wh-word *who* has moved across the pronoun *he*. In (1b), however, the wh-word *who* has not moved across the pronoun *he*. Potentially related to this is the following. Sentences involving a wh-word and a quantifier such as (2) can have different interpretations, depending on whether the wh-word has crossed over the quantifier or not.

(2) a. Who$_i$ did everyone say he met t_i at the party?

Example answers

Everyone met Sue. (Single answer reading)

Juan met Sue, Pedro met John and Julio met Mary. (Pair-list answer reading)

b. Who$_i$ t_i said he met everyone at the party?

Example answers

Everyone met Sue. (Single answer reading)

*Juan met Sue, Pedro met John and Julio met Mary. (Pair-list answer reading)

While (2a) allows a single and pair-list answer reading, (2b) allows only a single answer reading. These subtle differences in interpretation are claimed to be the result of movement with the wh-word *who* crossing over the universal quantifier *everyone* in (2a). In this case, *who* can be interpreted either in its embedded position, which gives the pair-list answer reading, or in its surface position, giving the single answer reading.

Crossover configurations are a good candidate for investigating L2 speakers' knowledge of syntax-semantics interface phenomena. For L2 speakers of English to distinguish the allowed and disallowed meaning of crossover constructions, they must be able to establish the correct mapping of syntactic dependencies onto semantic relations. Suppose that the scope of semantic relations is determined by syntactic c-command, L2 English speakers must come to know that the pronoun *he* in (1a) or the quantifier *everyone* in (2a) c-commands the wh-trace for crossover to arise, which is assumed to be available through Universal Grammar (UG). Furthermore, wh-movement is subject to parametric variation. This in turn implies that potential effects of L1 properties on L2 acquisition are expected to arise in crossover configurations. Thus, it could be difficult and challenging for speakers of wh-in-situ languages to establish the correct scope of semantic relations in (1)–(2).

A body of research has already been conducted at the interpretive interface of wh-questions: interpretation of indeterminate wh-words in L1 English–L2 Korean interlanguage (Choi, 2009); extraction of *combien*, 'how many' in L1 English–L2 French interlanguage (Dekydtspotter, Sprouse, & Swanson, 2001); superiority effects in L1 Japanese–L2 English interlanguage (Hawkins & Hattori, 2006); wh-quantifier interaction in L1 Chinese–L2 Japanese, L1 English–L2 Japanese, and L1 Korean–L2 Japanese interlanguage (Marsden, 2008). Findings from these studies yield different implications for UG and the role of L1

grammar at the syntax-semantics interface, questioning whether the probability of (non)-target-like L2 grammar is due to L1 interference or whether it is a consequence of the particular phenomena under investigation (White, 2011, see also Sorace & Filiaci, 2006; Sorace & Serratrice, 2009; Tsimpli & Sorace, 2006).

Such variation at the syntax-semantics interface of L2 wh-questions can be accounted for by two current competing models of L2 acquisition: the Interpretability Hypothesis (IH; Tsimpli & Dimitrakopoulou, 2007) and the Feature Reassembly Hypothesis (FRH; Ladiere, 2009).

The IH, which is a feature-based version of the Failed Functional Hypothesis proposed by Hawkins and Chan (1997), posits L2 learning problems on the two types of formal features: interpretable features that are responsible for semantic roles and uninterpretable features that are vital for syntactic operations such as movement. Those uninterpretable features are assumed to be the locus of persistent divergence in L2 acquisition beyond a hypothesised critical period if they are not instantiated in the L1. Interpretable features, on the other hand, are unproblematic for L2 acquisition even though they are not selected in the L1. The IH thus predicts L1 interference in development of L2 syntactic representations if uninterpretable features are not shared by the L1 and the L2.

On the other hand, the FRH, which is feature-based model of L2 acquisition based on the Full Transfer/Full Access Hypothesis (Schwartz & Sprouse, 1996), presents a different perspective on L2 learning problems from the IH. The FRH argues that L2 learnability lies in the marked contrasts between L1 lexical/functional features and L2 lexical/functional features. For the FRH, all of the formal features in the L2, regardless of their interpretability or availability in the L1, are eventually reconfigurable based on positive L2 input even if L1-specific features constitute the initial state of L2 acquisition. The FRH predicts global development of L2 syntactic representations by reconfiguring despite the marked contrasts in features between L1 and L2.

To address the questions of the role of L1 grammar, as both hypotheses argue, the present research project planned a comparison between two interlanguages: L1 German–L2 English and L1 Korean–L2 English. Korean, unlike English and German, has no crossover constraints on interpretations of wh-questions as in (1)–(2), due to the absence of overt wh-

movement. Thus, from the feature selection perspective, the German speakers of English may be expected to exhibit a more robust sensitivity to crossover constraints than the Korean speakers of English. From the feature reassembly perspective, on the other hand, crossover constraints may be expected to be unproblematic for both German and Korean speakers of English.

These contrasting outcomes also raise questions about whether L2 speakers make use of abstract grammatical knowledge in online processing. In an effort to flesh out the nature of grammatical development in L2, this thesis pays attention to the development of processing mechanism in L2. Research on L2 processing is on the upswing in attempts to find out more about whether L2 speakers utilise target grammatical knowledge in online sentence processing, and the debates are dominated by Shallow Structure Hypothesis (SSH; Clahsen & Felser, 2006), which argues that L2 speakers do not deploy abstract grammatical knowledge when parsing the target structures; instead, their processing mechanism is heavily rely on lexical, semantic, or pragmatic information. However, a body of research on L2 processing of wh-dependencies in English, for example, provides contrasting views on L2 speakers' use of grammatical knowledge in parsing the target structure. Marinis, Robert, Felser, and Clahsen (2005) find that L2 speakers parse the target dependencies differently from native controls, regardless of whether their L1 has wh-movement; Aldwayan, Fiorentino, and Gabriele (2010), on the other hand, observe that L2 speakers of wh-in-situ languages indeed utilise syntactic information when parsing wh-dependencies. On the basis of the SSH, this study predicts that both German and Korean speakers of English, irrespective of their L1 and proficiency, are incapable of parsing crossover configuration.

Taken together, the present research project raises a fundamental question about the acquisition and processing of the syntax-semantics interface in L2.

(3) Do L2 speakers show divergence in L2 grammars distinct from their L1?

(4) Does the divergence in L2 grammars force shallow processing?

If L2 data provide a positive answer to (3), this conveys the implication for L1 interference in L2 development, and the role of UG is limited in L2 acquisition, supporting the Interpretability Hypothesis; if they don't, this implicates the involvement of UG in L2 acquisition, supporting the Feature Reassembly Hypothesis

If the data yield a positive answer to (4), this implies the effects of L1 on L2 processing, which is not assumed in the Sallow Structure Hypothesis. The general hypotheses and questions are tested by means of a series of offline and online tasks. The experiments are outlined in the next section.

1.2 Experiments Overview

The current research project consists of a series of experiments: an acceptability judgement task (AJT), a truth-value judgement task (TVJT), and a self-paced reading task (SPRT). In the experiments, the same participants were invited to take part. Those experiments are introduced in each independent chapter. Chapter 2 explores L2 syntactic knowledge of long-distance wh-movement in English, making use of the AJT. Chapter 3 examines L2 knowledge of phenomena at the syntax-semantics interface (i.e., crossover phenomena), employing the TVJT. The crossover phenomena involve strong crossover constraint and wh-quantifier scope ambiguity, as already exemplified in Section 1.1. Chapter 3 moves on to L2 processing of strong crossover configurations and wh-quantifier scope relations, carrying out the SPRT. Two versions of the SPRT was created: the SPRT 1 was designed to investigate online processing of the strong crossover constraint and the SPRT 2 was created to examine online processing of the weak crossover constraint (i.e., wh-quantifier scope ambiguity)

In addition to the main tasks, the L2 speakers were given a further task, the Quick Placement Test (QPT; Oxford University Press, 2001), in order to measure their proficiency in English. Before taking the tasks, participants were asked to fill out a questionnaire on their language learning background as well as demographic information. The tasks were administrated in the following order: the TVJT, the AJT, the SPRT 1, the SPRT 2, and the QPT. This was done in order to divert, as far as possible, participants' conscious attention to the structures under investigation since the TVJT and the SPRT 2 shared similar factors or properties with each other.

For the L2 speakers, the experiment lasted approximately two to two hours and a half. For native speakers of English, it took approximately an hour and a half. Participants were paid £10 for their participation. All participants were tested individually, and the experiment was carried out in a quiet room at the University of York, the University of Leeds, the University of Sheffield, the University of Vienna, and Vienna University of Economics and Business.

Chapter 2

The Syntax and Second Language Acquisition of Wh-movement

2.1 Introduction

This chapter introduces and discusses typological distinction as to the formation of wh-questions between English, German, and Korean. Touching on the syntactic nuts and bolts of wh-question formation, this chapter provides empirical evidence whether L2 speakers of English acquire long-distance wh-movement in English, which is a cornerstone of this thesis. The central questions in the acquisition of long-distance wh-movement in English have been whether L2 speakers are able to acquire language specific properties that trigger long-distance wh-movement (5a) and observe constraints that rule out long-distance wh-movement (5b).

(5) a. Who did Madonna say she dated after years of friendship?

b. *Who did David start the rumour that Nicole had an affair with?

L2 speakers' ability to acquire long-distance wh-movement in English has been widely documented in L2 acquisition research. And yet, the results have been mixed, leading to different conclusions over the specific issues (Hawkins, 2001; White, 2003; Belikova & White, 2009). As for L2 speakers of wh-ex-situ languages, there is a general consensus that they are able to acquire constraints on wh-movement in English due to transfer benefit from their L1s. As for L2 speakers of wh-in-situ languages, on the other hand, L2 researchers are struggling to reach a consensus. Nonetheless, the appeal of long-distance wh-movement is that it exhibits parameterisation between languages.

In addition to the crosslinguistic differences, long-distance wh-questions in English involve complex syntax for L2 speakers, especially for L2 speakers of wh-in-situ languages. That is, long-distance wh-questions are derivationally complex in the sense that they involve success cyclic movement: Higher processing cost is incurred during parsing as a result

(Slavkov, 2015). Most importantly, interlanguage grammars, in principle, have little empirical base for inducing ungrammatical constructions. In other words, lack of accessibility to constraints on wh-movement constitutes a learnability problem for L2 speakers of wh-in-situ languages since the relevant positive input is available nowhere else. Hence, syntactic properties displayed by long-distance wh-movement have been a good candidate for investigating UG accessibility in L2 acquisition. If UG is a roadmap in the development of L2 grammars, universal principles such as Subjacency would be activated in analysing sentences violating constraints on wh-movement. If UG is not involved in L2, L2 speakers would be tempted to associate the target questions with long-distance wh-movement to alternative syntactic representations from their L1s, which are more familiar and less complex to them: Wh-movement in L2 speakers' grammars is considered not to be the product of genuine syntactic wh-movement (Hawkins, 2001; Hawkins & Hattori, 2006; White, 1992). For L2 speakers to acquire long-distance wh-movement in English, they have to attain mastery of the following core requirements that underlie the acquisition process:

I. (Re)setting relevant features of the target language that trigger wh-movement

II. Obeying a strict locality condition in successive cyclic wh-movement

III. Learning additional language-specific phenomena displayed by wh-movement (e.g., subject-auxiliary inversion, pied-piping, etc.)

The first requirement is relevant to the issues of whether L2 speakers are able to reset or reassemble parameters that are absent or different from their L1s, observing lexical properties of wh-words in English. The second requirement is also related to the parametric variations. That is, L2 speakers are required to figure out the type of long-distance movement used in English and its locality condition on top of the options available in their L1s such as long-distance scrambling in German and Korean. The third requirement is beyond parameterisation. It is rather a diagnostic tool as to whether the shape of long-distance wh-movement in L2 speakers' grammars can be considered to be the product generated by wh-movement in English. The discussion in this chapter will demonstrate that

acquisition of syntactic long-distance wh-movement arises from the accomplishment of those three requirements. The evidence obtained in this chapter will prove whether second language syntax is UG-constrained at all times.

This chapter, based on Cable (2010), offers a Q(uestion)-particle movement approach to long-distance wh-question formation, which is rarely touched on the L2 literature. The learning tasks described above will be discussed on the basis of Q-based theory of movement. It is however beyond this thesis to explore a comprehensive analysis of wh-questions across languages since the crossover constraints are at the heart of this research project. In the following, I begin with some background of wh-typology with reference to Q-particles.

2.2 Q-particle and typology of wh-questions

Since Katz and Postal (1964), it has been generally assumed that the presence of a Q-particle (or Q-morpheme) is considered as a mechanism for a universal formulation of wh-questions in natural languages. And yet there are crosslinguistic differences in the formation of wh-questions: Languages that have wh-movement (hence classified as wh-ex-situ languages) and languages that do not have wh-movement (hence classified as wh-in-situ languages). This typological variation can be attributed to whether or not the Q-particle is morphologically realised in the surface structure.

Such assumption was first made in Baker (1970). Baker notes that the position of yes-no particles is an indicator that determines whether a language has movement of a wh-word. Based on this observation, Baker (1970, p. 207) hypohesises that languages that have a clause-initial Q-particle for a yes-no question allow movement of a wh-word to the front of the clause. In addition, Baker assumes that wh-movement in English is triggered by a null Q-particle in the clause-initial position. For justification of his argument, Baker further claims that in English interrogative words such as *if* and *whether* are instances of morphological realisation. It is thus impossible to have both a Q-particle such as *if* and *whether* and a wh-word in an embedded question as in (6).

(6) a. *We're not sure whether who Bill saw.

b. *We're not sure if who Bill saw.

c. We're not sure who Bill saw.

(Baker, 1970, p. 211)

By conrtrast, wh-in-situ languages such as Japanese have a clause-final Q-particle for a yes-no question (7b); therefore, no wh-movement operates (7c).[1]

(7) a. Kore-wa anata-no desu.
this.as-for yours is
'This is yours.'

b. Kore-wa anata-no desu-ka?
this.as-for yours is-Q?
'Is this yours?'

c. Dare desu-ka?
who is-Q?
'Who is it?'

(Baker, 1970, p. 211)

[1] Baker's subject wh-question in Japanese (7c) might be somewhat whether its appearance is involved in wh-movement. It is likely that object wh-question (i) would provide better evidence for the absence of wh-movement in Japanese. Nevertheless, I keep Baker's credit intact.

(i) Koji-ga nani-o kaimasita ka?
Koji-NOM what-ACC bought.polite Q
'What did Koji buy?'

Baker (1970, p. 215) further argues for the existence of the Q-particle by proposing that the Q-particle functions as an operator that binds one or more wh-words. Thus, the scope ambiguity in (8) is resolved by the Q-particle that binds different wh-words as in (9).

(8) Who remembers where we bought which book?

(9) a. $[Q_{i/k}$ who_i remembers $[Q_j$ $where_j$ we bought which $book_k]]$

b. $[Q_i$ who_i remembers $[Q_{j/k}$ $where_j$ we bought which $book_k]]$

(Baker, 1970, p. 216)

According to Baker, (10a) would be the possible answer for (9a); for (9b), the possible answer would be (10b).

(10) a. John and Martha remember where we bought which book.

b. John remembers where we bought the physics book and Martha and Ted remember where we bought *The Wizard of Oz*.

(Baker, 1970, p. 215)

Elaborating on Baker's (1970) analysis, Bresnan (1972) proposes that the Q-particle in English should be reconsidered as an instance of complementisers. She observes that in English the Q-particle and other complementisers such as *for* and *that* are all complementary distribution as in (11). Since Bresnan, the Q-particle has been assumed to be in the interrogative complementisers C in the derivation of wh-questions.

(11) a. *I know that whether he came.

b. *For whom to own a rifle doesn't affect me.

c. *It doesn't matter to them whether that you march.

d. I asked what for John to do.

(Bresnan, 1972, p. 30)

Cheng (1991), however, argues that not all languages need to have the Q-particle in the interrogative C. Putting forward the Clausal Typing Hypothesis, Cheng claims that wh-ex-situ languages do not have Q-particles base-generated in C whereas wh-in-situ languages have Q-particles base-generated in C although they can be null in certain languages such as Chinese. That is, wh-in-situ languages type a clause as a wh-question by the use of the Q-particle base-generated in the interrogative C, rendering wh-movement resource unavailable. In wh-ex-situ languages, on the other hand, clause typing is by moving a wh-word to Spec of CP. This predicts that no languages will employ both wh-movement and Q-particles in forming wh-questions: Wh-ex-situ languages do not have Q-particles, and wh-in-situ languages have Q-particles. Cheng's work looks noticeable, making predictions about wh-typology based on whether languages possess Q-particles.

Cheng's generalisation, however, has the limited explanatory power to describe typological appearances of wh-questions across languages. Bruening (2007), based on the findings of Ultan (1978) and Dryer (2004), points out that there is no correlation between wh-in-situ languages and Q-particles. That is, there are wh-ex-situ languages with Q-particles, and there are wh-in-situ languages without Q-particles. In particular, Dryer's (2004) database covering more than 500 languages presents such evidence. Dryer provides the number of languages with respect to the relation between Q-particle and wh-movement as reported in Bruening (2007, p. 142).

Table 1

The Relation between Wh-movement and Q-particles across Languages

Types	Wh-ex-situ languages	Wh-in-situ languages
Q-particles	123 (70%)	258 (64%)
No Q-particles	53 (30%)	143 (36%)
Total	176	401

Table 1 clearly shows that the relationship between wh-in-situ languages and Q-particles does not hold in Dryer's database: 70% of wh-ex-situ languages and 64% of wh-in-situ languages have Q-particles. What is crucial in Drayer's database is that 36% of wh-in-situ languages do not have Q-particles. Based on Dryer's database, Bruening shapes the characteristics of languages that do not employ Q-particle in wh-interrogatives. Bruening (2007) states that "languages considered to lack question particles are the (a) languages with interrogative morphology, (b) languages that use a different word for questions, (c) languages that only mark polar questions intonationally, and (d) languages that do not distinguish polar questions even intonationally" (p. 143). Cheng's generalisation cannot hold for any given situation.

With the advent of Minimalist syntax, Chomsky (1995) proposes that in all languages, Q-feature is present in the interrogative C. His assumption presumes that the parametric variation of wh-question formation is determined by the strength of Q feature on the interrogative C. Chomsky further argues that the strong feature must be checked and eliminated for derivation to converge under Spec-head relationship that serves as a tool for agreement and movement; consequently, the wh-word that has a wh-feature undergoes movement to Spec of CP in order to check and eliminate the strong Q-feature on C. This predicts that since the Q-feature in wh-ex-situ languages is strong, the strong Q-feature is checked by overt wh-movement to Spec of CP for convergence. In contrast, the Q-feature in wh-in-situ languages is weak; hence, no wh-movement is required to check the weak Q-feature on C for convergence. For the derivation to converge, the Q-particle on the interrogative C unselectively binds the wh-word. The wh-word is then interpreted as an interrogative expression and pronounced in situ.

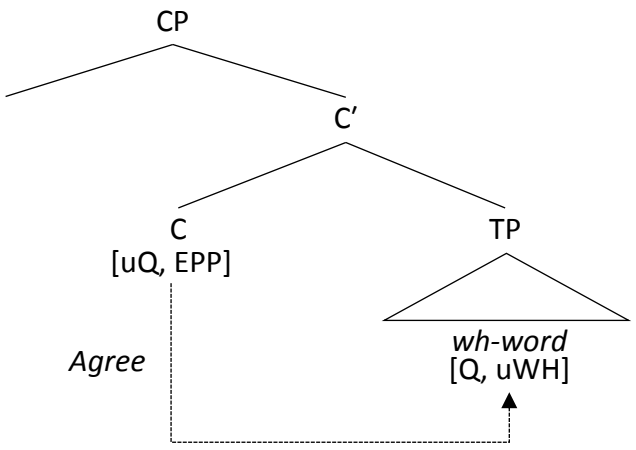
Chomsky (2000), however, relinquishes his 1995 notion of wh-parameterisation and proposes that wh-movement has the following procedures: Wh-word has an uninterpretable wh-feature [uWH] and an interpretable Q-feature [Q], while an interrogative C has an uninterpretable Q-feature [uQ] and an uninterpretable EPP-feature.[2]

[2] The [uWH] on the wh-word is postulated by virtue of Chomsky's (2000, 2001) Activity Condition, which requires that a probe and a goal must have uninterpretable features for Agree to apply. As the [uWH] on the wh-word is nothing but a postulation – Chomksy (2001: 48n57) is, in fact, not clear whether the wh-word has the [uWH], the feature composition of the elements that are involved in the derivation of wh-questions differs from researcher to researcher. For example, Pesetsky and Torrego (2007) assume that the wh-phrase has an

Under the probe-goal system, an Agree relation is established between the probe, interrogative C with [uQ] and the goal, the wh-phrase with [Q]; consequently, the uninterpretable features on the probe and the goal are valued and deleted for interface convergence (12a).[3] Still the uninterpretable EPP-feature on the probe, the interrogative C remains undeleted, which is satisfied by filling its specifier position. Thus, the movement of the goal, the wh-word is followed to satisfy the EPP on C and upon movement, the EPP is deleted (12b).

(12) Wh-movement: first Agree, then Move

a.



---

uninterpretable valued Q-feature; the interrogative C has an interpretable unvalued Q-feature. Yeo (2010) and Citko (2014) add terminological senses of Chomsky's original assumption. For Yeo, the wh-word has an uninterpretable wh-feature and an interpretable Q-feature; the interrogative C has an interpretable wh-feature and an uninterpretable Q-feature. For Citko, on the other hand, the wh-word has an interpretable wh-feature and an uninterpretable Q-feature; the interrogative C has an interpretable Q-feature and an uninterpretable wh-feature.

[3] The definition of Agree and Probe-Goal System are given below (Chomsky, 2000, p. 122).

(ii) Agree

The erasure of uninterpretable features of probe and goal

(iii) The probe-goal system

Matching is a relation that holds of a probe P and a goal G. Not every matching pair induces Agree. To do so, G must (at least) be in the domain D(P) of P and satisfy locality conditions. The simplest assumptions for the probe-goal system are given below.

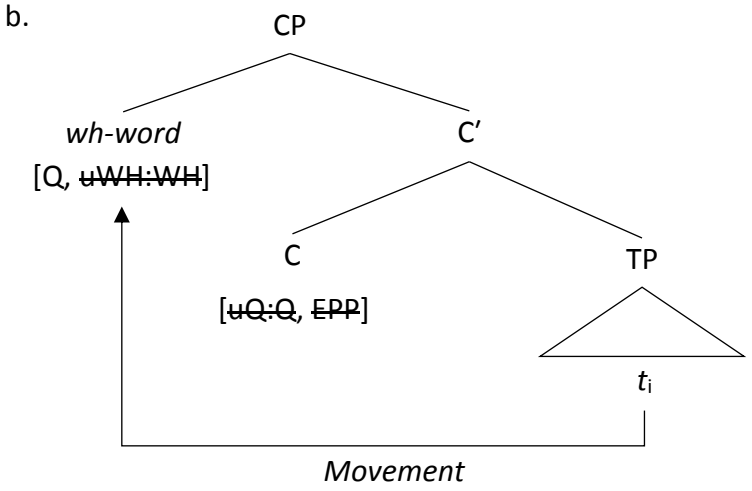
a. Matching is feature identity.

b. D(P) is the sister of P.

c. Locality is reduced to "closest c-command"

D(P) is the c-command domain of P, and a matching feature G is closest to P if there is no G' in D(P) matching P such that G is in D(G').

b.



For Chomsky, The EPP assignment is optional; hence, only when the interrogative C is associated with the EPP wh-movement is enforced. When the interrogative C does not bear the EPP, no overt wh-movement occurs. Wh-movement parametrisation can be thus attributed to the presence or the absence of the EPP on C. In wh-ex-situ languages, the EPP is present on C, which triggers movement of the wh-word to its specifier position. In wh-in-situ languages, on the other hand, the EPP is absent on C, which allows the wh-word to remain in situ.

Cable (2007, 2010) captures a relatively novel wh-typology based on Tlingit, a language that is assumed to belong to wh-ex situ languages with Q-particles. Cable develops a new theory of wh-movement in wh-ex-situ languages. He observes that Tlingit wh-questions are formed by fronting both the wh-word and the Q-particle *sá* (13a). By contrast, sentence (13b) is ill-formed since both the wh-word and the Q-particle remain in situ.

(13) Fronting both Wh-word and Q-particle

a. [Daa sá] i tuwáa sigóo [t_i yéi ysaneiyí]?

what Q your spirit it.is.glad you.do.it

'What do you want to do?'

b. *I tuwáa sigóo [daa sá yéi ysaneiyí]?

your spirit it.is.glad what Q you.do.it

(Cable, 2010, p. 29)

Furthermore, if the Q-particle is left in its base position (14b) or if the Q-particle is fronted without the wh-word (15b), the sentence becomes ill-formed.

(14) No Fronting Wh-word Alone

a. Daa sá iyatéen?

what Q you.can.see.it

'What can you see?'

b. *Daa iyatéen sá?

what you.can.see.it Q

(Cable, 2010, p. 35)

(15) No Fronting of Q-particle Alone

a. Daa sá i éesh aawaxáa?

what Q your father he.ate.it

'What did your father eat?'

b. *Sá i éesh daa aawaxáa?

Q your father what he.ate.it

(Cable, 2010, p 39)

Upon further investigation, Cable observes that the Q-particle *sá* can be separated from a wh-word (16a)–(17a). This, however, does not mean that the particle *sá* can be located

anywhere to the right of the wh-word. If the Q-particle *sá* is located between a wh-word and a phrasal element, the sentence is ill-formed (16b)–(17b).

(16) No Extraction of Wh-possessor

a. Aadóo yaagú sá ysiteen?
who boat Q you.saw.it
'Whose boat did you see?'

b. *Aadóo sá yaagú ysiteen?
who Q boat you.saw.it
'Whose boat did you see?'

(Cable, 2010, p. 44)

(17) No Extraction of Wh-determiner

a. Daakw keitl sá asháa?
which dog Q it.barks
'Which dog is barking?'

b. *Daakw sá keitl asháa?
which Q dog it.barks
'Which dog is barking?'

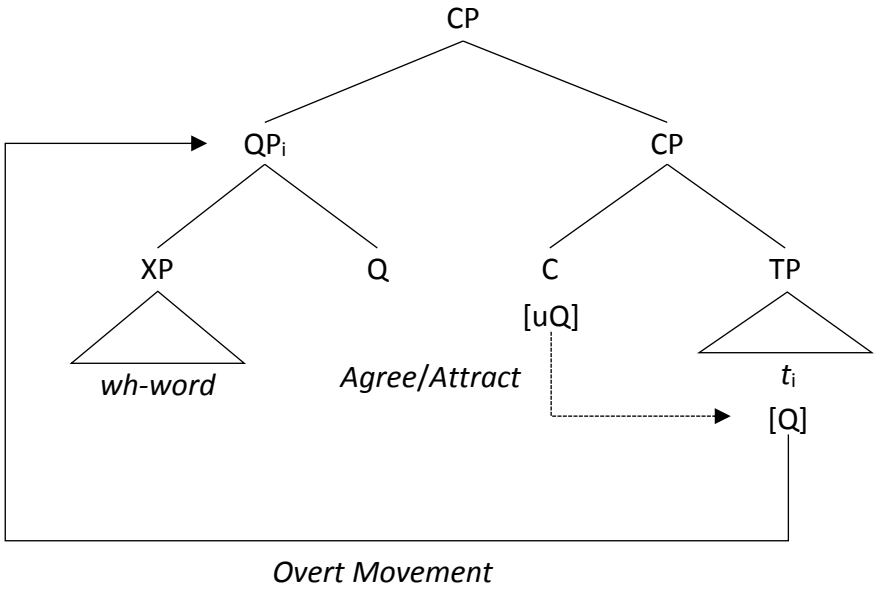
(Cable, 2010, p. 45)

In order to explain the ill-formedness of (16b)–(17b), Cable (2010) proposes a condition on the placement of the Q-particle, the QP-Intervention Condition, which states that "a QP cannot intervene between a functional head and a phrase selected by that functional head" (p. 57). The QP-Intervention Condition would predict that (16b) is ill-formed since the QP intervenes between the wh-possessor and its complement. The QP-intervention Condition

also rules out (17b) because the QP intervenes between the wh-determiner and its complement.

These data motivate Cable (2010) to propose that in Tlingit wh-questions, the Q-particle takes the wh-word or a phrase containing the wh-word as its complement. After merging with the-wh-word or the phrase containing the wh-word, the Q-particle projects a QP layer. Cable assumes that wh-movement in Tlingit is determined by the agreement relation between the interrogative C and the QP. Consequently, it is the entire QP that undergoes movement to Spec of CP. Hence, neither the wh-word nor the Q-particle alone can be fronted as in (14)–(15). This also has an important implication for the pied-piping structures in (16)–(17). Cable claims that pied-piping phenomena in wh-ex-situ languages can be viewed as instances of phrasal movement, QP-movement. Under Cable's system, any syntactic theory that is implemented for pied-piping mechanism such as feature percolation is reduced to pure syntactic operation, QP-movement. For Cable, movement of wh-words in Tlingit is, after all, a secondary effect brought by Q-particle movement. Cable, along the lines of Q-particle movement by Hagstrom (1998) and Kishimoto (2005), proposes (18) as an analysis of Tlingit wh-questions.

(18) Structure of Simplex Wh-question in Tlingit



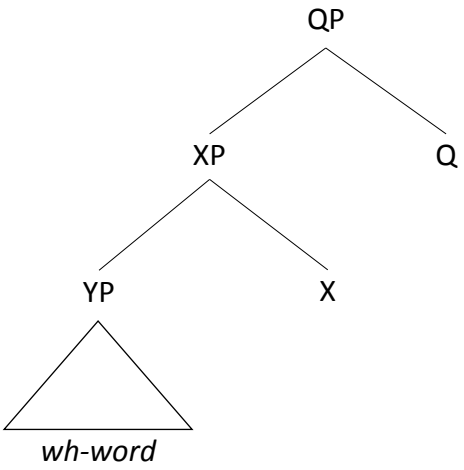
(Cable, 2010, p. 38)

As illustrated in (21), the interrogative C with an uninterpretable Q-feature probes a goal with a matching interpretable instance of the Q-feature. Cable assumes that the QP projection carries an interpretable Q-feature born by the Q-particle. Thus an Agree relation holds between the QP and the interrogative C with an uninterpretable Q-feature under the probe-goal system (Chomsky, 2000, 2001). This agreement operation is followed by movement of the goal. Since the QP is the goal, the QP that contains the wh-word undergoes overt movement to Spec of CP.

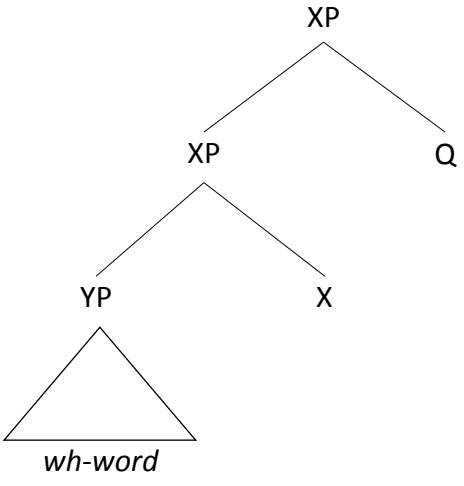
Under the analysis in (21), Cable argues that wh-words, Q-particles and the interrogative complementiser C are universals in the formation of wh-questions across languages. In all languages Q-particles – whether they are phonologically present or absent – are attached to wh-words. That being so, it is not the wh-word but the Q-particle that establishes a direct syntactic relation with the interrogative C. Following this line of reasoning, Cable proposes the Q-projection parameter. The Q-projection parameter predicts that crosslinguistic variation in wh-question formation lies in the way the Q-particle merges with a phrasal layer XP that contains the wh-word.

(19) The Q-projection Parameter (Cable, 2010, pp. 146–147)

a. Wh-ex-situ



b. Wh-in-situ languages



Given the distribution of Tlingit Q-particle *sá*, Cable proposes that the Q-particle in wh-ex-situ languages takes the XP as its complement, and a QP is projected from the Q-particle

(19a). In wh-in-situ languages, on the other hand, the Q-particle is adjoined to the XP, and this XP is projected from its head (19b). To support the Q-adjunction nature of wh-in-situ languages, Cable first observes that the Japanese/Korean Q-particle *ka* is different from Tlingit Q-particle *sá* in the sense that it is placed at the clause-final position as in (20)–(21).

(20) Japanese Q-particle at the Clause-final Position

John-ga nani-o kaimasita ka ?

John-NOM what-ACC bought.polite Q

'What did John buy?'

(Cable, 2010, p 89)

(21) Korean Q-particle at the Clause-final Position

Eti-ey sensayng-nim-i ka-sipni- kka ?

Where.to teacher-HON-NOM go-HON-Q

'Where did the teacher go?'

(Cable, 2010, p. 89)

Cable further sketches the placement of Q-particles in the wh-indefinites of Japanese and Korean in order to exhibit contrasts between Japanese/Korean *ka* and Tlingit *sá*.

(22) Japanese Q-particle between a Postposition and its Complement

Taro-wa doko-ka-e itta

Taro-TOP where-Q-to went

'Taro went somewhere.'

(Cable, 2010, p. 91)

(23) Korean Q-particle between a Postposition and its Complement

Ku-nun eti-eyn-ka-ey ka-ess-ta.

he-TOP here-LINK-Q-to go-PST-DEC

'He went somewhere.'

(Cable, 2010, p. 91)

In (22)–(23), the Q-particle *ka* is positioned between the postposition *e*/*ey* 'to' and its complement *doko*/*eti* 'where'. Since the Q-particle is assumed to be adjoined to the complement of the postposition, no projection of the Q-particle violates the QP-intervention Condition. Based on these observations, Cable concludes that Q-particles in Japanese and Korean are Q-adjunction languages since they can be located in the position where the Q-particles in Tlingit cannot.

Another parameter that affects wh-typology includes what Cable termed as the Q-movement parameter. The Q-movement parameter concerns whether the Q-particle undergoes overt movement or covet movement. In the overt Q-movement languages, the Q-particle or the QP is raised into a peripheral position. In the covert Q-movement languages, by contrast, the Q-particle or the QP remains in situ. Pursuing these ideas, Cable (2010) proposes that overt movement of wh-words hinges largely upon the two parameters: the Q-projection parameter and the Q-movement parameter. Cable argues that all wh-ex-situ languages are held to be the Q-projection languages with overt Q-movement. Such typological characteristics require that both the wh-word and the Q-particle undergo movement to Spec of CP.

Cable's view on wh-in-situ languages somewhat differs from Hagstrom (1998) and Kishimoto (2005). Cable argues that wh-in-situ languages should be divided into two types. Cable's typology for wh-in-situ languages results from the differences in the distribution of Q-particles across wh-in-situ languages. Cable observes that while Japanese *ka* can appear at the clause-final position as in (24), Sinhala *da* patterns with Tlingit *sá*, as in (25)–(27).

(24) Ability for Japanese *ka* to Appear at the Clause-final Position

a. John-ga nani-o kaimasita ka?

John-NOM what-ACC bought.polite Q

'What did John buy?'

(Cable, 2010, p. 89)

(25) Inability for Sinhala *da* to Appear at the Clause-final Position

a. Chitra monawa da gate?

Chitra what Q buy

'What did Chitra buy?'

b. *Chitra monawa gatta da?

Chitra what buy Q

(Kishimoto, 2005 reported in Cable, 2010, p. 87)

(26) No Q between a Wh-possessor and its Complement

a. Chitra [kaa-ge amma] da daekke?

Chitra who-GEN mother Q saw

'whose mother did Chitra see?

b. *Chitra [kaa-ge da amma] daekke?

Chitra who-gen Q mother saw

(Kishimoto, 2005 reported in Cable, 2010, p. 88)

(27) No Q between a Wh-determiner and its Complement

a. Chitra [mona pota] da gate

Chitra what book Q bought

'What book did Chitra buy'

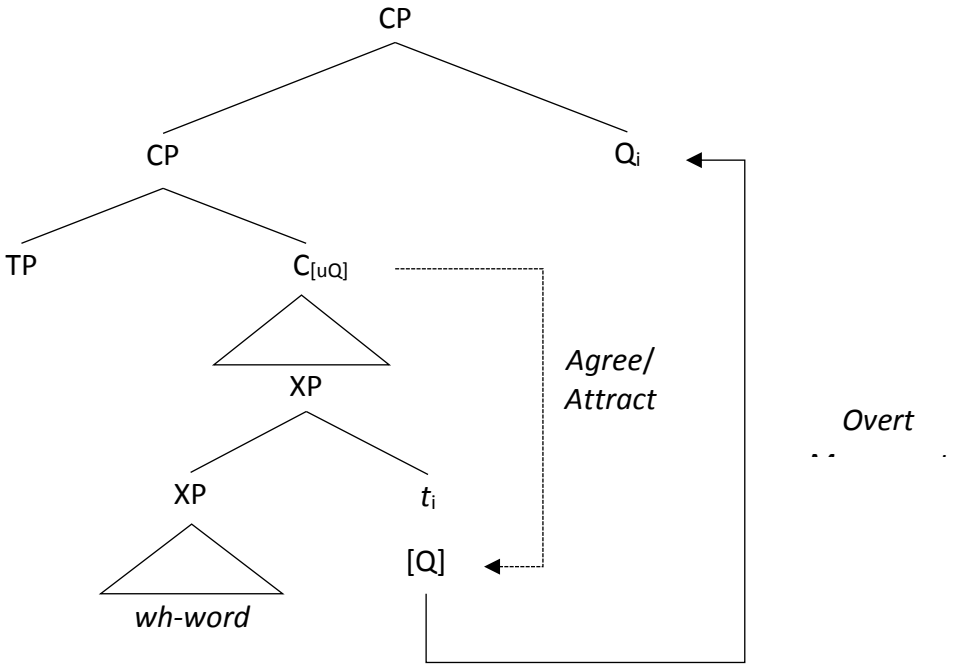
b. *Chitra [mona da pota] gate?

Chitra what Q book bought

(Kishimoto, 2005 reported in Cable, 2010, p. 88)

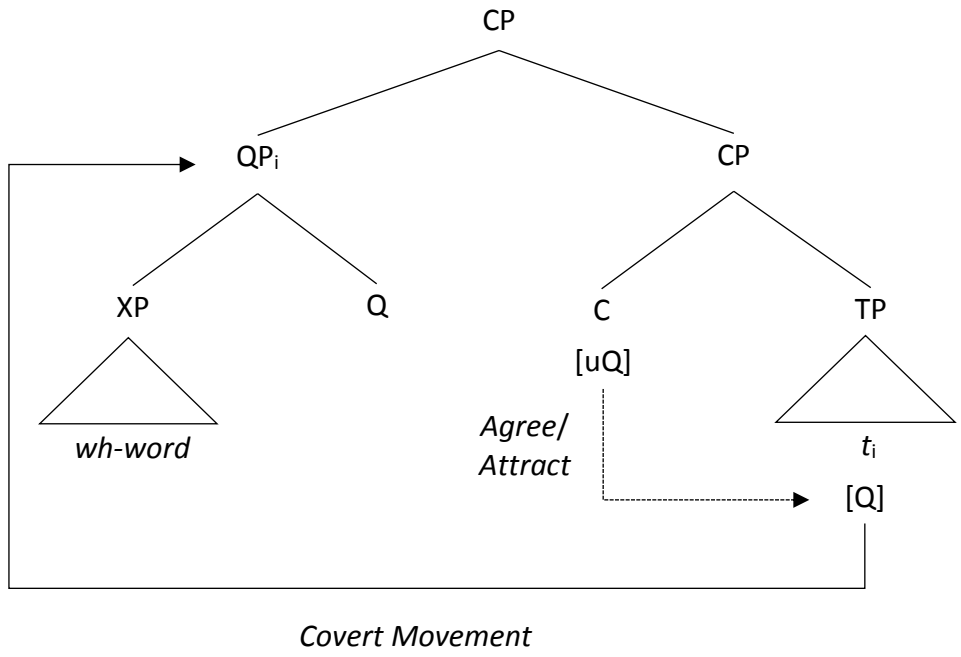
Under these observations, Cable concludes that Japanese-type languages are to be the Q-adjunction languages with overt Q-movement, while Sinhala-type languages are to be the Q-projection languages with covert Q-movement. As a consequence, in Japanese-type languages, the Q-particle alone undergoes movement to a clause-final position (28). In Sinhala-types languages, on the other hand, both the wh-word and the Q-particle remain in situ; instead, they move covertly to Spec of CP at LF (29).

(28) Structure of Simplex Wh-question in Japanese-type Languages



(Cable, 2010, p. 85)

(29) Structure of Simplex Wh-question in Sinhala-type Languages



(Cable, 2010, p. 86)

The third parameter that Cable proposes in his Q-based theory is the Q-pronunciation parameter. Assuming that in a given language the Q-particle can be phonologically visible or invisible, Cable argues that the Q-pronunciation parameter is an independent factor that affects only the surface form of syntactic output. For example, in some wh-ex-situ languages such as English and German, Q-particles are phonologically absent. In other wh-ex-situ languages such as Tlingit, Q-particles are phonologically present. In the same vein, in some wh-in-situ languages such as Japanese and Korean, Q-particles are phonologically visible. In other wh-in-situ languages such as Tibetan, Q-particles are phonologically invisible (Cable, 2007, p. 361). As evidenced by Dryer's (2004) database, this is not a surprise.

In addition to the three major parameters, Cable releases his fourth parameter, the agreement parameter that plays a crucial role in differentiating features assigned to Q-particles and wh-words.[4] The agreement parameter posits that languages differ as to

[4] The fifth parameter in Cable's Q-based theory is the multiple wh-question parameter, which is about whether a language allows multiple Q-particles in multiple wh-questions. The multiple wh-question parameter concerns

whether Agree takes place between a wh-word and a Q-particle. For example, in languages such as English and German, the Q-particle must agree with the wh-word that it c-commands (hence classified as the Q/Wh-agreement languages). In languages such as Japanese, Korean, and Tlingit, on the other hand, the Q-particle does not need to agree with the wh-word that it c-commands (hence classified as the non-agreement languages). Such predictions were born out from the contrasts in pied-piping structures found in English and Tlingit. Under Cable's system pied-piping structures in wh-ex-situ languages are viewed as a consequence of Q-movement that drags its complement, the wh-phrase, into the Spec of CP. Thus, pied-piping structures in English are analysed as in (30). The same analysis can be carried out for Tlingit pied-piping structures; the Q-particle *sá* cannot be located between wh-possessor and its complement, yielding ill-formed sentence as in (31).

(30) The Pied-piping Structures of English

a. Whose father's cousin's uncle did you meet at the party?

b. [$_{QP}$ [[[[whose] father's] cousin's] uncle] Q] did you meet at the party?

(Cable, 2010, p. 143)

(31) The Pied-piping Structures of Tlingit

a. [$_{QP}$ [$_{DP}$ Aadóoyaagú] sá] ysiteen?

who boat Q you.saw.it

'Whose boat did you see?'

b. *[$_{DP}$ [$_{QP}$ Aadóo sá] yaagú] ysiteen?

who Q boat you.saw.it

(Cable, 2010, p. 143)

---

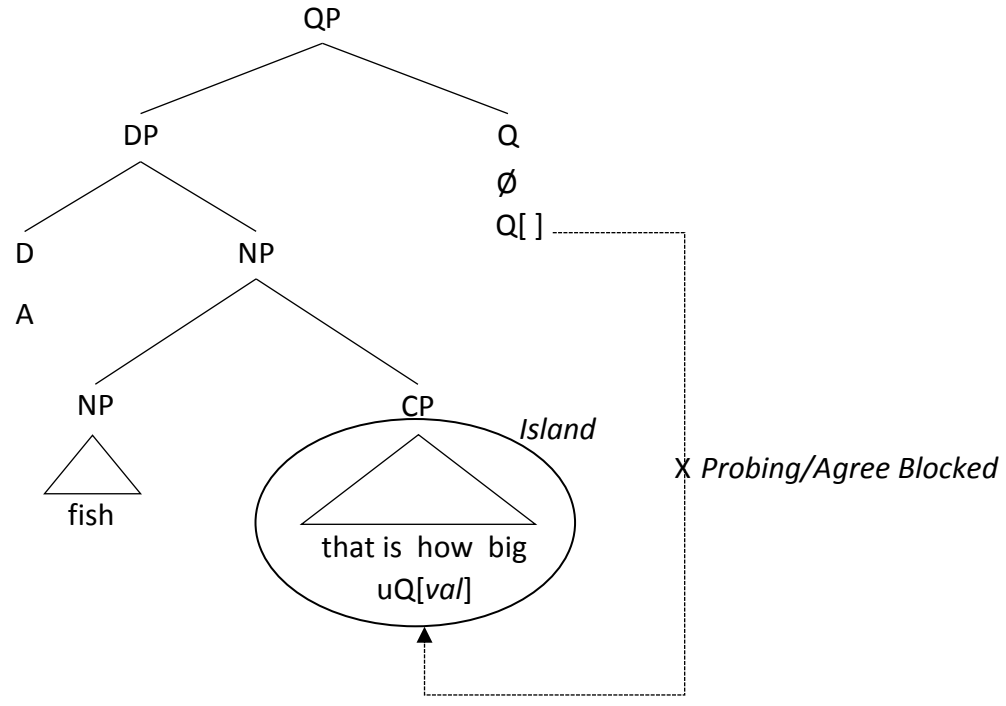
superiority effects and intervention effects crosslinguistically. This parameter is beyond the scope of this thesis; hence, it will remain silent.

However, the picture is not as simple as it looks. Cable observes that while English do not allow pied-piping past syntactic islands (32), Tlingit permits pied-piping past syntactic islands (33). In order to capture the variation on pied-piping structures in wh-ex-situ languages, Cable, adopting Pesetsky and Torrego's (2007) feature-valuation system, proposes that in Q/Wh-agreement languages such as English and German the Q-particle possesses an interpretable and unvalued Q-feature Q[ ]; the wh-word has an uninterpretable and valued Q-feature uQ[*val*]. Under the probe-goal system, Agree will assign values to uninterpretable/unvalued features on the two elements. In (32b), however, the relative clause island blocks the agreement between the null Q-particle and the wh-word and the derivation will not converge at LF due to the failure of valuation of uninterpretable/unvalued features on both. Hence the pied-piping structure (32a) is ill-formed.

(32) No Pied-piping past Islands in English

a. *A fish that is how big do you want?

b.



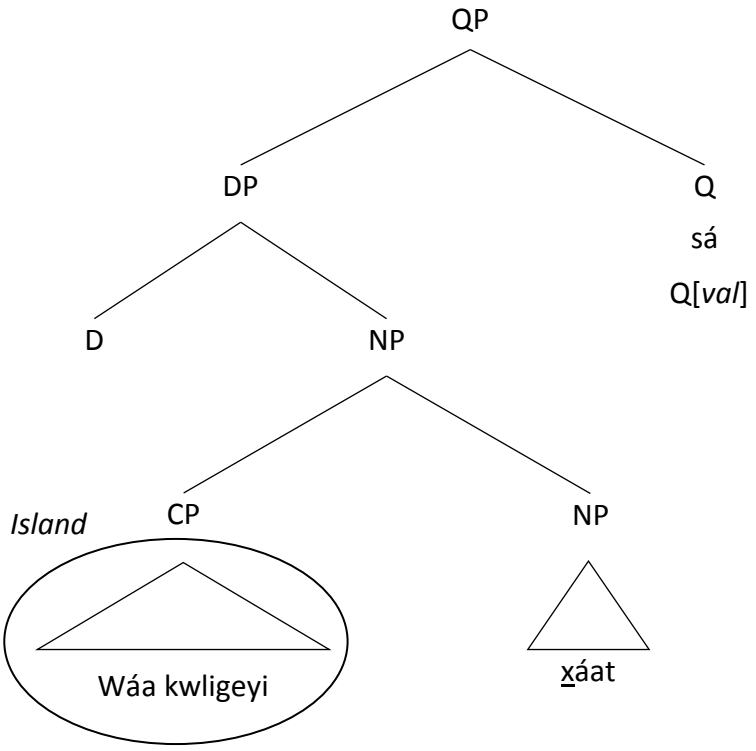
(Cable, 2010, p.148)

Cable, by contrast, assumes that in non-agreement languages such as Japanese, Korean, and Tlingit the Q-particle has an interpretable and valued Q-feature Q[*val*]; the wh-word does not have any type of Q-feature. Since the presence of Q[*val*] on the Q-particle and the blemished wh-word do not meet Chomsk'y (2000, 2001) Activity Condition, no agreement will apply between the Q-particle and the wh-word (33b). Nonetheless, the derivation will converge at LF due to the presence of value on the Q-feature, which means that non-agreement languages allow a Q-particle to merge with a wh-word inside an island. Hence the structure (33a) is well-formed.

(33) No Pied-piping past Islands in Tlingit

a. Wáa kwligeyi xáat sá i tuwáa sigóo?
how it.is.big.REL fish Q your spirit.at it.is.glad
'How big a fish do you want?'

b.



(Cable, 2010, p. 148)

The ban on pied-piping in wh-ex-situ languages has been viewed as a consequence of Q/Wh-agreement. The mechanism behind this constraint can be attributed to a distinctive morpho-phonological feature of wh-words in languages (Cable, 2007, p. 273). That is to say, languages that have a well-marked wh-morpheme such as English and German are equipped with lexically assigned uQ[*val*] on wh-words. On the other hand, languages such as Japanese, Korean, and Tlingit that are deficient in the wh-sub-morpheme do not carry any type of Q-feature (Cable, 2007, p. 276). We will get into this with more detail in Section 2.3.2.

So where are we so far? What we know so far is the presence of Q-particles in all languages. This constitutes our typological consideration underlying the formation of wh-questions across languages. And Cable's Q-based theory does not allow the standard assumption that the derivation of wh-questions is a result of the interaction of the interrogative C and the wh-word (e.g., Chomsky, 2000). Table 2 helps digest Cable's system.

Table 2

The Behaviour of Q-particles and the Typology of Wh-questions

Language	Q-projection	Q-movement	Q-pronunciation	Q/Wh-agreement
Wh-ex-situ				
English	Q-projection	Overt	Null	Q/Wh-agreement
German	Q-projection	Overt	Null	Q/Wh-agreement
Tlingit	Q-projection	Overt	Pronounced	Non-agreement
Wh-in-situ				
Sinhala	Q-projection	Covert	Pronounced	Non-agreement
Japanese	Q-adjunction	Overt	Pronounced	Non-agreement
Korean	Q-adjunction	Overt	Pronounced	Non-agreement

Table 2 shows that Cable's proposal centres wh-typology on the behaviour of Q-particles between wh-ex-situ languages and wh-in-situ languages. The Q-projection parameter plays

a critical role in whether a Q-particle moves along with a wh-word/phrase. Wh-ex-situ languages such as English, German, and Tlingit allow the Q-particle to move, along with the wh-word/phrase, to a left edge position; there is no language where the wh-word alone moves to a left peripheral position. On the other hand, wh-in-situ languages such as Japanese and Korean allow the Q-particle to move alone to a right edge position. The Q-movement parameter kicks in and tells us whether movement of a Q-particle is overt (Korean) or covert (Sinhala). The Q-pronunciation parameter is brought into play to accommodate morphological realisation of Q-particles in languages – that is to say, whether the Q-particle is phonologically present (Tlingit) or absent (English). The Q/Wh-agreement parameter is originally released to facilitate variation between wh-ex-situ languages: Q/Wh-agreement languages such as English do not allow pied-piping past an island, whereas non-agreement languages such as Tlingit allow pied-piping past an island. The upshot of this parameter is the ability for the Q-particle in wh-in-situ languages that do not require the Q/Wh-agreement to merge with the wh-word inside an island. Cable's input to wh-typology brings us one step closer to language universal.

At this point, it is worthwhile to reflect for a moment on Hornstein's (2009) view on movement in natural languages. Hornstein (2009), based on Chomsky's concept of Merge, argues that "any grammar that has Merge will have Internal Merge/Move ... grammars are expected to have the resources for displacement/movement as part of their natural package of possible syntactic operation" (p. 175). This seems to support the idea that Q-movement is universal across languages. The existence of Q-movement in wh-in-situ languages is then not a bolt out of the blue.

I thus adopt Cable's Q-based theory of movement as a basic mechanism for wh-question formations. In what follows, I will examine morpho-syntactic features of Q-particle and wh-words in English, German, and Korean, and then explore successive cyclic Q-movement, which is not touched on Cable's original proposal. Before going into details of Q-movement between the three languages, I will lay out the current minimalist approach to successive cyclic movement of wh-words.

2.3 Q-movement and successive cyclicity

2.3.1 Successive cyclicity in minimalist syntax

Within the generative syntax, it has generally been assumed since Chomsky (1973) that long-distance wh-movement cannot proceed in one fell swoop (37); rather, it proceeds in a short and local step (38). In other words, long-distance wh-movement happens successive-cyclically through the intermediate Spec of CP.

(34) $[_{CP}\ WH_i\ [_{C'}\ C\ .\ .\ .\ [_{VP}\ V\ [_{CP}\ [_{C'}\ C\ .\ .\ .\ [_{VP}\ V\ t_i]]]]]]]$

(35) $[_{CP}\ WH_i\ [_{C'}\ C\ .\ .\ .\ [_{VP}\ V\ [_{CP}\ t_i\ [_{C'}\ C\ .\ .\ .\ [_{VP}\ V\ t_i]]]]]]]$

A number of languages offer empirical coverage of successive cyclic wh-movement: partial wh-movement in German (McDaniels, 1989; Felsher, 2004; Pankau, 2013); embedded subject-auxiliary inversion in French (Kayne & Pollock, 1978), Belfast English (Henry, 1995); wh-agreement in Chamorro (Chung, 1994) and Tagalog (Rackowski & Richards, 2005); complementiser alternations in Irish (McCloskey, 2002).[5]

Successive cyclicity is captured in terms of locality constraint such as Subjacency, a condition that prohibits moving a wh-word across two bounding nodes, TP and DP (Chomsky, 1973, 1977, 1981, 1986). Chomsky's (2000, 2001, 2004) current path of successive-cyclic wh-movement concerns phase edges, the specifier domains of the phases. For Chomsky, phases are CP and vP, categories that are propositional. Phases define inaccessible domains to extraction. To put this idea into effect, Chomsky (2000, 2001) proposes the Phase Impenetrability Condition (PIC), a modern form of Subjacency. The PIC states that once the phase is complete, the complement domain of the phase is spelled out and handed over to the interfaces, rendering it inert. However, an undesirable and unwanted consequence for the PIC is the possibility that a wh-word in the complement domain would not be available

[5] See Boeckx (2008), Lahne (2008) and references therein for a more detailed overview.

for movement. To prevent the wh-word in the complement domain from being trapped in situ, Chomsky postulates a path for wh-movement out of the phase, that is, wh-movement takes place successive-cyclically through the edge of every phase since it is still penetrable to further operations under the PIC. This movement is assumed to be driven by EPP-features on the phase heads, as sketched below.

(36) Derivation of Simplex Wh-question

$[_{CP}\ WH_i\ [_{C'}\ C_{EPP} \ldots [_{vP}\ t_i\ [_{v'}\ v_{EPP}\ [_{VP}\ V\ t_i]]]]]$

(37) Derivation of Complex Wh-question

$[_{CP}\ WH_i\ [_{C'}\ C_{EPP} \ldots [_{vP}\ t_i\ [_{v'}\ v_{EPP} \ldots [_{CP}\ t_i\ [_{C'}\ C_{EPP} \ldots [_{vP}\ t_i\ [_{v'}\ v_{EPP}\ [_{VP}\ V\ t_i]]]]]]]]]$

To sum up, movement is, after all, a consequence of the EPP phenomenon under Chomsky's probe-goal system. The EPP is responsible for successive-cyclic movement to the phase edges. Successive cyclicity is enforced by the PIC, a strict locality condition on movement.

Although much research has been done in favour of Chomsky's phase-based model of structure building, what constitutes a phase hit a snag in the current phase-theoretic model of generative syntax: Abels (2003) for PPs; Bošković (2005) and Svenonius (2004) for DPs; Epstein and Seely (2002), Lahne (2008) and Müller (2011) for all phrases.[6] Furthermore, phasehood varies crosslinguistically. Abels (2003), for example, observes that PPs in languages with preposition stranding are phase, while in languages without preposition stranding PPs are not phases. Phasehood of DPs is also subject to crosslinguistic variation: DPs in languages with articles are phases, whereas in languages without articles DPs are not phases (Bošković, 2013). In this regard, phases encounter empirical and conceptual

[6] See Citko (2014) and references therein for a more detailed overview. Citko also nicely presents diagnostic tools for phasehood and deals with phasehood variability.

drawbacks such as computational load efficiency, valuation of features and locality (Boeckx, 2008; Boeckx and Grohmann, 2007). For example, Boeckx and Grohmann (2007) reveal doubt about computational load reduction argument, which is Chomsky's conceptual motivation for phases. Since phasehood shows substantial variability, it is not unclear whether phases reduce computational cost.

Chomsky's phase-based model of wh-movement is often criticised for the dubious nature of the EPP, posing several problems such as its lack of interpretable counterpart and a look-ahead problem (Biskup, 2009; Bošković, 2007). However, such worries may be dispensed with the ideas that the EPP is universally selected from the lexicon and allows lexical items to merge or move (Chomsky, 2000, 2007, 2008; Gallego, 2010). In this regard, the EPP comes into play as a second-order feature (Adger & Svenonius, 2011).[7] Adger and Svenonius assume that the second-order EPP could be a syntactic property in common across languages; it could be parameterised. In the matter of wh-question formation, the interrogative C bears a first-order Q-feature, along with a second-order EPP-feature; the interrogative C only bears a first-order Q-feature. By making the use of the EPP as a second-order feature, Adger and Svenonius capture the ways of merging and remerging the elements in structure building, along with parametric variation in syntax. Gallego (2010) defines the EPP as a criterial feature in the sense of Rizzi (1997, 2004) who argues that Ā-movement such as wh-movement is an instance of Spec-head requirement. As a consequence of the EPP phenomenon, operator-variable chains are formed for interpretation. In a similar vein, Alexiadou and Anagnostopoulou (1998) define the EPP as a universally fixed feature that has an effect on the PF outcome. For Alexiadou and Anagnostopoulou, the EPP is parametrised across languages. The EPP is therefore satisfied either by moving an XP to the specifier position of the head or by moving X to the head (see also Miyagawa, 2001).

[7] A second-order feature has the following definition (Adger & Svenonius, 2011, p. 36).

(iv) Second-order feature:

a. A feature in F is a first-order feature.

b. A property which syntactically distinguishes some instances of a first-order feature α from other instances of α is a second-order feature.

It might be a good time to close discussions on the EPP and phases, which is not run-of-the-mill. Chomsky's phase-based approach to successive cyclic movement remains ignored due to the variability of phasehood. Given Chomsky's assurance that the minimalism is not a theory, but a program, phases still need to be fine-tuned for our understanding of complex phenomena in natural languages. The phase-based syntactic derivation will remain ignored. However, other mechanisms such as Agree, I will retain. As for the EPP, it is no longer a feature since it is not involved in any feature valuation under Agree; rather it is a specifier enquirer, a formal syntactic property that certain functional heads have in common (Boeckx, 2008; Gallego, 2010; Lasnik, 2001; Pesetsky & Torrego, 2001).

Q-movement will be analysed based on Chomsky's (1995) Copy Theory of movement, which states that "trace left behind is a copy of the moved element, deleted by a principle of the PF component in the case of overt movement. But at LF the copy remains, providing the materials for reconstruction" (p. 202). Following Alexiadou and Anagnostopoulou (1998) and Miyagawa (2001), I assume that the EPP is a universally fixed property of languages that enters into syntactic relation for PF consideration. And this EPP is parameterised for the landing site of a moving element. These assumptions anchor our concern about successive cyclic Q-movement. In wh-ex-situ languages, Q-movement proceeds successive-cyclically through every intermediate Spec of CP as empirically evidenced in Boeckx (2008), Felser (2004), Fox (1999), Henry (1995), Lahne (2008), and McCloskey (2002). In wh-in-situ languages, successive cyclic Q-movement happens by stopping off at intermediate C heads. Successive cyclic Q-movement is subject to locality constraints such as Relativized Minimality (Rizzi, 1990, 2004, 2013) or Minimal Link Condition (Chomsky, 1995).

In the remainder of this section, I will demonstrate the way how successive cyclic Q-movement is achieved in English, German, and Korean. The morphological properties of Q-particles and wh-words in these languages offer a starting point for navigating long-distance Q-movement.

2.3.2 Q-particles and wh-words in English, German, and Korean

Recall that in our discussion in Section 2.2 we have explored Cable's (2007, 2010) Q-based account of the wh-question formation across languages. Given that Q-particles exist across

languages, regardless of their phonological content, Cable's system is indeed in the line with a typological expectation. In Cable's system, wh-parameterisation is determined by Q-particles' strategies for merge operation. The different behaviour of Q-particles is a crucial factor for wh-parameterisation. In addition, the interaction of the Q-particle and the wh-word also has a consequence that we cannot blink at in Cable's system. The island immunity or vulnerability to pied-piping has been a good candidate for the consideration as we have already witnessed. The observed difference in the island immunity results from distinctive morphological characteristics of wh-words between languages (see Section 2.2). In an effort to capture morphological differences in wh-words between languages, Cable (2007, p. 274) puts forward Kratzer and Shimoyama's (2002) theory of Q/Wh-agreement, based on the morphological pattern of wh-words in German and Japanese.

(38) The Morphological Pattern of the Wh-words in German and Japanese (Cable, 2007, p. 273)

a. Wh-words in German		b. Wh-words in Japanese	
wer	'who'	*dare*	'who'
was	'what'	*nani*	'what'
wo	'where'	*doko*	'where'
wen	'when'	*itu*	'when'
warum	'why'	*naze*	'why'

The paradigm in (38) shows that German wh-words make use of the same wh-morpheme *w-* and as such, have a distinctive morpho-phonological attribute. On the other hand, Japanese wh-words do not any morpho-phonological attribute; that is, they do not share any wh-morpheme. Such morphological contrast is centred on Kratzer and Shimoyama's Q/Wh-agreement theory. The gist of Kratzer and Shimoyama's theory, as discussed in Cable (2007), is that features assigned to functional words such as wh-words determine the appearance of the functional words. German wh-words, carrying an uninterpretable Q-feature, have a

distinctive morpho-phonological characteristic. The uninterpretable Q-feature is in turn pronounced as the wh-morpheme, the initial *w*-. According the Cable, the existence of uninterpretable Q-feature on German wh-words entails that they must agree with a phrase that has an interpretable counterpart. For that reason, German wh-words enter into an Agree relation with the Q-particle. Japanese wh-words, by contrast, do not have any distinctive morpho-phonological semblance, which implies that they do not carry any instance of Q-feature. No Agree relation needs to be established between the wh-word and the Q-particle.

Working on Kratzer and Shimoyama's (2002) theory and Pesetsky and Torrego's (2007) feature system, Cable (2007, 2010) proposes that in some languages such as German, wh-words have an uninterpretable and valued Q-feature uQ[*val*], whereas in other languages such as Japanese, wh-words do not have any instance of the Q-feature. Cable further assumes that in languages where wh-words carry an uQ[*val*], the Q-particle has an interpretable and valued Q-feature Q[ ], whereas in languages where wh-words have no instance of the Q-feature, the Q-particle carries an interpretable and valued Q-feature Q[*val*]. Let us now turn to the application of the factors to the case at hand. The morphological pattern of wh-words in English, German, and Korean is listed below.

(39) The Morphological Pattern of the Wh-words in English, German, and Korean

a. Wh-words in English	b. Wh-words in German		c. Wh-words in Korean	
who	*wer*	'who'	*nwukwu*	'who'
what	*was*	'what'	*mwues*	'what'
where	*wo*	'where'	*eti*	'where'
when	*wen*	'when'	*encey*	'when'
why	*warum*	'why'	*way*	'why'

The paradigm (39), wh-words in German and English have a distinctive wh-morpheme (the initial *wh*- for English and *w*- for German). Wh-words in Korean like those in Japanese do not

share any wh-morpheme. Thus, Cable's (2007, 2010) assumption seems to be hold for wh-words in those languages. However, as we have seen in Section 2.2, Cable's analysis of Q-adjunction in Korean needs to be elaborated.

Korean wh-words are assumed to be unspecified for their quantificational force as they are ambiguous between an interrogative reading and an indefinite reading. (Kim, 2000; see also Aoun & LI, 1993; Cheng, 1991; Cole & Hermon, 1998; Nishigauchi, 1990; Tsai, 1994).[8] The indefinite reading is divided further into an existential reading and a universal reading. For example, *nwukwu* 'who' in Korean can have an interrogative reading (40), an existential reading (41), or a universal reading (42).[9]

(40) The Interrogative Reading of Korean Wh-word

Yanf-ka nwu(kwu)-lul chohahay-ni?

Yanf-NOM who-ACC iked-Q

'Who did Yanf like?'

(41) The Existential Reading of Korean Wh-word

Yanf-ka Nwukwu-(i)nka-lul chohahay-ta.

Yanf- NOM who-INDEF(∃)-ACC liked-DEC

'Yanf liked someone.'

[8] A group of Korean linguists states that Korean wh-words have an inherent quantificational force. For example, Chung (1996) claims that wh-words in Korean are wh-interrogative clauses. Yoon (1999) and Hong (2005) propose that wh-words in Korean are pure indefinite wh-pronouns. Kim (1989) claims that wh-words in Korean are quantifiers. (1994) suggests that wh-expressions in Korean have two different types of wh-entries (i.e., wh-interrogative and wh-indefinite) in the lexicon.

[9] Note that the initial *i* of *inka* and *ina* can be dropped when the wh-word ends in a vowel. If the wh-word ends in a consonant, the *i* is retained. This phonological variation, however, will remain ignored in the transcription.

(42) The Universal Reading of Korean Wh-word

Yanf-ka nwukwu-(i)na-lul chohahay-ta.

Yanf- NOM who-INDEF(∀)-ACC iked-DEC

'Yanf liked everyone.'

The data clearly shows that the interpretation of Korean wh-words is determined by the particles that they are associated with. Due to the Q-particle *ni* in (40), the quantificational force of *nwukwu* 'who' is fixed as interrogative. When *nwukwu* 'who' is associated I(ndefiniteness)-particle *inka* in (41), its quantificational force is fixed as existential.[10] The quantificational force of *nwukwu* 'who' is fixed as universal by virtue of the I-particle *ina* in (42). In this regard, Q-particles and I-particles in Korean function as an operator: Q-particles have interrogative force and I-particles have existential or universal force. Korean wh-words in turn serve as variables whose interpretation is determined by a Q-particle that c-commands it (Kim, 2000). The validity for these observations is achieved by (43).

(43) a. Yanf-ka nwukwu-(i)nka-lul chohahay-ni?

Yanf-NOM who-INDEF(∃)-ACC liked-Q

'Did Yanf like someone?'

b. Yanf-ka Nwukwu-(i)na-ka chohaahy-ni?

Yanf-NOM who-INDEF(∀)-ACC liked-Q

'Did Yanf like everyone?'

c. Yanf-ka Nwu(kwu)-ka chohahay-ni?

Ynaf -NOM who -ACC liked-Q

'Who did Yanf like?'

[10] The term I-particle is borrowed from Kim (2006).

In (43a), the Q-particle *ni* cannot c-command *nwukwu* 'who' because the I-particle *inka*, intervene between them. Consequently, the quantificational force of *nwukwu* 'who' in (43a) is specified as wh-indefinite since it is in the scope of the existential operator *inka*. In the same vein, in (43b) *nwukwu* 'who' is no longer c-commanded by the Q-particle *ni* due to the intervener, the I-particle *ina*; hence, *nwukwu* 'who' is interpreted as wh-indefinite. In (43c), however, *nwukwu* 'who' is c-commanded by the Q-particle *ni* since no operator intervene between them; therefore, the quantificational force of *nwukwu* 'who' in (43c) is specified as wh-interrogative.

I thus assume that while the Q-particle in (46c) is an instance of wh-Q-particles, the Q-particle in (43a)–(43b) is an instance of yes/no-Q-particles, which is directly merged in the interrogative C. Since yes/no-Q-particles do not create an operator-variable chain for interpretation, their quantificational force is limited to a polarity reading (Cheng, 1991; Nishigauchi, 1990).[11]

One piece of clear evidence giving backing to this assumption can be found Kyengsang dialect of Korean where Q-particles show a morphological distinction between wh-questions and yes/no questions. In Keyngsang dialect, a wh-question are marked with a Q-particle *no* (44a), whereas a yes/no question are marked with a Q-particle *na* (44b).

[11] It has been generally assumed that wh-words in Korean are ambiguous. Consider the following sentence from Choe (1994, p. 276).

(v) Nwu(kwu)-ka pakkey wass-ni?
who-NOM outside came-Q
'Who is at the door?'
'Is there someone at the door?'

According to Choe (1994), the wh-word *nwukwu* 'who' in (v) is ambiguous. When *nwukwu* is stressed with a sentence-final falling intonation, the sentence (v) is interpreted as a wh-question. On the other hand, when *nwukwu* is unstressed with a sentence-final rising intonation, the sentence (v) is interpreted as a yes/no question. Choe assumes that wh-words in Korean are lexically ambiguous.

(44) a. Swuni-ka nwu-lul cohaha-no?

Swuni-NOM who-ACC like-Q_{WH}

'Who does Swuni like?'

*'Does Swuni like someone?'

b. Ni-ka nwu-lul cohaha-na?

you-NOM who-ACC like-$Q_{YES/NO}$

'Do you like someone?'

*'Who do you like?'

(Choe, 1994, p. 278-279)

From (44), I assume that Korean has two different types of Q-particles: Q_{WH}-particles for wh-questions and $Q_{YES/NO}$-particles for yes/no questions. Q-particles in Chinese support this assumption. Chinese also exhibits a morphological contrast between Q_{WH}-particles and $Q_{YES/NO}$-particles. In Chinese, wh-questions are marked with the Q_{WH}-particle *ne* as in (45a), whereas yes/no questions are marked with the $Q_{YES/NO}$-particle *ma* as in (45b)

(45) a. Hufei mai-le shenme (ne)?

Hufei bought what Q_{WH}

'What did Hufei buy?'

b. Hufei mai-le shenme ma?

Hufei bought what $Q_{YES/NO}$

'Did Hufei buy something?'

(Cheng, 1991; Cheng & Rooryck, 2001)

Given the evidence that Chinese and Korean make use of two different types of Q-particles, I further assume that interrogative C is underspecified for a $Q_{YES/NO}$-feature and a Q_{WH}-

feature (Cheng and Rooryck, 2000). When the interrogative C is selected for a wh-question, it bears an [uQ_{WH}]. When the interrogative C is selected for a yes/no question, on the other hand, it bears an [u$Q_{YES/NO}$]

Let us turn to Cable's analysis of Q-particles in Korean wh-indefinites. Cable (2010, p. 91) analysed the particle in the Korean wh-indefinite as an instance of Q-particles, repeated here as (46).

(46) Korean Q-particle between a Postposition and its Complement

Ku-ka eti-eyn-ka-ey kass-ta.

he-NOM here-LINK-Q-to went-DEC

'He went somewhere.'

Cable (2007, 2010) is somewhat misleading. As we have already seen, *ka* in (46) should be analysed as an instance of I(ndefinite)-particles although Cable uses the term Q as a pure syntactic category label. As noted in Cable (2007, 2010), the placement of I-particles in Korean wh-indefinites is flexible; that is, I-particles can come before or after Case-markers (Kim, 2006; Huh, 2011).

(47) a. Yanf-ka nwukwu-inka-eykey ton-ul pillyecwuess-ta.

Yanf-NOM who-INDEF(∃)-DAT money-ACC lent-DEC

'Yanf owed someone money.'

b. Yanf-ka nwukwu-eykey-inka ton-ul pillyecwuess-ta.

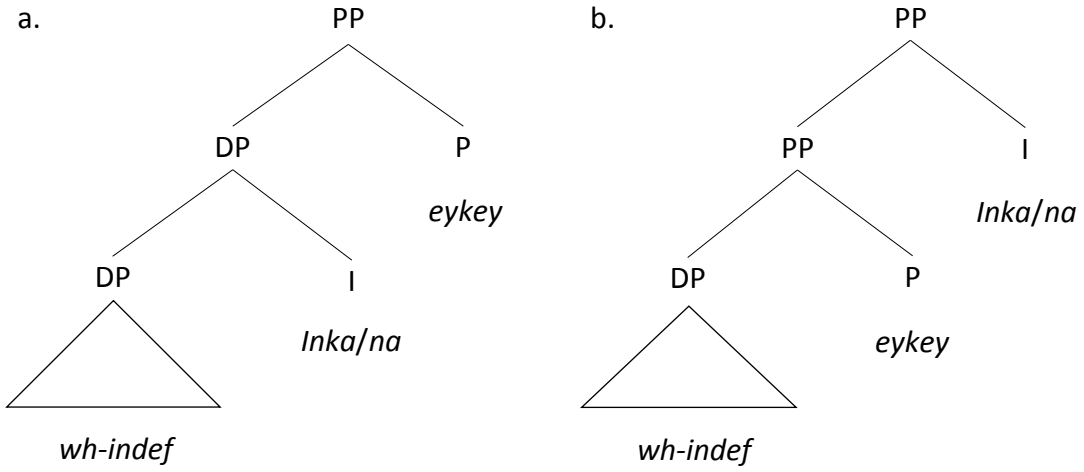
Yanf-NOM who-DAT-INDEF(∃) money-ACC owed-DEC

(48) a. Yanf-nun nwukwu-na-eykey chincelha-ta.
Ynaf-TOP who-INDEF(∀)-DAT is.kind-DEC
'Yanf is kind to everyone.'

b. Yanf-nun nwukwu-eykey-na chincelha-ta.
Ynaf-TOP who-DAT-INDEF(∀) is.kind-DEC

The data pattern clearly shows that the I-particles *inka* in (47a) and *na* in (48a)can be followed by the dative Case-marker *eykey*; the I-particles *inka* and *na* can be preceded by the Case-marker *eykey* as in (47b)–(48b). I-particles' behaviour that they can appear before or after the Case-markers entails that they are adjoined to wh-words just like as adverbial adjuncts. The following structural analyses provide a clear view of I-adjunctions in Korean.

(49) The Structure of I-Adjunction in Korean



The structure (49a) would capture the I-adjunction in (47a)–(48a); for (47b)–(47b), (49b) would represent their I-adjunction. Still and all, though, the intervention of the I-particle does not affect the well-formedness of the structure. To offer backing to Cable's system, we have to resolve one more task that still remains unclear. We find that a Q_{WH}-particle is allowed to appear between a wh-interrogative and a Case-marker in the same way as the I-particle. Let us consider the following sentences.

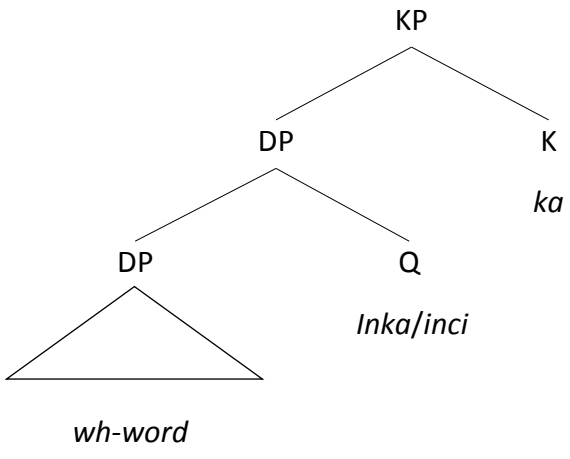
(50) a. Na-nun kunye-ka nwukwu-inka/inci-ka kwungkumha-ta.
I-TOP she-NOM who-Q-NOM wonder-DEC
'I wonder who she is.'

b. Na-nun kunye-uy chip-i eti-inka/inci-ka kwungkumha-ta.
I-TOP she-GEN house-NOM where-Q-NOM wonder-DEC
'I wonder where her house is.'

c. Na-nun kunye-uy sayngil-i eynce-inka/inci-ka kwungkumha-ta.
I-TOP she-GEN birthday-NOM when-Q-NOM wonder-DEC
'I wonder when her birthday is.'

In (50), the Q_{WH}-particle such *inka* and *inci* appears between the nominative Case-marker *ka* and the wh-word – *nwukwu* 'who' (50a), *eti* 'where' (50b), and *eynce* 'when' (50c), and all the sentences are interpreted as an embedded wh-question. This entails that the Q_{WH}-particles are adjoined the wh-word during the derivation of the embedded wh-question since it can intervene between the wh-word and the Case-marker. The following structure illustrates the data pattern above.

(51) The Structure of Q-adjunction in Korean[12]



[12] A notion of case phrase (KP) is used to capture the Q-adjunction strategy (Jo, 2000; see also Suh, 2005). In Jo's system, all Case-markers head a KP.

As predicted above, the structure (51) confirms that the Q_{WH}-particle is adjoined to wh-word. The Q_{WH}-particle does not project any category, and thus the intervention of the Q_{WH}-particle does not influence the well-formedness of the structure. The evidence presented so far suggests that wh-words are not specified for their quantificational force; rather they are variables. Their quantificational force is achieved with the help of Q_{WH}-particles or I-particles. They are adjoined to wh-words in order to assign their quantificational force proper.

We now turn to wh-words in English and German. It is well-known that these languages are known as lack of wh-indefinites. However, it is reported in the literature that wh-words in English and German are also used to express different types of quantificational force other than interrogative force. For example, German wh-words can be used to express existential quantifier (Haspelmath, 1997; Šimiḱ, 2010).

(52) Ich habe was zu tun.
I have what to do
'I have something to do.'

(Šimiḱ, 2010, p. 26)

(53) Da kommt wer.
here coming who
'Someone is coming.'

(Haspelmath, 1997, p. 171)

Cable (2007, p. 210) also notes that English wh-words can be used as wh-indefinite. Cable reports an instance of English wh-indefinites in New York English from Caponigro (2003).

(54) I don't have what to eat.
'I don't have anything to eat.'

(Caponigro, 2003)

Furthermore, English wh-words can be used in free relative clauses. Let us consider the following sentences. The embedded wh-clauses in (55) look alike in their appearance at a glance, but they differ in their quantificational force: (55a) is interpreted as an embedded wh-question due to its matrix predicate, whereas the free relative clause (55b) is interpreted as definite such as *Ana tasted everything Samir cooked* (Patterson & Caponigro, 2016).

(55) a. Ana wondered what Samir cooked.

b. Ana tasted what Samir cooked.

(Patterson & Caponigro, 2015, p. 341)

The data suggest that languages use the same morphological form to express different types of quantificational force. I thus assume that wh-words in all languages are not specified for their quantificational force. Consequently, the semantics of a wh-word remains deficit in the lexicon. This implies that a specific quantificational operator such as Q_{WH}-operator, $Q_{\exists}$-operator, and Q_{REL} is attached to a bare wh-word that acquires its quantificational from the operator. Thus, an operator-variable relation holds between a particle and a bare wh-word. Only when a Q_{WH}-particle is selected for computation, the interrogative force of a wh-word is determined. I thus assume that a Q_{WH}-particle bears an [Q_{WH}] due to its unambiguous property, and a wh-word, which is parasitic on the Q_{WH}-particle, bears an [uQ_{WH}]. If the derivation were to be a wh-question, the wh-word is combined with the Q_{WH}-particle at computational level and an agreement operation takes place between them due to an [uQ_{WH}] on the wh-word.

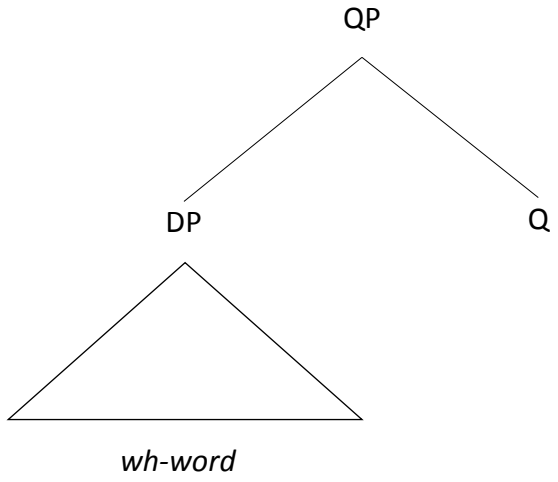
However, the combination of the wh-word and the Q_{WH}-particle is subject to be parameterised (Cable, 2007, 2010). While in wh-ex-situ languages such as English and German the Q_{WH}-particle takes the wh-word as its complement and projects a QP, in wh-in-situ languages such as Korean the Q_{WH}-particle is adjoined to the wh-word. When the interrogative C on [uQ_{WH}] is introduced in the derivation, the following predictions are born out: In wh-ex-situ languages the interrogative C with targets the QP, whereas in wh-in-situ

languages the interrogative C only attracts the Q_{WH}-particle. In what follows, I will apply the Q-movement factors to successive cyclic Q-movement in English, German, and Korean. Its consequences including a learning problem will be of course discussed.

2.3.3 Successive cyclic Q-movement in English and German

Now then, we have established the properties of Q-particles and wh-words in English, German, and Korean. Let us explore in more detail how they interact in structure building. In Cable's system, Q-particles in wh-ex-situ languages – more precisely Q-projection languages – take wh-words as their complements as illustrated below. As of now, I, following Cable (2007, 2010), will use Q as a pure syntactic category label for any particle that has an inherent quantificational force besides the Q_{WH}-particle.

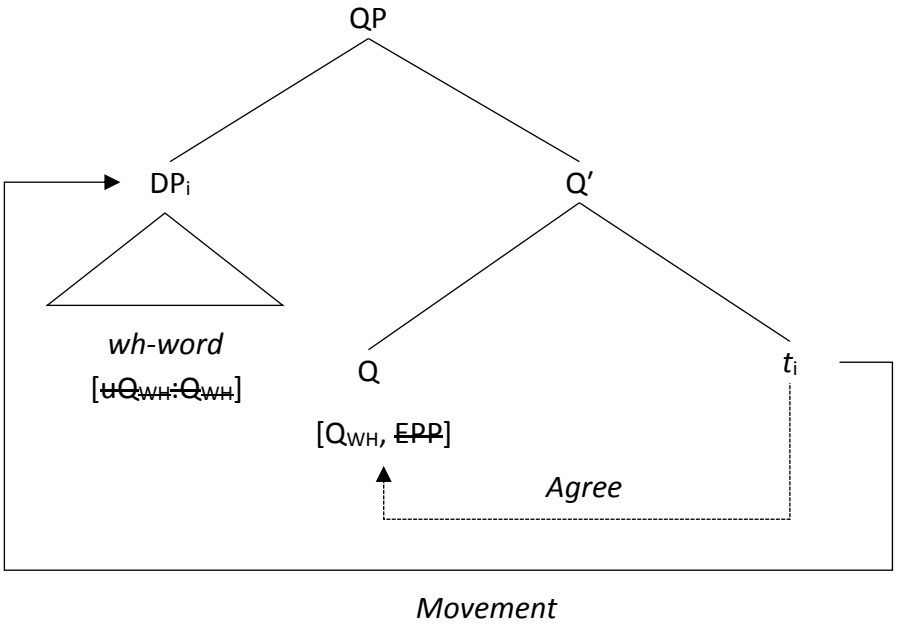
(56) The QP Structure of Wh-ex-situ Languages



However, the structure (56) should be reanalysed if we take a direction of head into consideration (Greenburg, 1963). It is reasonable to assume that head-initial languages such as English and German would have head-initial Q_{WH}-particles, whereas head-final languages such as Korean would have head-final Q_{WH}-particles (Yeo, 2010). One might question whether German is purely head-initial due to its head-final VP. However, it should be noted that mixed headness is common across languages (Zepter, 2003). According to Zepter (2003), while VP in German is head-final, its NP is head-initial. In addition, Baker (2003) suggests

that functional categories in German are head-initial. Given Baker's (2003) suggestion, the correct structure of the QP for English and German is sketched below.

(57) The Revised QP Structure of English and German[13]

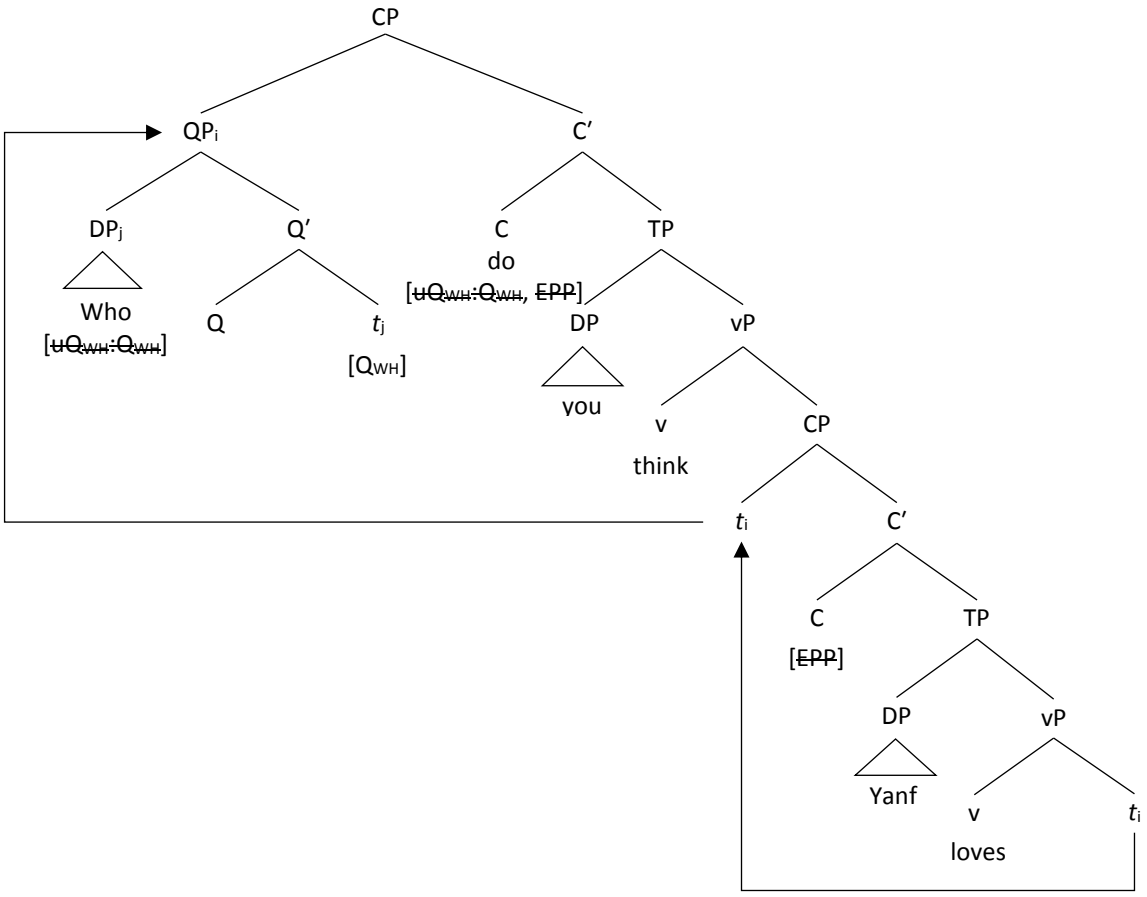


In (57), the wh-word should appear at the right position of the head Q due the head directionality. Then the [uQ_{WH}] on the wh-word probes and agrees [uQ_{WH}] on the Q_{WH}-particle with under the probe-goal system. Finally, the wh-word moves to Spec of QP in order to satisfy the EPP on Q head for PF consideration. Now that we recast the QP structure of English and German, let us examine how this QP moves successive cyclically. In Section 2.3.1, I assumed that successive cyclic movement happen through the intermediate Spec of CP. This was motivated by the presence of EPP on functional heads. Consider the following complex wh-question in English. The sentence (58) will have the derivation in (59).

(58) Who do you think Yanf loves?

[13] The idea comes from Yeo (2010) who applies Q-movement account to wh-questions in Singapore English. Yeo deserves full credit for this.

(59) Successive Cyclic Q-movement in English Wh-questions



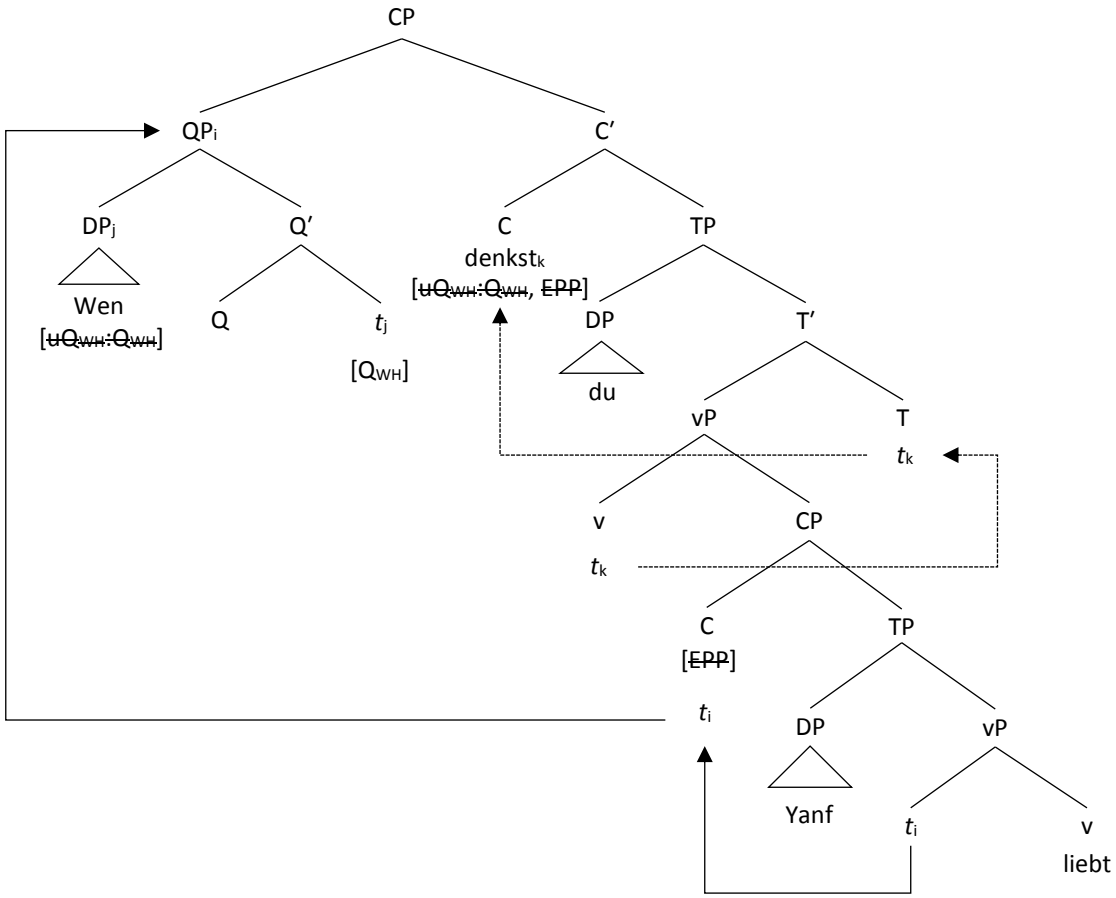
The derivation (59) starts out with merging the Q_{WH}-particle and *who*. The [uQ_{WH}] on *who* is valued by the [Q] on the Q_{WH}-particle under the probe-goal system. *Who* undergoes movement to Spec of QP to satisfy the EPP on head Q. Following this, since the EPP on the embedded C is a specifier enquirer, it attracts the QP to Spec of embedded CP. The derivation continues until the matrix C is merged. The [uQ_{WH}] on the matrix C probes and agrees with the [Q_{WH}] on the QP under the probe-goal system. The QP in turn undergoes movement to Spec of matrix CP to satisfy the EPP on the matrix C. Finally, the derivation converges at the interface.

Let us examine how German complex wh-question (60) is derived in connection with Q-movement. Note that the difference between English and German in the formation of wh-questions is that German unlike English does not require a rule of *do*-support.[14]

[14] Another important difference between two languages is that German allows wh-copying in the embedded Spec of CP as in (vi).

(60) Wen denkst du Yanf liebt?
who-ACC think you-NOM Yanf loves
'Who do you believe Yanf loves?'

(61) Successive cyclic Q-movement in German wh-questions



The derivation (61) proceeds in a similar way to (59). It begins with merging the Q_{WH}-particle and the wh-word *wen* 'who'. The [uQ_{WH}] on *wen* 'who' is valued by the [Q] on the Q_{WH}-particle under the probe-goal system. Then *wen* 'who' undergoes movement to Spec of QP

(vi) a. Wen enkst du en Yanf liebt?
who-ACC think ou-NOM who-ACC Yanf liebt
'Who do you think Yanf loves?'

b. [$_{CP}$ Wen$_i$ denkst du [$_{CP}$ wen$_i$ Yanf t_i liebt]]]]?

It has been generally assumed that *wen* 'who' in Spec of CP_1 is a copy of the fronted wh-word although a copy of a moved element is not normally pronounced. Wh-copying in German is taken as evidence that wh-movement happens successive cyclically from CP to CP (Beck & Gergel, 2014).

to satisfy the EPP on the head Q. When the embedded C is introduced, the QP moves to Spec of embedded CP to satisfy the EPP on the embedded C. At the point when the higher TP is merged, the matrix verb *denkst* 'think' is raised to the matrix T head. When the matrix C is merged, *denkst* 'think' undergoes obligatory T-to-C movement. The [uQ_{WH}] on the matrix C probes and agrees with the [Q_{WH}] on the QP under the probe-goal system. The QP in turn undergoes movement to Spec of CP to satisfy the EPP on the matrix C. Then, the derivation converges at the interface.

The derivation of Q-movement in English and German has a ready account for certain facts of wh-questions in English and German; why wh-words in English and German appear in the clause-initial position and notably, why pied-piping is triggered in English and German wh-questions.

In our current view, wh-movement is a by-product of Q-movement. It is a well-known fact that wh-movement observes locality conditions such as island constraints. It is thus expected that Q-movement is subject to the island effects. The term island, which is first introduced by Ross (1967), denotes certain structural configurations that constrain movement of wh-words. For example, a wh-word cannot escape from a complex noun phrase island (62) or a wh-island (63).

(62) Complex Noun Phrase Island

*What$_i$ did they raise [$_{NP}$ doubts about the report [$_{CP}$ that North Korea had t_i]]?

(63) Wh-island

*Who$_i$ did Rachel wonder [$_{CP}$ when Tom invited t_i to the party]?

Within the Government and Binding framework, Subjacency was an attempt to rule out illicit wh-movement from islands (Chomsky, 1973, 1977, 1981, 1986). Let us examine the complex noun phrase island in (62), repeated here as (64). The bounding nodes are boldfaced for expository purposes.

(64) *[$_{CP}$ What$_i$ did [**$_{TP}$** they raise [**$_{NP}$** doubts about the report [$_{CP}$ t_i that [**$_{TP}$** North Korea had t_i]]]]]?

In (64) *what* undergoes movement to Spec of embedded CP, crossing one bounding node embedded TP, but *what* in the course of subsequent movement to the matrix CP has to cross two bounding nodes the matrix NP and TP in one fell swoop. The ill-formedness of (64) is thus ruled out by Subjacency.

Rizzi (1990), in the meanwhile, introduces a generalised locality constraint on movement, which is known as the Relativized Minimality (RM). Rizzi (2011, p. 222) presents the basic concept of the RM.[15]

(65) Relativized Minimality

In the configuration [… X … Z … Y …], a local relation cannot connect X and Y if Z intervenes and Z is of the same structural type as X. Intervention is hierarchically defined: Z intervenes between X and Y when Z commands Y and Z does not c-command X.

The intervening candidate concerns about movement chain formed between moved element and its base position, and the structural types are reduce to heads, A-positions, and Ā-positions. Movement chain is then created by head movement, A-movement, and Ā-movement. Keeping these in mind, let us examine how the RM works in wh-islands in (66).

(66) *[$_{CP}$ Who$_i$ did Rachel wonder [$_{CP}$ when [Tom invited to the party t_i]]]?

[15] Since Rizzi's (1990) original proposal, Relativized Minimality has made much headway in need of revision (e.g., Cinque, 1990; Rizzi, 2001, 2004; Strake, 2001). For ease of exposition I introduce a version of Relativized Minimality introduced in Rizzi (2011). Rizzi's (1990) original version is given below.

(vii) Relativized Minimality (Rizzi, 1990, p. 7)

X α-governs Y if and only if there is no Z such that:

a. Z is a potential α-governor for Y,

b. Z c-commands Y and does not c-command X

According to the definition (65), the ill-formedness of (66) can be attributed to the intervention of *when* between *who* and its copy/trace. Since the intervener, *when* is of the same structural type as *who* and c-commands the trace of *who,* the RM kicks in and rules out the movement of *who* crossing over *when*. Rizzi's RM accounts for wh-island constraints proper.

Within the Minimalist framework, Rizzi's RM is succeeded by Chosmky's (1995) Minimal Link Condition (MLC).[16]

(67) Minimal Link Condition

K attracts α if there is no β, β closer to K than α, such that K attracts β.

(Chomsky, 1995, p. 311)

In Chomsky (1995), the MLC is implemented as a movement operation in connection with Atrract-F. The MLC requires that an attracter always prefers the closest attractee which states that "K attracts F if F is the closest feature that can enter into a checking relation with a sublabel of K" (p. 297). The MLC requires feature identity or matching. In other words, an attracter always prefers the closest attractee that can enter into a checking relation for any given movement. To illustrate, let us consider wh-islands in (68).

(68) *[$_{CP}$ Who$_i$ did [$_{TP}$ Rachel wonder [$_{CP}$ when$_j$ [$_{TP}$Tom invited to the party t_j t_i]]]]?

In (68), the MLC enforces that the attracter, the matrix C attracts the closest attractee, *when* to check its feature. Thus, the illicit movement of *who* is banned by the definition of MLC.

Starke (2001), building on Rizzi (1990) and Chomsky (1995), defines the intervention effect in terms of feature identity. Locality constraints such as the RM and the MLC are reduced to Q-crossing-Q Effect in Strake (2001).

[16] Chomsky (1995) introduce MLC to captures Rizzi's RM from a derivational perspective (Zwart, 1998; Müller, 2011).

(69) Q-crossing-Q Effect[17]

*Q_1 … Q_2 … <Q_1> where Q = {wh-words, negation, focalised elements, quantifiers, and quantificational-adverbials}, a feature of a given class cannot cross a member of the same class.

(Strake, 2001, p. 6)

In Starke's system, weak islands boil down to illicit movement of a quantificational element crossing over another quantificational element. Thus, wh-movement is impossible if a wh-word crosses a negation (70b), a focalised element (70c), another wh-element (70d), and a quantified adverbial (70e).

(70) a. How$_i$ do you think that I should cook this stuff t_i?

b. *How$_i$ don't you think that I should cook this stuff t_i?

c. *How$_i$ do you think that, THIS STUFF, I should cook t_i, not those eggplants over there?

d. *How$_i$ do you wonder why I should cook this stuff t_i?

e. ?*How$_i$ should I often cook this stuff t_i?

Starke (2001, p. 5)

Building on Starke (2001), Rizzi (2013) releases a revised version of the RM, which is often referred to as the Featural Relativized Minimality.

[17] Q means a quantificational element, and the angle bracket shows the base position of Q_1 before it crosses Q_2.

(71) Featural 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. The relevant features are those involved in the triggering of movement.

(Rizzi, 2013, p. 179)

Let us see how (71) accounts for wh-island in (72). The relevant features that are responsible for triggering movement are represented in accordance with the featural RM.

(72) *[$_{CP}$ Who$_i$ did Rachel wonder [$_{CP}$ when Tom invited to the party t_i]]?

[+Q_{WH}]	[+Q_{WH}]	[+Q_{WH}]
X	Z	Y

In (72), the intervening candidate Z matches the relevant feature specification of X: Both X and Z are specified as [+Q_{WH}]. Thus, movement of X is blocked by the intervention of Z that has the same feature specification as X. In the next section, I will demonstrate how successive cyclic Q-movement works in Korean. I will also deal with the wh-island effect in Korean.

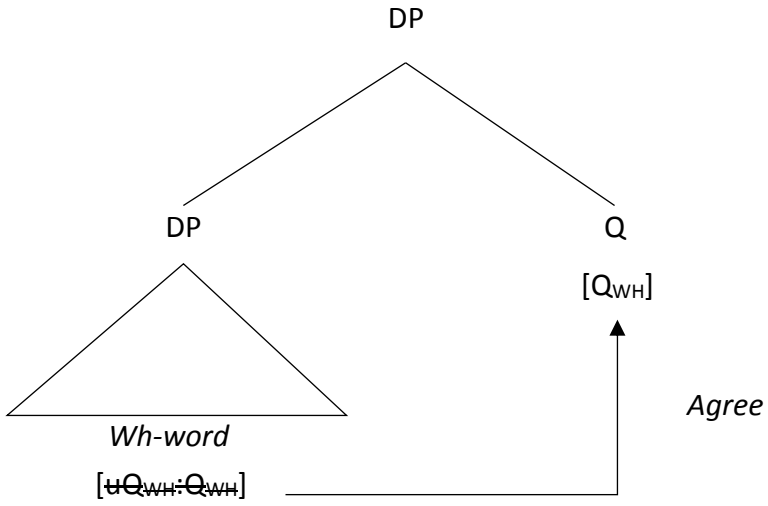
2.3.4 Successive cyclic Q-movement in Korean

It has been standardly assumed that Korean is a wh-in-situ language since wh-words in Korean remain in situ. In order to be interpreted as wh-interrogative, the in situ wh-word must be bound by a Q-particle directly merged in either embedded C or matrix C, and the scope of the wh-word is determined by unselective binding at LF in the sense of Heim (1982; see also Choi, 2006; Hong, 2005; Kim 2001).[18] However, our Q-movement theory does not

[18] Choe (1987) and Yoon (2001) proposes that wh-words in Korean undergo wh-movement at LF since wh-questions in Korean are allergic to the wh-island effect (see also Huang, 1982; Watanabe, 1992). Choe (1994)

allow such an approach since the Q_{WH}-particle – as observed in Section 2.3.2 – is adjoined to the wh-word in the derivation as in (73).

(73) Q-adjunction in Korean



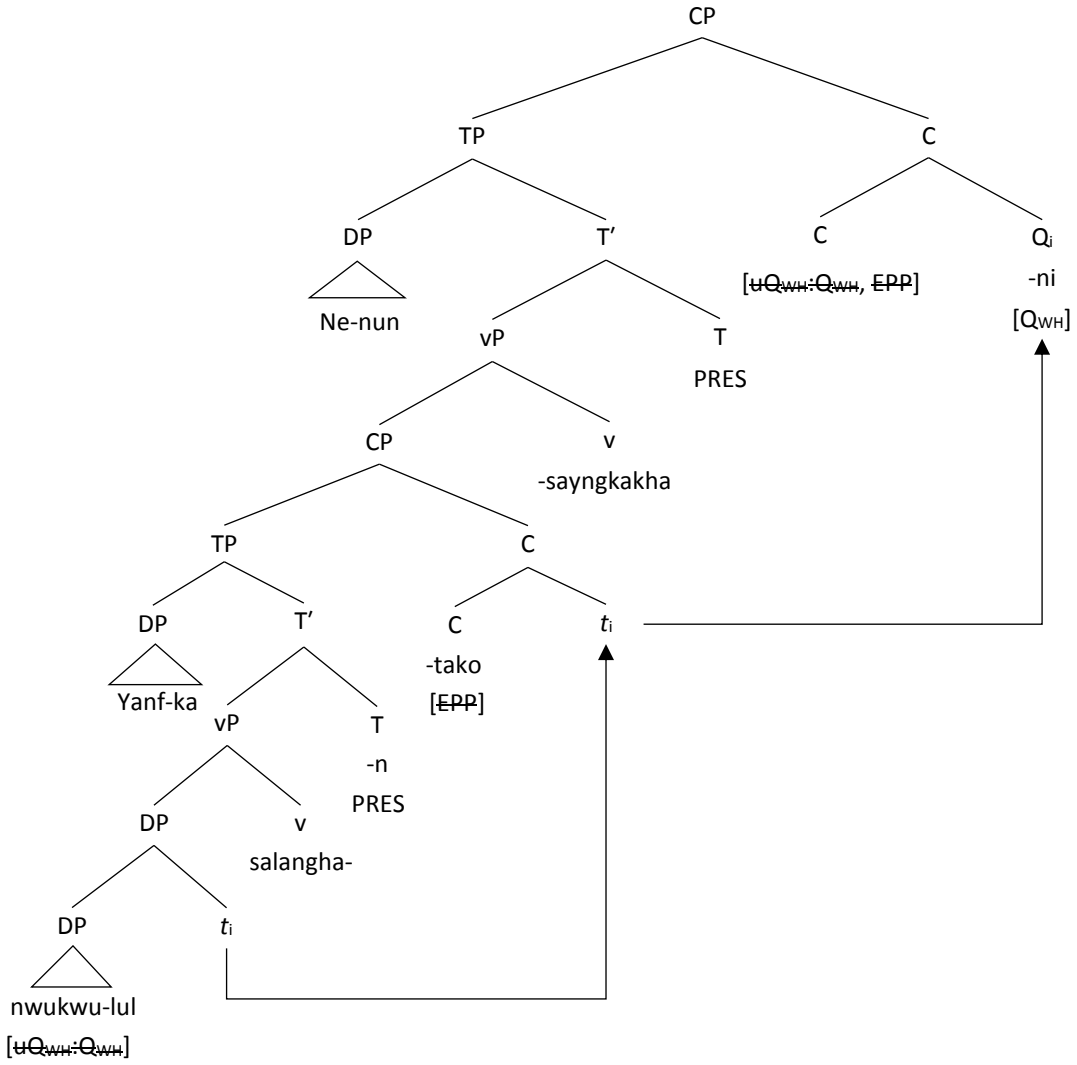
In (79), a Q_{WH}-particle in Korean is adjoined a wh-word in the derivation. Due the [uQ_{WH}] on the wh-word, it probes and agree with [Q_{WH}] on the Q_{WH}-particle. Let us examine how this Q moves successive cyclically. Let us consider the complex wh-questions in (74) and its derivation in (75).

(74) Ne-nun Yanf-ka nwukwu-lul salanghan-ta-ko sayngkakha-ni?
you-TOP Ynaf-NOM who-ACC love-DEC-COMP think-Q
'Who do you think Yanf loves?'

---

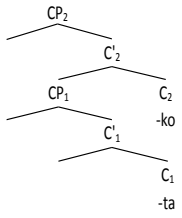
and Lee (2009) argue that scrambled wh-words in Korean are consequences of overt wh-movement. On the other hand, Kim (2001) claim that wh-fronting in Korean is focus movement.

(75) Successive Cyclic Q-movement in Korean[19]



[19] In (75), the mood-marker particle *ta* and the subordinating particle *ko* are incorporated into a complementiser C_1. Due to its agglutinative characteristics, Korean makes use of two different types lexical complementisers: *ta* as a mood-marker and *ko* as a subordinator. In English, on the other hand, a mood-marker and a subordinator are incorporated into a lexical complementiser such as *that* (Bhatt & Yoon, 1992). For that reason, simplification has been pursued in (75) in order to avoid unnecessary complication. Although we might entertain with MoodP analysis, I will not go after it. Instead, I introduce an alternative analysis proposed by Jung (1992) who suggests double CP structure for two sentential ending particles, which allows two independent complementiser positions as illustrated below.

(viii) Double CP analysis for the incorporated complementiser *tako*



In (75), the derivation begins with merging the Q_{WH}-particle *ni* and *nwukwu* 'who'. Note at this point that the Q_{WH}-particle is adjoined to *nwukwu* 'who'; thus, it is the DP that is merged with the lower vP. The [uQ_{WH}] on *nwukwu* 'who' is valued by the [Q_{WH}] on the Q_{WH}-particle *ni* under the probe-goal system. Following this, since the EPP on the embedded C attracts the Q_{WH}-particle *ni* into the embedded C head (see Section 2.3.1 for the EPP-parameterisation). The derivation continues until the matrix C is introduced. The [uQ_{WH}] on the matrix C probes and agrees with the [Q_{WH}] on the Q_{WH}-particle *ni* under the probe-goal system. The EPP on matrix C in turn attracts the Q_{WH}-particle *ni* to its head position. When the Q_{WH}-particle *ni* lands in the matrix C head, the EPP on the matrix C is satisfied. The derivation eventually converges at the interface. The derivation by Q-movement captures straightforwardly the representation of wh-questions in Korean; that is, Q-movement approach clearly shows why wh-words in Korean remain in situ.

In the previous section, we have seen that Q-movement in English wh-question observes the locality conditions such as the RM and the MLC. The same observation is then expected to be hold for Q-movement in Korean wh-questions. In fact, it has been often argued in the literature that wh-questions in Korean are immune to island constraints such as the complex noun phrase island and the adjunct island constraint (Hong, 2005; Yoon, 1999). However, they are, in particular, allergic to the wh-island constraint (Choe, 1994; Chung, 1996; Lee, 2006; Yoon, 1999). Let us examine why wh-questions in Korean observe the wh-island effect. We start out with an instance of complex noun phrase islands.

(76) Yengmi-ka [[t_i mwues-ul-t_j potoha-n] kica$_i$]-ul kosohayss-ni$_j$?
Yengmi-NOM what-ACC report-REL journalist-ACC sued-Q
'What did Yengmi sue a journalist who reported on?'

In (76), the Q_{WH}-particle *ni* and its trace t_j has undergone Q-movement out of the relative clause, and the sentence is well-formed, and this can be attributed to the featural RM. Consider the following representation.

(77) Yengmi-ka [[t_i mwues-t_j-ul potoha-n] kica$_i$]-ul kosohayss-ni$_j$?

[+Q_{WH}] [+Q_{REL}] [+Q_{WH}]

Y Z X

In (77), the intervening candidate Z (the relative pronoun *-n* 'who') does not match the relevant feature specification of X (the Q_{WH}-particle *ni*): X is specified as [+Q_{WH}], whereas Z is specified as [+Q_{REL}]. Consequently, Z does not intervenes the local relation between the X (the Q_{WH}-particle *ni*) and Y (the copy of the Q_{WH}-particle *ni*), and so (77) is well-formed. Q-movement in Korean is immune to the complex noun phrase constraint.

Let us now turn to the wh-island effect in Korean below. It has been often argued that (78) cannot be interpreted as a matrix wh-question; rather, it obtains an embedded wh-question reading due to the wh-island effect at LF.

(78) *Yanf-nun [Yengmi-ka ecey mwues-ul-t_i sass-nunci] kiekha-ni$_i$?

Yanf-TOP Yengmi-NOM yesterday what-ACC bought-Q remember-Q

*'What does Yanf remember whether Yengmi bought yesterday?'

'Does Yanf remember what Yengmi bought yesterday?'

LF wh-movement strategy is, however, not an option we would like to accept in our current Q-movement analysis. As we will discuss it shortly, the failure of the matrix wh-question reading can be attributed to a local constraint on Q-movement. The following representation illustrates the ill-formedness of (79).

(79) *Yanf-nun [Yengmi-kaecey mwues -ul-t_i sass-nunci] kiekha-ni$_i$?

[+Q_{WH}] [+Q_{WH}] [+Q_{WH}]

Y Z X

In (79), the potential intervener Z (the Q_{WH}-particle *nunci*) matches the relevant feature specification of X (the Q_{WH}-particle *ni*): Both Z and X are specified as [+Q_{WH}]. Thus, Z disrupts the local relation between the X (the Q_{WH}-particle *ni*) and Y (the copy of the Q_{WH}-particle *ni*), and so (79) is ill-formed. Q-movement in Korean is allergic to wh-island – Q-island to be more precise. Other local constraints introduced in the previous section. For example, Starke's Q-crossing-Q effect kicks in (79) to ban movement of a Q_{WH}-particle crossing over another Q_{WH}-particle. Chomksy' MLC also accounts for the ill-formedness of (79); that is, the attracter, matrix C prefers the closest attractee, the Q_{WH}-particle *nunci,* and as such, movement of the Q_{WH}-particle *ni* is blocked by the intervening Q_{WH}-particle *nunci*.

The following example further supports Q-movement in Korean. Lee (2006) suggests that if the matrix subject *Yanf* in (79) is replaced with a wh-word, the wh-island effect disappears. Consider the following sentence.

(80) Nwu(kwu)-ka-t_i [Yengmi-ka ecey nwues -ul-t_j sass-nunci$_j$] kiekha-ni$_i$?
who-NOM Yengmi-NOM yesterday what-ACC bought-Q remember-Q
'Who remembers whether Yengmi bought what?'

The representation (80) illustrates Q_{WH}-particle's journey end in Korean: The wh-word accommodates safe take-off of the Q_{WH}-particle, and the interrogative C ensures perfect landing of the Q_{WH}-particle. In other words, the Q_{WH}-particle *nunci* undergoes movement from *mwues* 'what' to the embedded C. The Q_{WH}-particle *ni* later moves from *nwukwu* 'who' to the matrix C. Then (80) obtains a multiple wh-question reading, which lenders further support to Q-movement in Korean.

Alternatively, I assume that there is no such a derivation that induces the wh-island effect in Korean. Given the assumption that Korean makes use of two different types of Q-particles in the lexicon (i.e., Q_{WH}-particles and $Q_{YES/NO}$-particles), the Q-particles *nunci* and *ni* differ in their inherent properties: The Q-particle *nunci* is an instances of Q_{WH}-particles and the Q-particle *ni* is an instance of $Q_{YES/NO}$-particles in (80). Thus, the embedded wh-question reading is only allowed in (80) (see Section 2.3.2).

Consider again the following wh-questions in Keyngsang dialect of Korean. Keyngsang dialect distinguishes the use of Q-particles: *no* for a wh-question and *na* for a yes/no question as in (81).[20]

(81) a. *Yanf-nun [Yengmi-ka ecey mwues-ul saass-nunci] kiekha-no?
Yanf-TOP Yengmi-NOM yesterday what-ACC bought-Q_{WH} remember-Q_{WH}
'What does Yanf remember whether Yengmi bought yesterday?'

b. Yanf-nun [Yengmi-ka ecey mwues-ul sass-nunci] kiekha-na?
Yanf-TOP Yengmi-NOM yesterday what-ACC bought-Q_{WH} remember-$Q_{YES/NO}$
'Does Yanf remember what Yengmi bought yesterday?'

In (81a), the use of the Q_{WH}-particle *no* is banned due to the intervention effect on the movement chain between *no* and its copy/trace. On the other hand, the use of the $Q_{YES/NO}$-particle *na* is allowed since no movement of $Q_{YES/NO}$-particle is observed. Thus, it is reasonable to assume that $Q_{YES/NO}$-particle *na* is directly merged in the matrix C. It is this line of reasoning that I would like to pursue. That is, the Q-particle *ni*, which is used in the alleged wh-island sentence (80), should be analysed as an instance of $Q_{YES/NO}$-particles. The wh-island effect in Korean may result from a misinterpretation of the Q-particle on the ground that the distinction between Q_{WH}-particles and $Q_{YES/NO}$-particles has been vanished in standard Korean. Experimental evidence reports that the wh-island effect in Korean is subject to speaker variation (Yoon, 2012).

It is time to wrap up this section. We find that wh-parameterisation boils down largely to whether a Q_{WH}-particle takes a wh-word as its complement since types of features involved in Q-movement are equal regardless of whether a wh-word resides ex situ or remains in situ. If Q-movement is a universal property that all languages share, the Q-projection parameter – which is a precondition for Q-movement – underlies the learning problem for L2 speakers of English. This Q-projection parameter depends on whether a

[20] This idea is based on Hong (2005), but the analysis differs, especially in terms of Q-movement.

language carries an EPP with a Q-particle, resulting in either QP-movement or Q-movement. Table 3 summarises wh-typologies between languages in question.

Table 3

The Behaviour of Q-particles in English, German, and Korean

Properties	English	German	Korean
Q-projection	Q-projection	Q-projection	Q-adjunction
Q-movement	Overt	Overt	Overt
Q-pronunciation	Null	Null	Pronounced
Q/Wh-agreement	Q/Wh-agreement	Q/Wh-agreement	Q/Wh-agreement
EPP on Q-particle	+EPP	+EPP	-EPP

Thus learning problems ahead of L2 speakers of English is to figure out the feature composition of the Q_{WH}-particle; that is, they must come to know the EPP is realised on the Q_{WH}-particle and project a QP. We now turn to pervious L2 studies on island constraints to see whether this is the case.

2.4 L2 in islands constraints

L2 studies on island constraints in English has been often carried out with speakers whose L1s are wh-in-situ languages and used to pin down whether their interlanguage grammars are constrained by UG. And yet the results have not been as promising as expected. Bley-Vroman, Felix, and Ioup (1988) investigated island constraints in Korean-English interlanguage grammars. Table 4 illustrates the correct responses of English and Korean speaker to island constraints, based on Bely-Vroman et al. (1988, pp. 15–16).

Table 4

Correct Responses to Island Constraints in English

Group	Wh-island	Complex NP Island	Relative clause island
Native control	91%	99%	100%
Korean	86%	75%	84%

Bley-Vroman et al. claim that UG may explain Korean speakers' performance beyond the chance level, but does not account for their non-native-like performance compared to native speakers of English on the ground that they are met 90% accuracy criterion. Bley-Vroman et al further argue that Korean speakers judge the sentences that violate island constraints not because of knowledge of UG, but because of processing difficulty. Bley-Vroman et al. (1988, p. 27) conclude that "UG does operate in adult language acquisition, but in some attenuated form." However, at a mere glance Korean speakers are indeed sensitive to island constraints: Around 80% of accuracy cannot be attributed to processing difficulty – the absolute criterion is just harsh for L2 speakers.

Schachter (1990) examined island constraints in L2 English with Dutch, Indonesian, Chinese, and Korean speakers. Table 5 illustrates overall performance on grammatical wh-questions and ungrammatical sentences including island constraints, based on Schachter (1990, p. 111).

Table 5

Correct Responses to Grammatical and Ungrammatical Sentences in English Wh-questions

Group	Grammatical sentences	Island constraints
Native control	93%	92%
Dutch	97%	91%
Indonesian	72%	63%
Chinese	73%	72%
Korean	77%	52%

Schachter (1990, p. 116) reports that Dutch speakers were significantly better than all the other L2 speakers in detecting island constraints and indistinguishable from native controls. Korean speakers performed quite poorly compared to Indonesian and Chinese speakers and worse than Dutch speakers Table 6 illustrates Dutch and Korean speakers' responses to each island type, based on Schachter (1990, p. 117).

Table 6

Correct Responses of the Dutch and the Korean Speakers to Island Constraints in English

Group	Wh-island	Complex NP island	Relative clause island	Sentential subject island
Dutch	88%	88%	97%	92%
Korean	43%	43%	57%	63%

All in all, the speakers with wh-in-situ languages such as Chinese, Indonesian, and Korean fail to observe island constraints in English although they acquire wh-movement in English, which is not the case for speakers with wh-ex-situ languages such as Dutch. Schachter (1990, p. 118–119) concludes that interlanguage grammars of English are not constrained UG; interlanguage grammars of proficient Chinese and Indonesian speakers of English are

partially UG-constrained, and that Dutch speakers' interlanguage grammars of English are fully constrained by UG.

On the other hand, others have found that speakers of wh-in-situ languages do not have difficulty in detecting island constraints in English and concluded that their interlanguage grammars are UG-constrained. Martohardjono (1993) tested island constraints with Indonesian, Italian, and Chinese speakers of English, assuming that the acceptability of island violations depends on the types of islands. That is, movement out of adjuncts such as relative clause and adjunct islands leads to strong violation, whereas movement out of argument position such as wh-islands and complex NP islands leads to weak violation. If L2 speakers' grammars are UG-constrained, they are able to distinguish the relative unacceptability of island violations. Table 7 gives L2 speakers' rejection rates of strong and weak island violations, based on Martohardjono (1993, p. 124).

Table 7

Rejection Rates of Strong and Weak Island Violations in English

Group	Strong island violations	Weak island violations
Native control	94%	79%
Italian	89%	61%
Indonesian	87%	42%
Chinese	76%	38%

All of the L2 groups distinguished strong from weak violations as English speakers. Table 7 indicates that L2 speakers' intuitions about the unacceptability of island violations pattern with the intuitions of native controls. Martohardjono concludes that L2 speakers have access to island constraints in English. Martohardjono's L2 speakers have fully acquired wh-movement in English, despite poverty of stimulus.

Li (1998) examined Chinese speakers' knowledge of island constraints in English. Li resists the claim that Bley-Vroman et al. (1988) and Schachter (1990) made about UG accessibility in L2. Li argues that L2 speakers' performance in Bley-Vroman et al. (1988) and Schachter (1990), which is not as good as native speakers of English, cannot be an indicator of whether their interlanguage grammars are UG-constrained; rather, it is important to find whether L2 speakers show same or similar pattern in target languages as native speakers, and then it would be sufficient to conclude that UG is operative in L2 speakers' interlanguages grammars (see also White & Genesse, 1996). Table 8 summarises LI's finding on island constraints in Chinese interlanguage grammars of English, based on Li (1998, p. 100).

Table 8

*Correct Responses of Chinese Speakers to Island Constraints in Englis*h

Group	Wh-island	Relative clause island	Sentential subject island
Native control	89%	93%	90%
Chinese	52%	76%	70%

Li (1998, p. 106) suggests that Chinese speakers' performance is not UG-constrained; rather, it signals that they will eventually attain native-like knowledge of island constraints in English provided that their interlanguage grammars are still progressing. Li concludes that island constraints are observed in Chinese speakers' interlanguage grammar of English guided by principles of UG.

White and Juff (1998) investigated Chinese speakers' knowledge of island constraints in English. Two tasks were conducted: a grammaticality judgement task with reaction times and a question formation task and reaction times. White and Juff (1998) found that Chinese speakers are access to island constraints, indicating that they have acquired constraints on wh-movement in English. Table 9 presents Chinese speakers' judgement on island constraints in English, based on (White & Juff, 1998, p. 122).

Table 9

Correct Responses of English and Chinese Speakers to Island Constraints in English

Group	Complex NP island	Relative clause island	Adjunct island	Sentential subject island
Native control	97%	98%	92%	88%
Chinese	88%	88%	83%	88%

White and Juff (1998) also found that Chinese speakers' reaction times in making their judgements are significantly slower than English speakers. Table 10 gives the response times to island constraints, based on White and Juff (1998, p. 123).

Table 10

Mean Reaction Times to Island Constraints

Group	Complex NP island	Relative clause island	Adjunct island	Sentential subject island
Native control	3585	3155	3684	3335
Chinese	8199	7780	7911	7503

White and Juff (1998, p. 127) suggest that results from Table 8 indicate potential processing difficulties; that is, Chinese speakers have reached native-like competence, and yet they take longer to parse illicit movement of wh-words in English. But they were careful in jumping to the conclusion since slow response times are due to slower L2 reading.

The results of the question formation task are presented in Table 11, based on White & Juff (1998, p. 126). The rationale for this task is that if L2 speakers do not have knowledge of island constraints, they will produce ungrammatical wh-questions that violate Subjacency.

Table 11

Question Formation Task Result in Percentages

	Complex NP island		Adjunct island		Sentential subject island	
Group	VIOL	GRAM	VIOL	GRAM	VIOL	GRAM
Native control	4%	49%	0%	64%	2%	57%
Chinese	6%	66%	0%	78%	13%	54%

Note. *VIOL* = the sentences that produced from islands; *GRAM* = the grammatical wh-extraction.

The results indicate that wh-movement is in Chinese speakers' interlanguage grammars of English, and they hardly produced wh-questions that violate island constraints. From the results of their findings, White and Juffs (1998) conclude that Chinese speakers have acquired wh-movement in English in that they respect island constraints on wh-movement, rejecting Subjacency violations in the judgement task and avoiding them in the question formation task.

The previous findings suggest that L2 speakers of wh-in-situ languages are aware of abstract grammatical knowledge of the target structures even though they are not as good as native speakers. However, there is a possibility that we cannot blink at L2 speakers' interlanguage grammars of English. That is, L2 speakers might not employ genuine wh-movement strategies; rather, they make use of other displacement mechanisms available in their L1s. Such assumption might be relevant to the topicalisation of a wh-word (Hawkins & Chan, 1997; Martohardjono & Gair, 1993; White, 1992). Alternatively, L2 speakers might employ wh-scrambling strategies for wh-movement in English, which is allowed in Case-marking languages such Japanese and Korean (Hawkins, 2001; Hawkins & Hattori, 2006).

Non-target-like grammar may be accounted for by our Q-based analysis; that is, those who were not as good as native speakers may project an abstract Q-particle without an EPP in English, which is an essential element for the full QP structure building in the target grammar. As a consequence, they may employ non-target-like grammars such as wh-scrambling available in their L1s.

In the next section, we will explore whether genuine wh-movement resides in German and Korean speakers' interlanguage grammars of English.

2.5 Experiment 1: Island constraints on wh-movement

The aim of this experiment is to establish whether L2 speakers of English acquire syntactic knowledge of LD wh-movement in English. In particular, this experiment aims to examine whether L2 speakers have wh-movement constraints in English. If L2 speakers of English know both when wh-movement is possible and when it is impossible, it will provide robust evidence that they do indeed have syntactic wh-movement in their grammars.

In accordance with the logic and assumptions of previous studies (Bley-Vroman et al., 1988; Li, 1988; Martohardjono, 1993; Schachter, 1990; White & Juffs, 1998), the following research questions are formulated in terms of the Interpretability Hypothesis (IH; Tsimpli & Dimitrakopoulou, 2007) and the Feature Reassembly Hypothesis (FRH; Ladiere, 2009).

(82) Are any L2 speakers of English able to acquire constraints on wh-movement?

(83) Does the L1 influence the acquisition of wh-movement constraints in L2 English?

(84) Does proficiency affect the acquisition of wh-movement constraints in L2 English?

With respect to these research questions, the following general hypotheses are raised in this experiment.

(85) L2 speakers will transfer the featural composition of the Q_{WH}-particle from their L1s.

(86) If the L1 and the L2 share the Q_{WH}-particle even though they function differently, then L2 speakers will be able to reorganise their L1 features onto the L2 use

(87) Even If the L1 and the L2 share the Q_{WH}-particle, L2 speakers will not be able to reconfigure the L2 features that are not selected in their L1s.

Prediction (85) claims that the Korean speakers will transfer [Q_{WH}] without [EPP] in the Q_{WH}-particle into the L2, whereas German speakers will transfer [Q_{WH}] with [EPP] in the Q_{WH}-particle into the L2. This is predicted by the IH and by the FRH.

Prediction (86) states that advanced Korean speakers will reorganise [Q_{WH}] without [EPP] in the L1 Q_{WH}-particle onto [Q_{WH}] with [EPP] in the L2 Q_{WH}-particle, whereas intermediate Korean speakers will be remain with [Q_{WH}] without [EPP] in the L1 Q_{WH}-particle. German speakers, irrespective of proficiency, will project [Q_{WH}] with [EPP] in the L1 Q_{WH}-particle into the L2 Q_{WH}-particle. It is therefore expected to find that the properties displayed by English wh-questions are unproblematic for the German speakers and the advanced Korean speakers. However, those properties are problematic for the intermediate Korean speakers. Such predictions are borne out by the FRH.

Prediction (87) argues that German speakers will project [Q_{WH}] with [EPP] in the Q_{WH}-particle into the L2 Q_{WH}-particle, whereas Korean speakers will not be able to project [Q_{WH}] with [EPP] the L1 Q_{WH}-particle into the L2 Q_{WH}-particle since it is not available in Korean Q-particles. This is predicted by the IH.

Note that the current research project bases these general hypotheses onto the subsequent experiments since L2 speakers' knowledge of syntactic properties of English wh-questions predict their knowledge at the interpretive interface and their processing of phenomena at the interpretive interface. Put it simple, if L2 speakers do not have target syntactic knowledge, it would be expected to affect their mapping syntactic representation onto the semantic relations. This consequently influences L2 speakers' online processing of crossover constructions.

Table 12 summarises the developmental process of Q-projection in L2 English in terms of the IH and the FRH.

Table 12

L2 Development Patterns of Q-projection in English

	Interpretability Hypothesis		Feature Reassembly Hypothesis	
	EPP on Q_{WH}-particle	Q-projection	EPP on Q_{WH}-particle	Q-projection
German				
Advanced	✓	✓	✓	✓
Intermediate	✓	✓	✓	✓
Korean				
Advanced	✓	✓	✓	✓
Intermediate				

2.5.1 Participants

80 participants participated in the experiment: 32 Korean speakers of English, 29 Austrian German speakers of English, and 19 native speakers of British English. Participants were asked to fill out a personal background questionnaire at the beginning of the experiment. As for the Korean speakers, they were tested in the UK. They were monolingual native speakers of Korean. At the time of testing, 29 were enrolled in either undergraduate or postgraduate programmes at the University of York. The other three were working professionals, living in York, UK and had postgraduate degrees from UK universities. As for the German speakers, they were tested in Austria. They were monolingual native speakers of Austrian German. At the time of testing, they were enrolled in undergraduate programmes at the University of Vienna or Vienna University of Economics and Business. Finally, the English speakers were monolingual native speakers of British English. At the time of testing, they were enrolled in either undergraduate or postgraduate programmes at the University of York and served as a control group. Detail of the participants' demographic information is provided in Table 13.

Table 13

Summary of Participants' Background Questionnaire

	Age		Gender		OE		LOR	
Group	*M*	Range	Male	Female	*M*	Range	*M*	Range
German (n = 29)	22.9	18–40	8	21	8.8	7–11	0.8	0.3–0.9
Korean (n = 32)	33.1	18–52	11	21	11.4	7–14	3.1	0.9–16
English (n = 19)	23.9	20–41	14	5	N/A	N/A	N/A	N/A

Note. OE = onset of English learning in year; LOR = length of residence in English-speaking countries in year

On the basis of their performance on the Quick Placement Test (QPT, Oxford University Press, 2001), Korean and German speakers of English were further divided into two subgroups: intermediate and advanced group.[21] The detailed results of the proficiency test are summarised in Table 14.

Table 14

Mean Scores of the Proficiency Test

			95% CI			
Group	*M*	*SD*	*LB*	*UB*	Min	Max
German						
Advanced (n = 17)	55.2	3.7	53.3	57.2	48	59
Intermediate (n = 12)	37.8	5.1	34.6	41.1	31	46

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound.

[21] The QPT is a test of English language proficiency developed by Oxford University Press and Cambridge ESOL. The QPT, used here, was a paper and pen version. It consisted of 60 multiple choice questions, assessing vocabulary, grammar, and reading. Proficiency levels, corresponding to the Common European Framework levels, were determined by the following score ranges: elementary (18–29 out of 60); intermediate (30–39 out of 60); upper intermediate (40–47 out of 60); lower advanced (48–54 out of 60); upper advanced (55–60 out of 60).

Table 15 (continued)

Mean Scores of the Proficiency Test

			95% CI			
Group	*M*	*SD*	*LB*	*UB*	Min	Max
Korean						
Advanced (n = 10)	52.3	3.4	49.9	54.7	48	57
Intermediate (n = 22)	42.4	2.3	41.4	43.4	38	46

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound.

A one-way ANOVA conducted on the QPT scores shows statistically significant differences between the four groups, $F(3, 57) = 75.67$, $p = .000$. Games-Howell *post hoc* tests confirm that within each group, intermediate groups' QPT scores differ significantly from those of the advanced groups ($p < .05$). Between the advanced groups, no significant difference occurs ($p > .05$), but there appears to be a significant difference between the intermediate groups ($p < .05$). As shown in Table 12, however, the mean score for the German advanced group (55.2) does not fall within the CI for the Korean advanced group [49.9, 54.7] and the other way around, which indicates that the difference between these two mean is statistically different (see Lason-Hall & Plonsky, 2015). The difference between these two groups is demonstrated by calculating the effect size, which results in a large effect size with Cohen's *d* value of .08. Nevertheless, participants had to be divided into advanced and intermediate group to increase sample size and to improve statistical power.

2.5.2 Materials

An untimed acceptability judgment task (AJT) was designed to examine whether L2 speakers of English have genuine wh-movement in their grammars. The task was similar to the designs in White and Genesee (1996) and White and Juffs (1998), but the materials used here were different. The AJT consisted of 52 long-distance wh-questions: 24 were grammatical sentences, 12 were ungrammatical sentences, and 16 were sentences violating Subjacency. Both the grammatical and ungrammatical sentences included extraction of

subjects and objects from embedded clauses. However, the sentences involving Subjacency violations included only object extractions from embedded clauses. The sentences were all finite without complementisers. No fillers were included in the task since each sentence type, being distinct from each other, serves as distractors. And this was done in order to minimise the overall test burden, given that four further tasks followed the AJT.

The grammatical sentences were manipulated by the position of a wh-extraction: wh-movement from embedded subject position and wh-movement from embedded object position. The ungrammatical sentences involved three types of ungrammatical wh-questions: wh-movement without T-to-C movement, wh-movement with doubly marked tense, and wh-movement without pied-piping. The sentences violating Subjacency comprised four types of islands: wh-islands, complex noun phrase islands, relative clause Islands, and adjunct islands. The target sentences were balanced across each type. The sentence types are illustrated in (88)–(90). A full list of test items is provided in Appendix 1.

(88) Grammatical Sentences

a. Wh-movement from embedded subject

   Who did he say ___ was the first Asian Member of Parliament?

b. Wh-movement from embedded object

   What does Mary say she will sell at the charity sale ___ tomorrow?

(89) Ungrammatical Sentences

a. No T-to-C movement

   Who Natalie said everyone wanted to invite ___ to the party?

b. Double marking of tense

   What does Ryan worries they will ban ___ due to its explicit contents?

c. No pied-piping

   What did the reporter say WikiLeaks released ___ documents?

(90) Subjacency Violations

a. Weak islands

- Wh-island

  *?Who did Susan explain why she had to break up with ___?

- Complex noun phrase island

  *?What did they raise doubts about the report that North Korea had ___?

b. Strong islands

- Relative clause island

  *What did the reporter criticise the company that produced ___?

- Adjunct island

  *Who did Marvin hate Charlotte because she used to hang out with ___?

The purpose of the grammatical sentences is to establish whether L2 speakers indeed acquire long-distance movement of wh-words in English (see also White & Genesee, 1996; White & Juffs, 1998). The purpose of the ungrammatical sentences is to examine whether L2 speakers have knowledge of syntactic properties displayed by wh-movement in English. The presence of such knowledge is a prerequisite for L2 speakers to access constraints on long-distance wh-movement in English (Schachter, 1989). Even though L2 speakers whose L1s do not involve overt wh-movement may correctly produce wh-questions in English, such as *What do you want?*, one would not know for sure whether wh-words in questions undergo true wh-movement to the specifier position of CP, especially when wh-questions involve long-distance wh-movement (Hawkins, 2001; Hawkins & Hattori, 2006; White, 1992). The purpose of Subjacency violations is to provide a means to establish whether L2 speakers indeed acquire constraints on wh-movement in English. More specifically, if Korean speakers of English obey constraints on wh-movement in English, then it would indicate the existence of genuine wh-movement in their grammars. If not, it would suggest the absence of true wh-movement in their grammars. In other words, wh-movement is unbounded in their grammars due to the lack of target-like syntactic representation of wh-movement in English. It is for that reason that Subjacency is used as a diagnostic tool to establish whether

L2 speakers have constructed target-like syntactic representation of wh-movement in English.

2.5.3 Procedure

The experiment was run on a laptop PC, using PsychoPy (Peirce, 2007). Participants were asked to read each sentence carefully and to judge whether the sentence is fully possible or impossible, on the basis of a five-point scale: −2 (completely unnatural, this is impossible as a sentence of English); −1 (somewhat unnatural, people probably don't say this); 0 (I can't decide); +1 (somewhat natural, people might say this); +2 (completely natural, this is a fully possible sentence of English). Participants were instructed to rate each sentence by clicking the appropriate point scale with the mouse.

Figure 1. An Example of Stimulus in the AJT

They were also instructed to make the judgment as quickly as possible. Participants read and judged the sentences one at a time since PsychoPy would not proceed forward unless they completed rating the sentence. That being so, PsychoPy did not allow participants to skip or miss any sentences, or to go back to the previous sentences they had already made the judgment. As well as recording participant's judgment of each sentence, PsychoPy

recorded response times participants spent on making the judgment. Before they performed the task, participants were given four practice items in order to familiarise them with the task. The sentences were presented in a quasi-random order. The experiment, including instructions and practice, lasted approximately fifteen to twenty-five minutes to complete. Participants were tested individually.

2.6 Results

For the data analysis, each correct judgement was given a score of 1, and each incorrect judgement was given a score of 0. In addition, '*I can't decide*' judgement was removed from the analysis, and this affects 2.8% of the native control, 3.6% of the German advanced, 9.3% of the German intermediate, 2.1% of the Korean advanced, and 3.9% of the Korean intermediate group data. Table 15 presents mean accuracy on each sentence type: grammatical, ungrammatical, and island violations sentences.

Table 16

Correct Responses to the Three Types of Sentences

	Grammatical sentences			Ungrammatical sentences			Island violations		
		95% CI			95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	95% (5)	92	98	77% (19)	68	86	84% (13)	78	90
GA	89% (9)	84	94	84% (15)	76	92	92% (7)	89	96
GI	69% (17)	58	79	51% (20)	38	63	59% (24)	44	74
KA	77% (21)	61	92	78% (17)	66	91	75% (20)	61	89
KI	59% (25)	47	70	64% (23)	54	74	59% (24)	48	69

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

A one-way ANOVA conducted on the three sentence type yields between-group effects for the grammatical sentences $F(4, 75) = 14.082$, $p = .000$, for the ungrammatical sentences, $F(4, 75) = 6.604$, $p = .000$, and for the island violations, $F(4, 75) = 11.669$, $p = .000$. Note that the analysis here does not rely solely on p-values; rather, the group differences are analysed in terms of the CI and effect size, due to the sample size (Lason-Hall & Plonsky, 2015).

As for the grammatical sentences, the NC group's acceptance rates are significantly different from the L2 groups. The mean acceptance rate for the NC (95%) does not fall within the CIs for the L2 groups and vice versa, as shown in Table 15. The effect sizes are large in general (Cohen's $d > 0.8$). The advanced groups demonstrate higher acceptance rates than the intermediate groups. The mean acceptance rate for the GA group (89%) does not fall within the CIs for the intermediate groups and the other way around. The effect sizes are large on average (Cohen's $d > 1.5$), indicating that the difference between these groups is significant. No significant difference yields between the advanced groups. The mean acceptance rate for the GA group (89%) is within the CI for the KA group [61, 92]. There is no significant difference between the intermediate groups. The mean acceptance rate for the GI group (69%) falls within the CI for the KI group [47, 70]. Let us examine how L2 speakers behave differently in subject and object wh-movement. Table 16 gives how L2 speakers respond to each of the extraction types.

Table 17

Correct responses to Grammatical Subject and Object Extraction

	Subject extraction			Object extraction		
		95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	93% (9)	88	97	97% (6)	95	100
GA	91% (10)	86	96	87% (12)	81	94
GI	68% (21)	55	82	69% (15)	60	79
KA	73% (30)	52	95	80% (18)	67	93
KI	50% (32)	36	64	67% (26)	55	79

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

Descriptively, no subject/object asymmetries are found in the NC, GA, KA, and GI group; the CI comparisons do not reveal a significant difference between the subject and object extraction. The KI group, however, show subject/object asymmetry; the mean acceptance rate for the subject extraction (50%) is not within the CI for the object extraction [55, 79] and in reverse. This suggests that for the KI group, the subject extraction is more difficult than the object extraction.

Moving on to the ungrammatical sentences, there are significant differences between the NC and the intermediate groups. The mean rejection rate for the NC group (77%) is not within the CIs for the intermediate group, [38, 63] for the GI group and [54, 74] for the KI group, and the other way around. The effect sizes are large in general (Cohen's d > 1.9). No significant differences are found between the NC group and the advanced groups. The mean rejection rate for the NC group (77%) is within the CIs for the GA group [76, 92] and for the KA group [66, 91]. There are significant differences between the advanced and intermediate groups. The mean rejection rates for the GA group (84%) and for the KA group

(78%) do not fall within the CIs for the GI group [38, 63] and for the KI group [54, 74], and conversely. The effect sizes are large on the whole (Cohen's *d* > 0.9), indicating that the advanced groups demonstrates much higher rejection rates of ungrammatical sentences than the intermediate groups. A significant difference yields between the intermediate groups. The mean rejection rate for the GI group (51%) is not within the CI for the KI group [54, 74] and vice versa. The effect size is medium in general (Cohen's *d* > 0.6). The KI group demonstrates much higher rejection rates of ungrammatical sentences than the GI group. Table 17 presents L2 speakers' behaviour on different types of ungrammatical sentences.

Table 18

Correct Responses to Ungrammatical Sentence Types

	No T-to C movement			Double marking of tense			No pied-piping		
		95% CI			95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	82% (20)	72	91	63% (32)	48	78	86% (21)	75	96
GA	78% (29)	63	93	78% (25)	65	91	96% (10)	91	101
GI	48% (29)	29	66	60% (29)	42	79	44% (22)	30	58
KA	73% (34)	48	97	90% (17)	77	103	73% (18)	59	86
KI	60% (31)	46	74	72% (30)	58	85	60% (31)	47	74

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

It is likely that all of the groups behave differently in different ungrammatical sentences. For the intermediate groups, both wh-movement without subject–auxiliary inversion (34% in the GI group and 60% in the KI group) and without pied-piping receive (44% in the GI group and 60% in the KI group) lower rejection rates than wh-movement with double marking of tense (60% in the GI group and 72% in the KI group). The KA group

patterns with the intermediate groups; however, their rejection rates higher than the intermediate groups. The NC group is quite opposite; the double marking of tense condition (63%) receives lower rejection rate than no T-to-C movement (82%) and no pied-piping (86%) condition. For the GA group, no pied-piping condition (96%) receives higher rejection rate than no T-to-C movement (78%) and double marking of tense (78%) condition. Table 17 confirms that the intermediate groups have not yet acquired syntactic properties of wh-movement in English. The advanced groups, by contrast, demonstrate higher rejection rates on both conditions, suggesting that they have acquired syntactic properties of wh-movement.

Turning now to the island constraints, the advanced groups reject sentences violating island constraints higher than the intermediate groups; the mean rejection rates for the GA group (92%) and for the KA group (75%), do not fall within the CIs for the GI group [44, 74] and for the KI group [48, 69], and vice versa. The effect sizes are medium on the average (Cohen's $d > 0.7$). The GA group has a higher rejection rate than the NC and KA group; the mean rejection rate for the GA group (92%) is not within the CIs for the NC [78, 90] and for the KA [61, 89] group and the other way around. The effect size is large in general (Cohen's $d > 0.9$). There is no significant difference between the NC and KA group. The mean rate for the NC group (84%) is within the CI for the KA group [61, 89]. No difference is found between the intermediate groups with the same low rejection rates at 59%. Table 18 gives L2 speakers' response rates of weak vs. strong islands.

Table 19

Correct Responses to Weak vs. Strong Island

	Weak island						Strong island					
	Wh-island			Complex NP island			Relative Clause island			Adjunct island		
		95% CI			95% CI			95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	84% (12)	78	90	72% (25)	60	84	97% (8)	94	101	83% (24)	71	94
GA	88% (18)	79	97	84% (22)	73	95	99% (6)	95	102	99% (6)	95	102
GI	40% (36)	17	63	48% (31)	28	68	73% (34)	51	95	77% (27)	60	94
KA	75% (24)	58	92	63% (36)	37	88	90% (17)	77	103	73% (28)	53	92
KI	57% (30)	43	70	48% (30)	35	61	61% (35)	46	77	68% (27)	56	80

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

The GA group has robust rejection rates for strong island violations: both relative clause and adjunct islands are rejected at a rate of 99%, respectively. Their rejection rate of the relative clause islands is not significantly different from the NC and KA group; the mean rejection rate for the GA group (99%) is within the CIs for the NC group [94, 101] and for the KA group [77, 103]. The mean rejection rate of the relative clause for the GA group (99%), however, is not within the CIs for the GI group [51, 95] and for the KI group [46, 77] and vice versa. The effect sizes are large on the average (Cohen's $d > 1.1$). The mean rejection rate of the adjunct islands for the GA group (99%) is not within the CIs for the NC group [71, 94] and for the KA group [53, 92], and contrariwise. The effect size is large on the whole (Cohen's $d > 0.8$). In addition, the mean rejection rate of the adjunct islands for the GA group (99%) does not fall within the CIs for the GI group [60, 94] and for the KI group [56, 80], and the other way around. The effect sizes are large in general (Cohen's $d > 1.3$).

Turning to the weak island violations, the GA group's rejection rates are somewhat lower than the strong ones: wh-islands at a rate of 88% and complex NP islands at a rate of 83%. Their rejection rate of the wh-islands is not significantly different from the NC and KA group; the mean rejection rate for the GA group (88%) is within the CIs for the NC group [78, 90] and for the KA group [58, 92]. The GA group's rejection rate of the complex NP islands is not significantly different from the NC and KA group; the mean rejection rate for the GA group (84%) is within the CIs for the NS group [60, 84] and for the KA group [37, 88]. However, the GA group's rejection rates of the weak islands are significantly different from the intermediate groups. The mean rejection rate of the wh-islands for the GA group (88%) is not within the CIs for the GI group [17, 63] and for the KI group [43, 70], and the other way around. The effect sizes are large in general (Cohen's $d > 1.2$). In addition, the mean rejection rate of the complex NP islands for the GA group (84%) is now within the CIs for the GI group [28, 68] and for the KI group [35, 61], and oppositely. The effect sizes confirm the significance between these groups on the whole (Cohen's $d > 1.3$).

Looking at the KA group, their rejection rates of the strong islands are not significantly different from the NC group; the mean rejection rate of the relative clause islands for the KA group (90%) is within the CI for the NC group [94, 101], and that of the adjunct islands for the KA group (73%) is within the CI for NC group [71, 94]. The weak islands are much of the same. The mean rejection rate of the wh-island for the NC group (84%) is within the CI for the KA group [58, 92], and that of the complex NP island for the NC group (72%) is within the CI for the KA group [37, 88]. Interestingly, the KA group appears to pattern with the NC group in rejecting island violations. Furthermore, the KA group's mean rejection rates of the strong islands are not significantly different from the GI group; the mean rejection rate of the relative clause islands for the KA group (90%) falls within the CI for the GI group [51, 95], and that of the adjunct islands for the KA group (73%) is within the CI for the GI group [60, 94]. However, while the mean rejection rate of the adjunct islands for the KA group (73%) is within the CI for the KI group [56, 80], that of the relative clause islands for the KA group (90%) does not fall within the CI for the KI group [46, 77] and inversely. Generally, the effect size is large (Cohen's $d > 0.9$), suggesting that the difference is significant.

Moving on to the intermediate groups, descriptively, no differences are found between the GI and KI group. As evidenced in their different behaviour in grammatical and ungrammatical sentences, lack of syntactic knowledge leads to lower rejection rates of the island constraints, compared to the advanced group. This in turn implies that the intermediate groups do not project Q of the target languages proper.

Interestingly, through the reanalysis of our data, we observe a similar pattern uncovered in Martohardjono (1993). Table 19 gives the evidence that our L2 speakers are able to distinguish the relative unacceptability of island constraints.

Table 20

L2 Speakers' Access to Weak vs. Strong Island

	Weak island			Strong island		
		95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	78% (16)	71	86	90% (14)	96	101
GA	86% (14)	79	93	99% (4)	67	95
GI	44% (29)	25	62	75% (29)	57	93
KA	69% (25)	51	87	81% (20)	67	95
KI	52% (24)	42	63	65% (29)	52	78

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

Table 19 clearly shows that L2 speakers are sensitive to relative strength of island constraints. That is, their rejection rates for the strong islands are higher than the weak islands: 99% (strong islands) vs. 86% (weak islands) in the GA group; 81% (strong islands) vs. 69% (weak islands) in the KA group; 75% (strong islands) vs. 44% (weak islands) in the GI group; 65% (strong islands) vs. 52% (weak islands) in the KI group. This confirms that while

the advanced group have reorganised the features of the Q_{WH}-particle with the EPP, the intermediate groups have not yet reconfigured them fully, showing limited access to island constraints.

We now turn to response times (RTs) on the same sentence types: grammatical, ungrammatical, and island violations sentences. The RTs with '*I can't decide*' judgement were removed from the analysis. In addition to this, The RTs that were two standard deviations above the mean RT were replaced with the cut-off value (Mean RT ± 2SDs). This affects 5.2% of the control, 4.3% of the GA, 4.5% of the GI, 5.8% of the KA, and 5.5% of the KI group data. Table 20 presents overall RTs from each of the groups.

Table 21

Mean response times on three types of sentences

	Grammatical sentences			Ungrammatical sentences			Island violations		
		95% CI			95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	6326 (1548)	5580	7072	6715 (1543)	5972	7459	7293 (2298)	6186	8401
GA	6815 (1678)	5953	7678	6843 (1064)	6296	7390	7503 (1399)	6784	8222
GI	9426 (3008)	7515	11338	9141 (2553)	7519	10763	9536 (2561)	7909	11163
KA	14945 (6220)	10496	19395	13550 (5517)	9603	17497	15634 (6896)	10700	20567
KI	15797 (3595)	14203	17391	16630 (4945)	14438	18823	20188 (6425)	17340	23037

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

A one-way ANOVA showed between-group effects in making judgement on the grammatical sentences $F(4, 75) = 32.29$, $p = .000$, for the ungrammatical sentences $F(4, 75) = 29.31$, $p = .000$, and for the island violations, $F(4, 75) = 30.63$, $p = .000$.

As shown in Table 20, it turns out that GA group's RTs appear to be much the same as the control group's in all of the cases. However, the KA group is significantly slower in judging all of the sentences than the NC and GA group; the mean RTs for the KA group are not within the CIs for the NC group and for the GA group, and in reverse. The effect sizes are exceedingly large on the whole (Cohen's d > 2.1). Furthermore, the CI comparisons between the KA and GI group yield significant differences in all of the cases. As shown in Table 20, the mean RTs for the KA group do not fall within the CIs for the GI group in all the sentence types, and vice versa; the effect sizes are large in general (Cohen's d > 1.1). Additionally, descriptive statistics demonstrate that the KA group does not differ from the KI group; that is, the mean RTs for the KI group are within the CIs for the KA group. The effect sizes are small in general (Cohen's d = 0.4). The KI group is much slower than the NC and GA group. The effect sizes are extremely large in general (Cohen's d > 2.3)

The GI group is also slower than the GA and the control group in making judgement in all of the sentence types; the mean RTs for the GI group is not within the CIs for the NC group and for the GA group across the conditions, and inversely. In general, the effect sizes are large (Cohen's d > 1.2). The GI group's RTs appear to be significantly different from the KI group's across the conditions; the effect sizes are large on the average (Cohen's d > 1.9).

Provided that the KA group has acquired genuine wh-movement in English, they took longer to access native-like parsing of the target structures. GA group's RTs support this line of reasoning; that is, they have no difficulties in parsing island constraints due to mastery of wh-movement. The GI and the KI group were rather inaccurate in all of sentence types, regardless of the grammaticality. If their interlanguage grammars do not project the features of Q_{WH}-particles properly, their low judgement rates and slow RTs might be explained. Further

Overall the results suggest that the advanced L2 speakers demonstrate their knowledge of long-distance wh-movement, and yet accuracy in rejecting or accepting complex wh-questions varies. RTs seem to be a good candidate for the difference in (un)acceptability of complex wh-questions. Nevertheless, the current findings suggest that the advanced L2 speakers are able to acquire abstract grammatical properties of wh-movement in English.

2.7 Discussion

Before we discuss L2 speakers' knowledge of complex wh-questions in English demonstrated in the previous section, let us recall our predictions on their behaviours and research questions

(91) Research questions

a. Are any L2 speakers of English able to acquire constraints on wh-movement?

b. Does the L1 influence the acquisition of wh-movement constraints in L2 English?

c. Does proficiency affect the acquisition of wh-movement constraints in L2 English?

(92) Hypotheses

a. L2 speakers will transfer the feature composition of the QWH-particle from their L1s.

b. If the L1 and the L2 share the QWH-particle even though they function differently, then L2 speakers will be able to reorganise their L1 features onto the L2 use

c. Even If the L1 and the L2 share the QWH-particle, L2 speakers will not be able to reconfigure L2 features that are not selected in their L1s.

We started out with this chapter by innocent assumptions such as role of L1 and L2 proficiency in L2 syntax. And it's time to answer the questions. The answer to research question (91c) would be positive. What we can do with L2 proficiency is to look at the initial state of L2 acquisition, allowing us to observe a path or growth of L2 speakers' linguistic abilities. L2 proficiency does not tell us about the nature of L2 acquisition beyond the initial state as predicted in (92a). Findings from this chapter suggest that L2 initial state is not influenced by the L1, which is against the view that Schwartz and Sprouse (1998) hold; that is, "L2 acquirers with typologically distinct L1s do in fact differ with respect to their developmental paths for a given target language" (p. 67). The current experiment shows

that the German and Korean intermediate group share the same developmental profiles; their relatively low judgement rates and slow response times in making judgement suggest that they have not yet reorganised the features of the Q_{WH}-particle in the target language. In other words, they appear to be flexible to project the target Q_{WH}-particle. It seems that they project it with or without the EPP, which essential element to build the functional category, QP. For that reason, they demonstrated relatively low judgement across the condition. Yet, they could also project the Q_{WH}-particle with the EPP. This is manifested by their ability to distinguish the relative unacceptability of island constraints.

This relates to research question (91b). L2 research centres the role of L1 or L1-L2 difference on different behaviours of L2 speakers; that is, whether L2 acquisition is influenced by L2 speakers' L1s that are typologically distinct from the properties of the target languages. The results from the current experimental study dismiss the claim that L2 syntactic representation is affected by the L1 (Hawkins, 2005; Hawkins & Hattori, 2006; Tsimpli & Dimitrakopoulou, 2007). If the L1 plays a role in the L2, the Korean advanced group should have had difficulties either in accepting the grammatical sentences or in rejecting the ungrammatical sentences including island violations. Thus, we need to keep an eye on the patterns that L2 speakers expose since L2 end-state representations may not be fully native-like, and it may take some time to successfully accomplish the reconfigure lexical or functional features of the target languages given the Feature Reassembly Hypothesis (Lardiere, 2009). The advanced speakers are successfully able to project the QWH-particle with the EPP. They accept grammatical sentence and reject ungrammatical sentences including island violations; that is, their linguistic behaviour is target-like. They know where to move and what to move. This in turn answers to the research question (91a), Are any L2 speakers of English able to acquire constraints on wh-movement? The answer to (91a) is positive as well. Any L2 speakers of English have access to constraints on wh-movement in English just like anyone can play guitar.

However, it is noticeable that the Korean advanced speakers, despite their target-like representations, demonstrated slow response times in making judgement on all of the sentence types. This appears regardless of the (un)acceptability of sentence types. It seems then the Korean advanced speakers may have processing difficulties with long-distance wh-

questions, which is reflected on relatively low acceptance on the grammatical sentences. In fact, processing of a complex wh-question is not cost-free at all since the filler, the wh-word must be kept in working memory until it identifies the gap, the base position of the wh-word; as a consequence, all of the elements on the path between the filler and the gap must be process at the same time (Hawkins, 1999, pp. 246–247). The German advanced speakers, on the other hand, appears to have little processing difficulties. I thus assume that both German and Korean advanced group have acquired syntactic properties of long-distance wh-questions in English, but they diverge at processing.

Given that grammar is related with competence and processing is associated with performance, L2 end-state is, after all, diverges at processing of target structures. This in turn might raise an issue on L1 transfer in L2 acquisition. However, L1 does not influence L2 syntax in the current experimental study. Rather, L1 may affect processing of the target structures provided that in Korean wh-questions do not require the filler-gap dependency. In this line of reasoning, the findings from Experiment 1 convey the implicationthat L1 does not influence L2 competence, rendering a support on the Feature Reassembly Hypothesis; rather, the L1 may have an effect on L2 performance (i.e., parsing).

Chapter 3

Interpreting Crossover Constraints in Second Language Acquisition

3.1 Introduction

This chapter investigates L2 knowledge of phenomena at the syntax-semantics interface, attempting to broaden out into how grammar and meaning interact in L2 acquisition. More specifically, this chapter examines how L2 speakers make use of syntactic knowledge to resolve ambiguity that results from structural asymmetry. To this end, this chapter explores crossover phenomena in German-English and Korean-English interlanguage grammars.

Where languages involve wh-movement, they give rise to the crossover effects (Postal, 1971). This is illustrated in (93).

(93) a. Who does he think loves Yengmi?

b. Who thinks he loves Yengmi?

While (93a) is unambiguous, (93b) is ambiguous. That is, in (93a), *he* cannot be the same person referred to as *who*, but in (93b), *he* and *who* can be the same person. This is held to be because in (93b) *who* has not moved across *he* – it is generated in matrix subject position. In (93a), however, *who* has moved across *he* from the embedded subject position:

Potentially related to this is the following. Sentences involving a wh-word and a quantifier such as (94) can have different interpretations, depending on whether the wh-word has crossed over the quantifier or not.

(94) a. Who met everyone?

b. Who did everyone meet?

Suppose a scenario where there is a party, and there are three people who know each other – *John*, *Mary* and *Sue* – but do not know anyone else. By the end of the evening, however, each of them has met some people. An appropriate answer to question (94a) could be (95a). For (94b), on the other hand, (95a) and (95b) could be possible answers.

(95) a. Single answer: Everyone met Sue

b. Pair-list answer: Juan met Sue, Pedro met John and Julio met Mary

These subtle differences in interpretation are claimed to be potential learning problems at the syntax-semantics interface. L2 speakers with wh-in-situ languages such as Korean do not have these interpretation constraints realised in questions. Although speakers of Korean easily learn that wh-words come at the front in English, it is not clear whether their grammars involve movement; if they don't then they would not be sensitive to allowed and disallowed interpretation of target sentences. However, this does not hold for speakers of German as they have crossover constraints in their grammars.

In what follows, I will provide descriptive accounts for crossover phenomena and analyse factors that affect differences in interpretations of wh-questions between English, German, and Korean. I will also show that Q-based theory has an effect on interpretations of wh-questions. Let us start out with some background of crossover phenomena.

3.2 Crossover Constraints in Wh-interrogatives

3.2.1 Crossover and Bound Variable Interpretation of Pronouns

It has been widely assumed that wh-ex-situ languages such as English give rise to phenomena known as crossover. The term crossover was originally introduced by Postal (1971) to describe the illicit syntactic configuration where a wh-word moves across a pronoun with which it is coreferential.

(96) a. Who$_i$ does he$_{*i/j}$ think Yengmi love t_i?

b. Who$_i$ t_i thinks Yengmi loves him$_{i/j}$?

The sentences in (96) are all grammatical but differ in their interpretation on the basis of Postal's description. In (96a) *who* and *he* cannot be interpreted as coreferential because *who* undergoes movement crossing over *he*. In (96b), on the other hand, *who* and *him* can be interpreted as coreferential since *who* does not move across *him*. The difference between sentences in (96) is that in (96a), the crossed pronoun *he* c-commands the wh-trace, whereas in (96b), the wh-trace c-commands *him*.

The crossover effect is reanalysed by Wasow (1972). Wasow observes that the crossover effect becomes far less deviant than (96a) when the crossed pronoun does not c-command the wh-trace as in (97a).[22]

(97) a. Who$_i$ does his$_{*?i/j}$ mother loves t_i?

b. Who$_i$ t_i loves his$_{i/j}$ mother?

Wasow (1972) distinguishes (97a) from (96a) in terms of the degree of unacceptability: (96a) is labelled as strong crossover (SCO), whereas (97a) is tagged as weak crossover (WCO) since it is far less degraded than (96a).

The unavailability of coreference between *who* and *his* in (97a) can be explained by Koopman and Sportiche's (1982) Bijection Principle (BP), one of the most well-known analyses of the WCO constraint.[23]

[22] Wasow (1972) originally states that the difference between the SCO and the WCO lies in whether the pronoun is more deeply embedded in the NP than the wh-trace. This is now understood in term of c-command, that is, the difference depends on whether the crossed pronoun commands the wh-trace (Lasnik & Uriagereka, 1998; Safir, 2004).

[23] A number of analyses have been put forward to account for the WCO effect: binding theory in Agüero-Bautista (2012), Lasnik and Stowell (1991), and Reinhart (1983); scope theory in (Ruys, 2000); linking theory in Higginbotham (1983) and Safir (2004).

(98) Bijection Principle

> There is a bijective correspondence between variables and Ā-positions. That is, every variable is locally bound by one and only one Ā-position, and every Ā-position locally binds one and only one A-position.
>
> (Koopman & Sportiche, 1982, p. 146)

In short, the BP does not allow Ā-operators to bind more than one variable. A variable in Koopman and Sportiche's system are defined as follows; their definition is a simplified version of Chomsky (1981).[24]

(99) α is a variable if α is locally Ā-bound and in an A-position.

(Koopman & Sportiche, 1982, p. 147)

(100) α is locally bound by β if and only if α is X-bound by β, and if ϒ Y-binds α then either ϒ Y-binds β or ϒ = β.

(Chomsky, 1981, p. 185)

We now ready to account for the difference in (97) on the relevant reading. In (97a), since no c-command relation holds between *his* and the wh-trace, they are locally Ā-bound by the definition (99); therefore, both *his* and wh-trace are variables. Consequently, the Ā-position in which *who* resides locally binds two variables (*his* and its trace) in A-position. The BP rules out coreference between *who* and *his* in (97a). By contrast, in (97b) the wh-trace is a variable by the definition (95). But unlike the wh-trace, *his* does not count as a variable since

[24] Chomsky's (1981) definition of a variable is given below.

(ix) α is a variable if and only if α = [NP ^{e}], and α is in an A-position, and there is a β that locally Ā-binds α. (p. 185)

it is locally A-bound by the wh-trace. Therefore, the BP allows coreference between *who* and *his*.

Let us now turn to the SCO constraint where the degree of acceptability on the relevant reading is perceived as far more degraded than the WCO one. Consider the following again in connection with the BP: the SCO example (101a) and the WCO example (101b).

(101) a. Who$_i$ does he$_{*i/j}$ think Yengmi love t_i?

b. Who$_i$ does his$_{*?i/j}$ mother loves t_i?

In (101b), *he* is a variable, but the wh-trace is no longer a variable since it is locally A-bound by *he*. Unlike the WCO (101b), the BP wrongly rules in the SCO (101a) since the Ā-operator *who* binds exactly one variable (*he*). Consequently, the BP fails to explain why the SCO (101a) is far more degraded than the WCO (101b). To do so, we need to implement another mechanism that can account for the different degree of unacceptability between the SCO (101a) and WCO (101b).

Chomsky (1981), building on Wasow (1972), proposes that the SCO effect is reduced to the Binding Condition C, assuming that a trace left by Ā-movement functions as an R-expression by analogy with a name on the basis of (102).

(102) a. He$_{*i}$ thinks that Yengmi loves Yanf$_i$.

b. Who$_i$ does he$_{*i/j}$ think that Yengmi love t$_i$?

In Chomsky's (1981) system, Ā-traces such as wh-traces and quantifier-traces are classified as variables. Variables in company with names fall into the class of R-expressions; R-expressions must obey the Binding Condition C.

(103) Binding Condition C

An R-expression is free.

(Chomsky, 1981, p. 188)

(104) Binding

α is X-bound by β if and only if α and β are coindexed, β c-commands α, and β is in an X-position. α is X-free if and only if it is not X-bound.

(Chomsky, 1981, pp. 184–185)

(105) C-command

Node A c(constituent)-commands node B if neither A nor B dominates the other and the first branching node which dominates A dominates B.

(Reinhart, 1976, p. 32)

What is entailed through (103)–(105) is that c-command is a necessary requirement for the binding relationship and that binding must be applied in terms of A-binding, and not Ā-binding; that is, a binder is an NP in an A-position, not in an Ā-position. Thus, an R-expression cannot be A-bound by an NP that has the same index as in (106). Now let us examine how Condition C works in the SCO configuration below.

(106) a. Who$_i$ does he$_{*i/J}$ think Yengmi love t_i?

b. Who$_i$ t_i thinks Yengmi loves him$_{i/j}$?

In (106a), the wh-trace (an R-expression) is not free since it is A-bound by *he* that has the same index, violating Condition C. in (106b), on the other hand, the wh-trace A-binds *him*, and so bound variable interpretation is available on the basis Reinhart's Generalisation, which states that "pronoun binding can only take place from a c-commanding A-position" (Büring, 2004, p. 24).

The difference between the SCO and WCO calls for different treatments of the crossover phenomena: Condition C for the SCO and the BP for the WCO. This in turn entails that the SCO and WCO share the same effect on the interpretation, that is, disjoint interpretation of the crossed pronoun, whereas the cause of the SCO and WCO do not seem to come from the same source, namely wh-movement across the pronoun. This assumption is reasonable given the fact that wh-ex-situ languages that observe the SCO effect do not display the WCO effect, as in the case in German (Büring, 2005, p. 173).

(107) The SCO effect in German

Wen$_i$ liebt er$_{*i/j}$ t_i?

who-ACC love he-NOM

'Who does he love?'

(108) No WCO effect in German

Wen$_i$ liebt seine$_{*i/j}$ Mutter t_i?

who-ACC loves he-GEN mother-NOM

'Who does love his mother?'

Furthermore, even in English the WCO effect is subject to variation, that is, specific D-linked wh-phrases repair the WCO effect (Culicover & Jackendoff, 1995; see Falco, 2007, in particular, for more details).

(109) Specific wh-phrases disobey the WCO

a. Who$_i$ do his$_{*?i/j}$constituents despise t_i? (Non-specific)

b. Which famous senator$_i$ do his$_{i/j}$ constituents despise t_i? (Specific)

(Culicover & Jackendoff, 1995, p. 262)

The specificity of the extractee may be a factor in the determination of the WCO effect. Postal (1993), on the other hand, suggests that the quantifier phrase containing a pronoun could be a factor in the determination of the WCO effect.

(110) a. Which lawyer$_i$ did his$_{*i/j}$ clients hate t_i?

b. Which lawyer$_i$ did even his$_{i/j}$ clients hate t_i?

c. Which lawyer$_i$ did only his$_{i/j}$ older clients hate t_i?

d. Which lawyer$_i$ did his$_{i/j}$ own clients hate t_i?

(Postal, 1993, p. 549)

Although we cannot go into further details about variations in the WCO effect, both (109) and (110) manifest different behaviour of the WCO. One thing is for sure then that wh-movement displays the SCO effect. It is thus expected that there will be an observable difference between wh-ex-situ and wh-in-situ languages; that is, wh-ex-situ languages observes the SCO effect, whereas wh-in-situ languages do not.

Let us examine how the SCO and Q-movement interact during the derivation of complex wh-questions. We start with identifying features relevant to binding since features are basic materials for structure building in Minimalist syntax. Following Hicks (2009), I assume that the feature relevant to binding is [VAR(IABLE)] feature.[25] According to Hicks, quantifier DPs such as wh-words are specified as [OP] and [VAR] feature, whereas referential DPs such as R-expressions and pronouns are specified as [VAR] feature. The value for [VAR] is indexed to identify the binding relation, and the indexical [VAR] is assumed to be selected from the numeration. In Hicks's system, pronouns and anaphors are distinguished with respect to feature valuation; [VAR] on an anaphor enters into derivation unvalued and agrees with its antecedent containing the corresponding valued feature, whereas [VAR] on a

[25] Features involved in binding differ from researcher to researcher. For example, Heinat (2006) assume that DPs carry φ-feature relevant to binding. According to Heinat, pronouns and reflexives differ in their feature value due to the difference in their morphological structures; pronouns bear an valued φ-feature, whereas reflexives bear an unvalued φ-feature. For a more detailed review, see Hicks (2009).

pronoun enters into the derivation valued and no Agree relation holds between the pronoun and its antecedent containing the same value. Hicks's basic mechanism is sketched below.

(111) Every boy loves himself.

a. Before Agree

Every [OP: ∀], [VAR: x] boy loves himself [VAR: _]

b. After Agree

Every [OP: ∀], [VAR: x] boy loves himself [VAR: x]

(Hicks, 2009, p. 116)

Building on Hicks (2009), I assume that the [VAR] value for a wh-word is underspecified for referents; hence, the wh-word is assumed to have a set of variables, x, y, z, say. It is also assumed that the wh-word does not bear any instance of [OP] feature since wh-words are assumed to have no semantic values (see Chapter 2). Rather, the Q-particle containing the wh- word bears an [OP: Q] feature. I also assume that all of the binding conditions serve as an evaluator to review whether a derivation yields proper interpretation at LF (Chomsky and Lasnik, 1993; Fox, 2000). To form a proper binding relation at LF, I adopt the LF binding condition (LBC) defined in Lasnik and Stowell (1991, p. 688).

(112) The LF binding condition

A pronoun P is construed as a variable bound by a quantifier Qu only if Qu binds P at LF. X binds Y if and only if X and Y are coindexed, and X c-commands Y.

In case of the SCO, for example, the LBC will check whether the wh-word c-commands the pronoun. In addition to this, Condition C will evaluate whether the copy of a wh-word is c-commanded by a pronoun at LF, assuming Chomsky's (1995) Copy Theory of movement.

Keeping in mind the above mentioned binding algorithm, let us see how the SCO violation (113a) is derived in connection with the LF representation (113b).

(113) a. Who$_i$ does he$_{*i/j}$ think Yengmi loves?

b. [$_{CP}$ Q $_{[OP: Q]}$ Who$_{i\ [VAR: x, y, z]}$ [$_{TP}$ he$_{j\ [VAR: x]}$ [$_{vP}$ think [$_{CP}$ t_i [$_{TP}$ Yengmi [$_{vP}$ t_j loves t_i]]]]]

In (113), *who* is assumed to carry a valued [VAR: x, y, z] feature, and *he* is assumed to carry a valued [VAR: x] features. At LF, *who* c-commands *he*, and yet the bound variable construal of *he* cannot be determined since there are still copies left by Q-movement for further scrutiny. The indexical values on the copies of *who* and *he* is now evaluated for interpretations. Upon detecting the same [VAR: x] between *who* and *he*, Condition C kicks in and exclude the bound variable construal of *he* since the copy of *he* (t_j) c-commands the copy of *who* (t_i) within its local domain (the lower vP). As a result, the bound variable interpretation of *he* cannot be achieved; instead, by filtering the [VAR: x] out at LF, *he* is interpreted as disjoint in reference.

Let us now turn our attention to wh-in-situ languages where no crossover effects are assumed to be observed.[26] Consider the following Korean wh-questions in line with Q-movement.

(114) No crossover, but bad on bound variable interpretation

ku$_{*i/j}$ -nun	[Yengmi-ka	nwukwu$_i$-lul	-t_k	salanghan-ta-ko]	sayngkakha-ni$_k$?
he -TOP	Yengmi -NOM	who-ACC		love-DEC-COMP	think-Q

'Who does Yengmi think he loves?

[26] It has been alleged in the literature that wh-questions such as (119) and (120) manifest the crossover effects, assuming that LF wh-movement or operator movement in Korean. The main caveat to this argument is that scrambling obviates the WCO effect in Korean (Choi, 2004; Lee, 1993; Lee, 2006). On the other hand, scrambling exhibits the SCO effect in Korean (Cho, 1994). I nevertheless resist the claim that the crossover effects are obtained in Korean, assuming that the crossover constraints are observed in Ā-movement to ban on bound variable interpretation of pronoun.

(115) No crossover, but bad on bound variable interpretation

Ku$_{*i/j}$-uy emeni-nun nwukwu$_i$-lul-t_k salangha-ni$_k$?
he-GEN mother-TOP who-ACC loves-Q
'Who does his mother love?

The sentences (114)–(115) are respectively equivalent to English SCO and WCO sentences in meaning. However, neither the SCO nor WCO effect are responsible for the absence of the bound variable interpretation of *ku* 'he' in (114) and (115) as Q-movement allows *nwukwu* 'who' remains in situ, even at LF; nonetheless, Korean does not allow coreference between *nwukwu* 'who' and *ku* 'he'; the interpretation of *ku* 'he' is disjoint in reference. It appears that a pronoun cannot be construed as a variable bound by a quantified expression in Korean.[27] This is held because a pronoun can be bound by a referential expression in Korean. Consider the following contrast in Korean.

(116) Nwu(kwu)$_i$-ka [Yengmi-ka ku$_{*i/j}$-lul salanghan-ta-ko] sayngkakha-ni?
who-NOM Yengmi-NOM he-ACC love-DEC-COM think-Q
'Who thinks that Yengmi loves him?'

(117) Yanf$_i$-nun [Yengmi-ka ku$_{i/j}$-lul salanghan-ta-ko] sayngkakhan-ta.
Yanf-TOP Yengmi-NOM he-ACC love-DEC-COM think-DEC
'Yanf thinks that Yengmi loves him.'

[27] In fact, there has been disagreement in the literature as to whether the bound use of pronoun *ku* 'he' (or *kunye* 'she') in Korean. Some claim that *ku* 'he' (or *kunye* 'she') can be bound by a quantified expression in Korean (Choi, 2002; Kang, 1998; Koak, 2008; Suh, 1990). Others argue that such occasion is impossible (Choe, 1988; Hong, 1985; Kang, 2000). However, the judgement is not as robust as one would expect. Experimental evidence proves the inter-speaker variation on the bound use of *ku* 'he' or *kunye* 'she' in Kroean (Kim & Han, 2016). My own judgement does not allow coreference between the wh-word and the pronoun in (114)–(115). I thus take my judgement to be exemplary.

The difference between (116) and (117) can be tentatively attributed to whether a potential binder is quantified or referential. Let us see how our current binding algorithm can feed the tentative conclusion. We begin with (117), repeated here as (118a). Its LF representation (1118b) is given below.

(118) a. Yanf$_i$-nun [Yengmi-ka ku$_{i/j}$-lul salanghan-ta-ko] sayngkakhan-ta.
Yanf-TOP Yengmi-NOM he-ACC love-DEC-COM think-DEC
'Yanf thinks that Yengmi loves him.'

b. [[[[[[ku$_{i\ [VAR:\ x]}$ salanha $t_{k\ vP}$] Yengmi$_{k\ TP}$] $_{CP}$] sayngkakha $t_{i\ vP}$] Yanf$_{i\ [VAR:\ x]\ TP}$] $_{CP}$]

In (118), the DP *Yanf* is assumed to have a valued [VAR: x] feature, and *ku* 'he' is assumed to have a valued [VAR: x, y]. At LF, the same indexical value [VAR: x] carried by *Yanf* and *ku* 'he' is examined for interpretations. Condition B in turn allows coreference between *Yanf* and *ku* 'he' since *ku* 'he' is not bound by *Yanf* in the local domain. As a result, *ku* 'he' can be interpreted either coreferentially or disjointedly

Now consider the sentence (116), repeated here as (119a), and its LF representation (119b) given below.

(119) a. Nwu(kwu)$_i$-ka [Yengmi-ka ku$_{*i/j}$-lul salanghan-ta-ko] sayngkakha-ni?
who-NOM Yengmi-NOM he-ACC love-DED-COM think-Q
'Who thinks that Yengmi loves him?'

b. [[[[[[ku$_{i\ [VAR:\ x]}$ salangha $t_{k\ vP}$] Yengmi$_{k\ TP}$] $_{CP}$] sayngkakha $t_{i\ vP}$] Nwu(kwu)$_{i\ [VAR:\ x,\ y,\ z]}$-$t_{h\ TP}$] ni$_{h\ [OP:\ Q]\ CP}$]

In (119), *nwukwu* 'who' is assumed to carry a valued [VAR: x, y, z] feature since wh-words themselves are not referential, and *ku* 'he' is assumed to carry a valued [VAR: x] feature. At LF, binding relation between them is evaluated for interpretations. In accordance with the LBC in (112), *ku* 'he' is construed as a variable bound by the c-commanding *nwukwu* 'who',

and no violation of the binding conditions occurs; thus, *ku* 'he' is interpreted as a bound variable. This is not promising since our current binding algorithm wrongly rules (119) in, contrary to the fact that Korean does not allow a bound variable interpretation of a pronoun. Dealing with expository failure would require an additional mechanism. We can attribute the unavailability of the bound variable reading of *ku* 'he' to Montalbetti's (1984) Overt Pronoun Constraint (OPC), which employs Higginbotham's (1983) linking mechanism.

(120) Overt Pronoun Constraint

> An overt pronoun cannot link to a formal variable if and only if the alternation empty/overt obtains.
>
> (Montalbetti, 1984, p. 94)

Put simply, the OPC disallow an overt pronoun to be construed as a variable bound by a wh-word or a quantifier in pro-drop languages. Korean is a pro-drop language where an overt pronoun is replaced by a null pronoun (*pro*), and so the OPC is applicable to Korean.[28] This is illustrated below.

(121) a. Nwu(kwu)$_i$-ka [Yengmi-ka ku$_{*i/j}$-lul salanghan-ta-ko] sayngkakha-ni?
who-NOM Yengmi-NOM he-ACC love-DEC-COM think-Q
'Who thinks that Yengmi loves him?'

b. Nwu(kwu)$_i$-ka [Yengmi-ka pro$_{i/j}$ salanghan-ta-ko] sayngkakha-ni?
who-NOM Yengmi-NOM pro love-DEC-COM think-Q
'Who thinks that Yengmi loves (him)?'

[28] Hong (1985) also proposes a constraint on pronominal binding, which states that an overt pronoun must be locally Ā-free at LF in pro-drop languages such as Korean, whereas an overt pronoun must be locally Ā-free at LF in non-pro-drop languages such as English. Hong's proposal basically relies on LF wh-movement across languages. Although it could descriptively account for the unavailability of bound variable interpretation of the pronoun in Korean, I will not pursue Hong (1985) since Q-movement precludes LF wh-movement.

In (121a), *ku* 'he' cannot be a variable bound by *nwukwu* 'who' in accordance with the OPC, and thus *ku* 'he' is interpreted as disjoint from *nwukwu* 'who'. In (121b), *ku* 'he' has been replaced with by *pro*, and as such, the bound variable or disjoint interpretation is available. With the OPC, we now entertain the absence of bound variable interpretations of pronouns in Korean.

To summarise, in wh-ex-situ languages such as English and German, the bound variable interpretation of a pronoun arises when its meaning is dependent on a quantified expression such as wh-words. Yet it appears that the pronoun cannot be a variable bound by the wh-word due to the SCO effect, and this can be attributed to Condition C effect. In wh-in-situ languages such as Korean, on the other hand, the bound variable interpretation of a pronoun is not permissible even though the SCO effect is absent in terms of Q-movement. Montalbetti's OPC feeds into the impossibility of a pronoun being interpreted as a bound variable.

A possible learning problem for Korean speakers of English is then reduced to whether they have acquired wh-movement in English; otherwise, they will allow disjoint interpretation for both strong crossover questions and non-strong crossover questions. For German speakers of English, they do not have any difficulties in distinguishing allowed and disallowed interpretation of wh-questions since German exhibits the SCO effect.

3.2.2 Weak Crossover and Wh-Quantifier Interaction

Crossover constraints are extended to a phenomenon where the interaction of a wh-word and a quantifier (Qu) yields ambiguity. May (1985, pp. 38–39) observes that wh-questions containing a quantifier in the object position such as (122) is ambiguous, allowing a single answer (SGA) or a pair-list answer (PLA) reading, whereas wh-questions including a quantifier in the subject position such as (123) is unambiguous, allowing only a single answer reading.

(122) What$_i$ did everyone buy t_i for Max?

a. Single answer: Everyone bought Max a Bosendorfer piano.

b. Pair-list answer: Mary bought Max a tie, Sally a sweater, and Harry a piano.

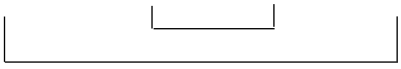
(123) Who$_i$ t_i bought everything for Max?

a. Single answer: Oscar bought everything for Max.

b. *Pair-list answer: Mary bought Max a tie, Sally a sweater, and Harry a piano.

May (1985) attributes this subject-object asymmetry to the c-command relations between the wh-word and the quantifier at LF, which in turn results in different scope ordering of quantifiers. In order to capture the scope ambiguity, May (1977) proposes a mechanism quantifier raising (QR) that enables quantifiers to undergo movement to take their scope at LF. May (1985), adding a touch of modification to May (1977), suggests that QR respects Empty Category Principle (ECP) of Chomsky (1981), a principle that requires that traces left by A-movement or Ā-movement are properly governed. Since QR is an instance of movement, its trace must be properly governed at LF in line with Kayne (1981). The ECP then constrains the well-formedness of an LF representation. In order to ensure the well-formednees of an LF representation, May (1985) further adopts Pesetsky's (1982) Path Containment Condition (PCC) and states that "Intersecting Ā-categorial paths must embed, not overlap" (p. 118).[29] Let us see how May's QR resolves scope ambiguity in (122). May (1985, p. 38) offers the following LF representation.

(124) [$_{CP}$ What$_i$ [$_{TP}$ everyone$_j$ [$_{TP}$ t_j bought t_i for Max]]]



The LF representation (124) is well-formed since QR satisfies both ECP and PCC: the wh-trace and the Qu-trace are properly governed, and the paths of *what* and *everyone* intersect, but embed. As *what* and *everyone* c-command each other, the relevant scope ordering is achieved: *everyone* can take scope over *what* in the lower TP, and this scope sequence

[29] Pesetsky's (1982, P. 309) original Path Containment Condition is defined as follows.

(x) Path Containment Condition

If two paths are overlap, one must contain the other.

everyone > *what* yields a pair-list reading; *what*, in its turn, can take scope over *everyone* in the CP, and this scope order *what* > *everyone* gives an individual reading. As a result, both SGA and PLA reading are obtained. However, if QR is only applied to TP-adjunction, (123) would have the following LF representation (May, 1985, p. 41).

(125) [$_{CP}$ Who$_i$ [$_{TP}$ everything$_j$ [$_{TP}$ t_i bought t_j for Max]]]

The LF representation (125) is ill-formed since it does meet neither ECP nor PCC: The wh-trace is not properly governed by the intervening Qu-trace, and the paths of *who* and *everything* intersect and cross each other. In order to derive a well-formed LF representation for (123), May (1985) assumes that QR can be adjoined to other than the TP layer so long as it would respect movement constraints such as the ECP and the PCC. Along this line of reasoning, May suggests the VP layer as a possible QR position. (123) would then have the following LF representation (May, 1985, p. 42).

(126) [$_{CP}$ Who$_i$ [$_{TP}$ t_i [$_{VP}$ everything$_j$ [$_{VP}$ bought t_j for Max]]]

The LF representation (126) is well-formed because it satisfies both ECP and PCC: the wh-trace and the Qu-trace are properly governed, and the wh-path and the Qu-path do not overlap. The scope ordering is then achieved: *Who* c-commands *everything*, and so *who* can take scope over *everything*, whereas *everything* does not c-command *who*, and thus *everything* cannot take scope over *who*. The LF disambiguates the scope ordering between *who* and *everything*. Since the only available scope sequence is *who* > *everything*, the SGA reading is permitted exclusively in May's system.

German, which is a wh-ex-situ language, also exhibits wh-quantifier scope ambiguity; while wh-object/Qu-subject questions such as (127) are ambiguous, wh-subject/Qu-object questions such as (128) are unambiguous (Zimmermann, 2016).

(127) a. Was$_i$ hat jeder Gast t_i gekauft? [SGA, PLA]

What-ACC has every-NOM guest bought

'What did every guest buy?'

b. [$_{CP}$ Was$_i$ [$_{TP}$ jeder$_j$ [$_{TP}$ t_j Gast t_i hat gekauft]]]

(128) a. Wer$_i$ hat t_i jedes Geschenk gekauft? [SGA, *PLA]

who-NOM has every-ACC present bought

'Who bought every present?'

b. [$_{CP}$ Wer$_i$ [$_{TP}$ t_i [$_{VP}$ jedes$_j$ [$_{VP}$ tj Geschenk hat gekauft]]]

The LF representation of (127b) and (128b) is well-formed, satisfying the ECP and the PCC. While the LF (128b) disambiguates the scope sequence, the LF (127b) does not. In (127b) *was* 'what' and *jeder* 'every' c-command each other; thus both SGA and PLA reading obtain. On the other hand, in (128b), *wer* 'who' c-commands *jedes* 'every', but *jedes* 'every' does not c-command *wer* 'who'; thus, the SGA reading is only available.

May (1985, p. 45) suggests that the above analyses are also applicable to complex wh-questions in which a wh-word undergoes long-distance movement.

(129) a. Who do you think everyone saw at the rally? [SGA, PLA]

b. [$_{CP}$ Who$_i$ [$_{TP}$ everyone$_j$ [$_{TP}$ you think [$_{CP}$ [$_{TP}$ t_j saw t_i at the rally]]]]]

(130) a. Who thinks everyone saw you at the rally? [SGA, *PLA]

b. [$_{CP}$ Who$_i$ [$_{TP}$ t_i thinks [$_{CP}$ [$_{TP}$ everyone$_j$ [$_{TP}$ t_j saw you at the rally]]]]]

The LF representation of (129b) and (130b) satisfies the PCC in addition to the ECP. In (129b), two interpretations (SGA and PLA) are available since *who* and *everyone* c-command each other. In (130b), on the other hand, the scope sequence is disambiguated by the LF; thus, *who* c-commands *everyone*, but not vice versa, which in turn yields the SGA reading only.

It appears that wh-quantifier scope interaction is limited to wh-ex-situ languages such as English and German. Let us examine whether this comes to hold by looking at wh-in-situ languages. Consider the following sentences in Korean.[30]

(131) a. Motun salam-i nwukwu-lul mannass-ni?
every person-NOM who-ACC met-Q
'Who did everyone meet?'

b. Nwu(kwu)-ka motun salam-lul mannass-ni?
who-NOM every person-ACC met-Q
'Who met everyone?'

Based on our discussion on Q-movement in Chapter 2, wh-words are variables void of inherent quantificational forces, and their quantification forces are determined by particles such as Q_{WH}, $Q_{\exists}$, and $Q_{\forall}$, which is adjoined to them. Hence, QR in Korean is applicable to wh-word. Then, the sentences in (131) would have the following LF representations: (132) for (131a) and (133) for (131b). For expository purposes, I will use the following abbreviations: Qu for the quantifier *motun* 'every' and Wh for wh-word *nwukwu* 'who'.

[30] In (124), *motun salam* 'everyone' sounds more natural than *nwukwu-na* 'everyone' – in particular – in wh-questions and has been widely used as a universal quantifier in the literature to describe the quantifier scope interaction in Korean (Kwon, 2007; Choe, 2005; Choi, 2002).

(132) Wh-object/Qu-subject questions

a. [[[[[$t_{i\ VP}$] $t_{j\ VP}$] $Qu_{j\ TP}$] $Wh_{i\ TP}$] $Q_{WH\ CP}$] ambiguous: Wh>Qu; Qu>Wh

b. [[[[[$t_{i\ VP}$] $Wh_{i\ vP}$] $t_{j\ TP}$] $Qu_{j\ TP}$] $Q_{WH\ CP}$] unambiguous: *Wh>Qu; Qu>Wh

(133) Wh-subject/Qu-object questions

a. [[[[[$t_{j\ VP}$] $Qu_{j\ vP}$] $t_{i\ TP}$] $Wh_{i\ TP}$] $Q_{WH\ CP}$] unambiguous: Wh>Qu; *Qu>Wh

b. [[[[[$t_{j\ VP}$] $t_{i\ TP}$] $Wh_{i\ TP}$] $Qu_{j\ TP}$] $Q_{WH\ CP}$] ambiguous: Wh>Qu; Qu>Wh

The LF representations in (132)–(133) are well-formed, satisfying the ECP and the PCC, but LF does not disambiguate the scope ordering. That is, QR, in (132)–(133), generates not only ambiguous but also unambiguous scope sequence regardless of subject-object asymmetry, contrary to the fact that wh-quantifier interaction in Korean does not display scope ambiguity. In other words, questions in (136) can receive only an SGA reading; even if scrambling is applied to the wh-object (131a) and Qu-object (131b), a PLA reading cannot be received (Kim, 2003).[31] This is an unwanted consequence if QR plays a crucial role in dissolving wh-quantifier scope ambiguity. It appears that we cannot attribute the (un)availability of a pair-list reading to the subject-object asymmetry in wh-quantifier scope relations.

[31] It has been argued that wh-subject/Qu-object questions such as (131b) unambiguously receive the SGA reading, whereas wh-object/Qu-subject questions such as (131a) are ambiguous between the SGA and the PLA reading (Joo, 1989; Suh, 1990; Yang, 1991). They argue the presence of a PLA reading on the ground that wh-words in Korean undergo movement at LF. However, as our discussion on wh-questions does not involve any type of movement of wh-words, syntactic outputs resulted from LF wh-movement analyses remain ignored.

Chierchia (1993) develops a different approach from May's (1985) scope ordering mechanism. Chierchia proposes that the subject-object asymmetry in wh-quantification scope relations is an instance of the WCO phenomena. For Chierchia, the availability of the PLA reading is due to the presence of two functional traces of the wh-word: a functional trace and an argument trace. Their functions are to specify the semantic value of a coindexed binder. Consider the following question-answer pairs from Chierchia (1993, pp. 194– 195).

(134) Who$_i$ does everyone$_j$ love [$_{NP}$ t_i t_j]$_i$?

a. His mother

b. Giovanni, Maria; Paolo, Francesca; . . . where the first member of each pair is a person and the second his mother.

In (134), the wh-traces are marked with two indexes: The functional trace is marked as t_i and the argument trace is marked as t_j . Chierchia argues that the functional trace (t_i) serves as an ordinary wh-trace and denotes an entity that individual arguments share, yielding a functional answer (134a), whereas the argument trace (t_j) behaves like a bound pronoun and specifies a pair of individuals based on the functional answer. Thus, a PLA reading is available in wh-object/Qu-subject questions due to the presence of a functional answer. The binding relation between the quantifier and the argument trace (t_j) is then a crucial factor that determines the (un)availability of the PLA reading answer in the subject-object asymmetry in wh-quantifier scope. Let us examine how the WCO effect is induced on the subject-object asymmetry in wh-quantifier scope relations.

(135) Wh-object/Qu-subject questions

a. SS: Who did everyone meet?

b. LF: [$_{CP}$ who$_i$ [$_{TP}$ everyone$_j$ [$_{VP}$ t_j meet [$_{NP}$ t_i t_j]$_i$]]]

(Chiercia, 1993, p. 214)

(136) Wh-subject/Qu-object questions

a. SS: Who met everyone?

b. LF: [$_{CP}$ who$_i$ [$_{TP}$ everyone$_j$ [$_{NP}$ t_i t_j]$_I$] [$_{VP}$ met t_j]]]

(Chiercia, 1993, p. 214)

In (135), *everyone* can be an antecedent for the argument trace (t_j) since it c-commands (t_j) at LF; hence a PLA reading obtains. In (136), on the other hand, *everyone* cannot be an antecedent for the argument trace (t_j) since it does not c-command (t_j). *Everyone* will then have to cross over the argument trace (t_j) to bind it, resulting in the WCO effect. Recall that the argument trace in Chierchia's system is considered as a pronominal element. Consequently, a PLA reading cannot be obtained in (136); only a SGA reading will be available. The upshot of Chierchia's system is that a PLA reading depends on whether a quantifier that has a distributive property c-commands a wh-trace left by movement. Pursuing Chierchia (1993), we can account for why Korean does not allow a PLA reading in wh-quantifier interactions. Since our Q-movement strategy does not allow any instance of movement of wh-words in Korean, no argument trace of a wh-trace is observable at LF, which is responsible for a PLA reading. By contrast, English and German allow a PLA reading in wh-quantifier interactions since both have an argument trace of the wh-word that establishes c-command relations with distributive quantifiers. And yet the c-command relationship is subject to the WCO violation that blocks a PLA reading.

A possible learning problem for Korean speakers of English is then reduced to whether they have acquired genuine wh-movement in English; otherwise, they will not be able to induce a PLA reading in wh-subject/Qu-object questions. Wh-scrambling would not be an option for this since wh-scrambling does not allow a PLA reading in Korean. For German speakers, they will have no difficulties in distinguishing wh-quantifier scope ambiguity since German also exhibit scope ambiguity in wh-subject/Qu-object questions.

3.3 L2 in crossover constraints

Miyamoto and Toratani (1996) investigated the contrast between SCO sentences and bound pronoun sentences in English as in (137).

(137) a. I know who$_i$ she$_{*i/j}$ said t_i has a bag.

b. I know who$_i$ t_i she$_{i/j}$ has a bag.

The idea of Miyamoto and Toratani's investigation is that if Japanese speakers of English exhibit knowledge of Condition C that is assumed to be component of UG, and UG is available in L2 acquisition. A truth value judgement task adopted from Crain and Mckee (1985) was used to test the SCO constraint in Japanese speakers' interlanguage. Figure 2 illustrates a context for the SCO trials in Miyamoto and Toratani (1996).

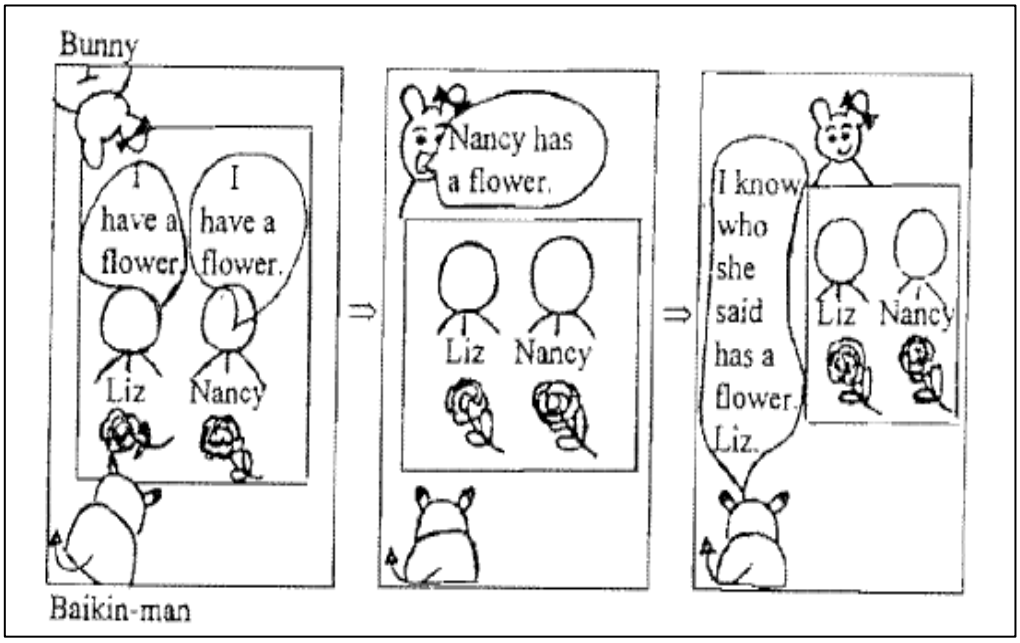


Figure 2 Context for Strong Crossover Trial (Miyamoto & Toratani, 1996, p. 43)

Based on Figure 2, the SCO effect induces the following truth values for each sentence type as illustrated in Table 21.

Table 22

Test Battery for Strong Crossover (Miyamoto & Toratani, 1996, p. 45)

	Type	Utterances by Liz and Nancy	Utterances by Bunny	Utterances by Baikin-man	T/F
Strong crossover	A	Liz said, "I have a ball." Nancy said, "I have a ball."	Liz has a ball.	I know who she said has a ball. Liz.	T
	B	Liz said, "I have a ball." Nancy said, "I have a ball."	Liz has a ball.	I know who she said has a ball. Nancy.	F
	C	Lisa said, "I have a ball." Nancy said, "I have a ball."	Liz has a ball.	I know who she said has a ball. Liz and Nancy.	F

In strong crossover trial, the context allows only *Bunny* to be the referent for *she*. The test battery requires that the Japanese speakers of English be able to identify the correct antecedent of *she* from the three possible referents in Baikin-man's utterance. The results of strong crossover trials are given in Table 22.

Table 23

Correct Responses to the Strong Crossover Sentences

Group	Type A (n = 2)	Type B (n = 2)	Type C (n = 2)	Total (n = 6)
Native controls	100%	100%	100%	100%
Japanese speakers	85%	73%	76%	78%

The results show that the Japanese speakers of English rejected the bound variable interpretation at a rate of 78% on the average, and they responded correctly: 85% for Type A, 73% for Type B, and 76% for Type C. Miyamoto and Toratani (1996) argue that the mean error rate of 22% did not reflected that the subjects did not realise that the strong crossover test sentences violate Principle C, and that the subjects' errors might originate from experimental effect or their inattentiveness to the task. Miyamoto and Toratani claim that the advanced Japanese speakers of English have knowledge of Condition C.

The context for bound sentences included the same format as the SCO trial to see whether Japanese speakers distinguish the SCO from the bound pronoun. The context for bound pronoun sentences is illustrated in Figure 3

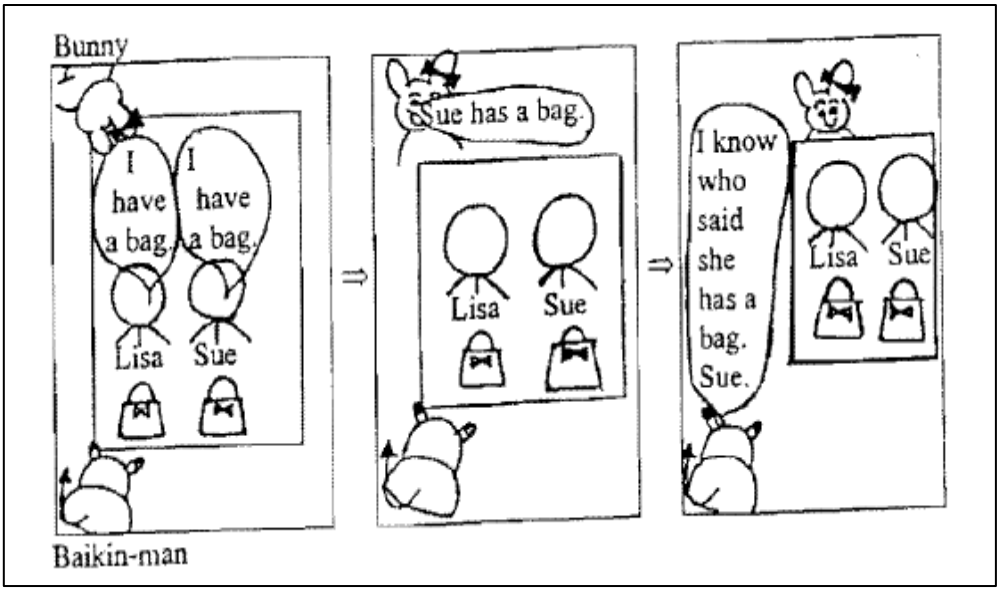


Figure 3 Context for Bound Pronoun trial (Miyamoto & Toratani, 1996, p. 44)

Based on Figure 3, the bound pronoun sentences have the following truth values as illustrated in Table 23

Table 24

Test Battery for Strong Crossover (Miyamoto & Toratani, 1996, p. 47)

	Type	Utterances by Lisa and Sue	Utterances by Bunny	Utterances by Baikin-man	T/F
Bound variable	A	Lisa said, “I have a bag.” Sue said, “I have a bag.”	Lisa has a bag.	I know who said she has a bag. Bunny.	T
	B	Lisa said, “I have a bag.” Sue said, “I have a bag.”	Lisa has a bag.	I know who said she has a bag. Sue.	T
	C	Lisa said, “I have a bag.” Sue said, “I have a bag.”	Lisa has a bag.	I know who said she has a bag. Lisa and Sue.	T

In contrast to the SCO sentences, the bound pronoun sentences are ambiguous; they allow disjoint referent, single referent, and multiple referents interpretation, and as such, the truth value for each interpretation are fixed as true at all times on the basis of Figure 3. The results of strong crossover trials are given in Table 24.

Table 25

Correct Responses to Bound Pronoun Sentences

	Japanese speakers			Native controls		
	Single	Multiple	Disjoint	Single	Multiple	Disjoint
Type A (n = 1)	35%	58%	5%	60%	40%	0%
Type B (n = 1)	0%	52%	4%	4%	40%	20%
Type C (n = 2)	3%	65%	32%	0%	80%	20%
Total	10%	60%	29%	25%	60%	15%

The results show that the bound variable interpretation is available to the Japanese speakers of English: 10% for single coreference and 60% for multiple coreference interpretation. Miyamoto and Toratani (1996) argues that the results from the bound variable trials confirms that the lack of bound variable interpretation for the SCO trials is not due to the unavailability of bound variable interpretation in any context. Furthermore, L1 transfer is not straightforward since bound variable interpretation is absent in Japanese since Japanese is a wh-in situ language. Miyamoto and Toratani (1996) conclude that since the advanced Japanese speakers of English demonstrate native-like knowledge of Condition C in the SCO trials, and therefore UG is available in L2 acquisition.

Marsden (2008) investigated wh-quantifier scope interpretations in L2 Japanese by speakers of Chinese, English, and Korean. In Japanese, wh-quantifier scope interpretation is restricted; thus, object/Qu-subject questions such as (143a) and its scrambled counterpart (143b) allow only a SGA reading; a PLA reading is unavailable in Japanese

(138) a. ??Daremo-ga nani-o katta no? (SGA, *PLA)

everyone-NOM what-ACC bought-Q

'What did everyone buy?'

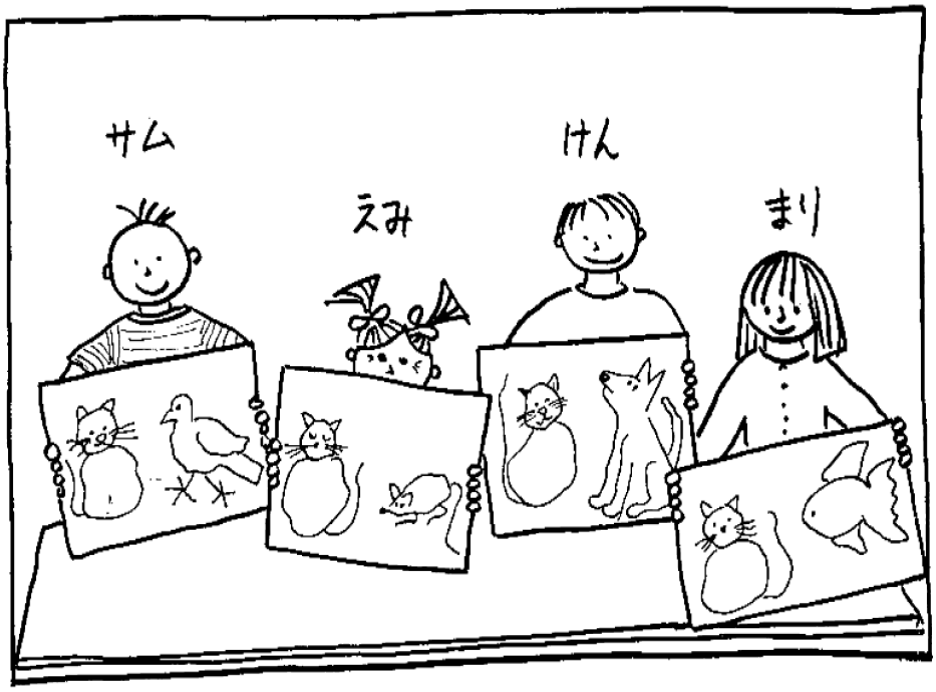
b. Nani-o daremo-ga katta no? (SGA, *PLA)

what-ACC everyone-NOM bought-Q

'What did everyone buy?'

(Marsden, 2008, p. 190)

Marsden observes that scope rigidity in Japanese pose a learnability problem for Chinese and English speakers of Japanese whose L1s allow both a single answer (SGA) and a pair-list (PLA) answer reading in wh-quantifier scope relations, but not for Korean speakers whose L1 does not allow a PLA reading. Marsden used a picture-matching acceptability judgment task as illustrated in Figures (4)–(5).

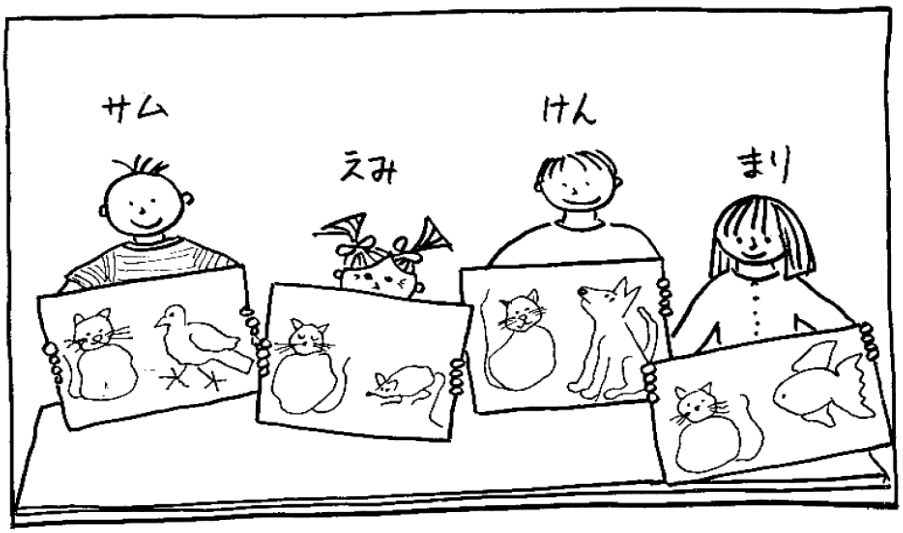


Q: Nani-o daremo-ga kaita no?
what-Acc everyone-Nom drew Q
'What did everyone draw?'

A: Neko desu.
cat Cop
'A cat.'

	No, definitely not			Yes, perfectly		Can't decide
1	–2	–1	+1	+2		×
2	–2	–1	+1	+2		×

Figure 4 Single Answer Test Item



Q: Nani-o daremo-ga kaita no?
what-Acc everyone-Nom drew Q
'What did everyone draw?'

A: Samu-kun-wa neko to tori-o, Emi-tyan-wa neko to nezumi-o,
Sam-*kun*-Top cat and bird-Acc, Emi-*tyan*-Top cat and mouse-Acc,

Ken-kun-wa neko to inu-o, Mari-tyan-wa neko to kingyo-o
Ken-*kun*-Top cat and dog-Acc, Mari-*tyan*-Top cat and goldfish-Acc

kaita.
drew

'Sam drew a cat and a bird, Emi drew a cat and a mouse, Ken drew a cat and a dog, and Mari drew a cat and a goldfish.'

	No, definitely not			Yes, perfectly		Can't decide
1	–2	–1	+1	+2		×
2	–2	–1	+1	+2		×

Figure 5 Pair-list Answer Test Item

In the task, participants were asked to judge how well the sentence matched the picture, using a scale. The results are given in Table 25.

Table 26

Acceptance of Individual and Pair-list Answers

	Native controls	Chinese intermediate	Chinese advanced	English intermediate	English advanced	Korean intermediate	Korean advanced
SGA	94%	60%	92%	87%	90%	73%	81%
PLA	37%	69%	62%	85%	58%	75%	53%

The results show that the advanced L2 speakers of Japanese demonstrate tendency target-like scope interpretation in Japanese, whereas the intermediate L2 speakers of Japanese show non-target-like scope interpretation in Japanese. With respect to relatively higher rates of acceptance of PLA readings, Marsden further analysed consistency of individual response types.

Table 27

Consistency Data for L2 Groups on SGA and PLA Reading (Marsden, 2008, p. 211)

	SGA		PLA	
	Consistent acceptance	Consistent rejection	Consistent acceptance	Consistent rejection
Chinese				
Advanced	90%	0%	60%	40%
Intermediate	29%	29%	57%	14%
English				
Advanced	83%	0%	50%	41%
Intermediate	81%	4.8%	86%	10%
Korean				
Advanced	73%	7%	47%	40%
Intermediate	68%	14%	68%	14%

The results show that around 40% of advanced speakers in each L2 group consistently reject PLA readings target-like scope interpretation in L2 Japanese, whereas fewer than 15% of intermediate speakers in each L2 group consistently reject PLA. On the basis of consistency data, Marsden (2008, p. 217) claims that a proportion of advanced L2 speakers achieved target-like knowledge of scope interpretation in Japanese, which lends support to Schwartz and Sprouse's (1996) Full Transfer/Full Access of L2 acquisition. Marsden concludes that L2 acquisition is constrained by UG.

3.4 Experiment 2: Interpretation of crossover constraints

This experiment was designed to extend a line of L2 research on long-distance wh-movement into the syntax-semantics interface where the presence of target-like syntactic representation is required to access the right semantic representation. By investigating L2 speakers' strategies for the interpretation of crossover configurations in English, this experiment explores the L2 learning challenge at the syntax-semantics interface (see Section 3.1). To this end, this experiment aims to investigate whether L2 speakers are sensitive to semantic interpretations of wh-questions in English, involving crossover violations. Within the generative framework, syntax is a core linguistic module for computations involving other linguistic modules such as semantic and phonological components (Chomsky, 1986, 1995). It is thus assumed that a one-to-one mapping relationship between syntax and semantics is to be established in the course of derivation – when viewed in the light of L1 (see Contreras-García 2015 for assumptions from different grammatical frameworks). This, however, can be extended to the L2 context if UG is involved in L2 development in ways similar to L1 development. That is, linguistic properties determined at the syntax-semantics interface are deemed to be straightforward and undemanding for L2 speakers if they have constructed the target-like syntactic representation in the L2 (Slabakova, 2008). Consequently, L2 speakers will show a straightforward contrast between allowed and disallowed interpretation of wh-questions in English. If not, crossover effects will pose difficulties for L2 speakers. In this regard, this experiment takes a step further to identify whether semantic knowledge is facilitated by syntactic knowledge in L2 acquisition. It is often the case that due to a deficit in syntactic representation in their grammar, L2 speakers

employ non-syntactic strategies, such as linear order, for interpretation (Meisel, 1997). The following research questions are addressed in this experiment:

(139) Do L2 speakers of English display sensitivity to crossover constraints in complex wh-questions?

(140) Does the L1 influence the acquisition of syntax-semantics interface knowledge?

(141) Does proficiency affect the acquisition of syntax-semantics interface knowledge?

With respect to these research questions, the following general hypotheses are formulated based on Experiment 1.

(142) Crossover configurations will be problematic for the intermediate L2 speakers of English due to the lack of syntactic representation of the target language.

(143) The advanced L2 speakers will be able to establish c-command relations between the wh-trace and the pronoun in crossover configuration; thus, crossover configurations are unproblematic for the advanced L2 speakers of English.

(144) Even if L2 speakers of wh-in-situ languages have acquired wh-movement grammar, they are vulnerable to crossover constraints due to processing difficulties.

Prediction (142) claims that both German and Korean intermediate speakers will not be able to establish proper c-command relations between the wh-trace and the pronoun since their wh-movement grammar showed potential chance performance in Experiment 1.

Prediction (143) states that since the advanced speakers have wh-movement grammar, it would be expected for them to establish c-command relations between the wh-trace and the pronoun; therefore, interpretive interface is unproblematic for the advance group.

Prediction (144) argues potential L1 interference at the interpretive interface. Since crossover configuration involves quite complex derivations, the Korean advanced group may experience processing difficulties to figure out the semantic relations between the wh-word and the pronoun

3.4.1 Participants

L2 speakers comprised four subgroups, on the basis of their L1s and L2 proficiency: 22 intermediate Korean speakers, 10 advanced Korean speakers, 12 intermediate German speakers, and 17 advanced German speakers. Also, 19 native speakers of British English participated as a control group for comparison. The participants were the same as in Experiment 1.

3.4.2 Materials

A truth-value judgment task (TVJT), adopted from Thornton (1990; see also Crain and Thornton, 1998) and Marsden (2005, 2008), was designed to test L2 speakers' knowledge of crossover constraints within complex wh-questions in English. The TVJT was employed since it is not only an appropriate task for investigation of syntactic structures that can be interpreted more than one way, but also a useful task for observation of individual differences or preferences in the interpretation of ambiguous sentences (Conroy, Takahashi, Lidz, & Phillips, 2009; Gordon, 1996).

Each test item consisted of a brief story and a corresponding question-answer pair. The story contained pictures and words to provide a plausible context for the question-answer pair. This was done in order to maximise L2 speakers' understanding of the context since the sole use of written contexts or picture contexts could lead to processing difficulties or individual variations (Marsden, 2005). The experiment comprised two question types: strong crossover questions and weak crossover questions. For ease of reference, questions involving wh-quantifier interactions are termed weak crossover questions (Chierchia, 1993). Twelve experimental items were created for each type, resulting in 24 target items in total. The target stimuli combined with 24 fillers, giving a total of 48 items. The filler items were all declarative sentences, sharing similar syntactic properties with the target items. In the

task, two types of fillers were included: violation of Binding Condition A and scope relations between quantifiers.

In strong crossover trials, test items were manipulated by two variables: answer type and question type. Target stimuli are illustrated in Figures (6)–(7). A full list of test items is provided in Appendix (2). There were two types of wh-questions: strong crossover (SCO) questions (145a) and non-strong crossover (NSCO) questions (146a). For each question type, there were two answer types: disjoint reference (145b) and coreference (145c).

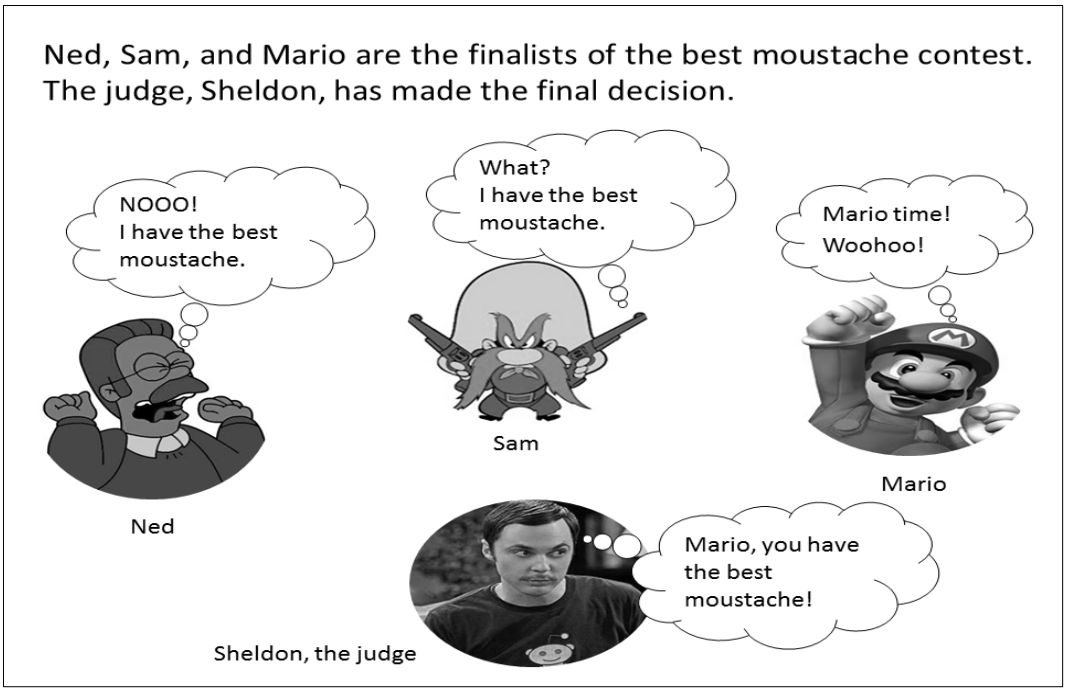


Figure 6 Context for SCO Question

(145) SCO trial

a. Who did he say had the best moustache?
b. Mario. (Disjoint referent interpretation)
c. *Ned and Sam. (Multiple referent interpretation)

In the task, SCO trials comprised 12 complex wh-questions. The question types were balanced: Half were strong crossover questions and half were NSCO questions. The SCO

question, such as (145a), appeared with either a disjoint referent answer (145b) or a multiple referent answer (145c). Since the SCO question is unambiguous, the disjoint referent answer was set up as a true judgment; the multiple referent answer was set up as a false judgment. The answer types were balanced: Half were disjoint referent answers and half were multiple referent answers.

Coreferential answer type was further divided into two possible answer types since the non-strong crossover is ambiguous: single reference (146b) and multiple references (146c).

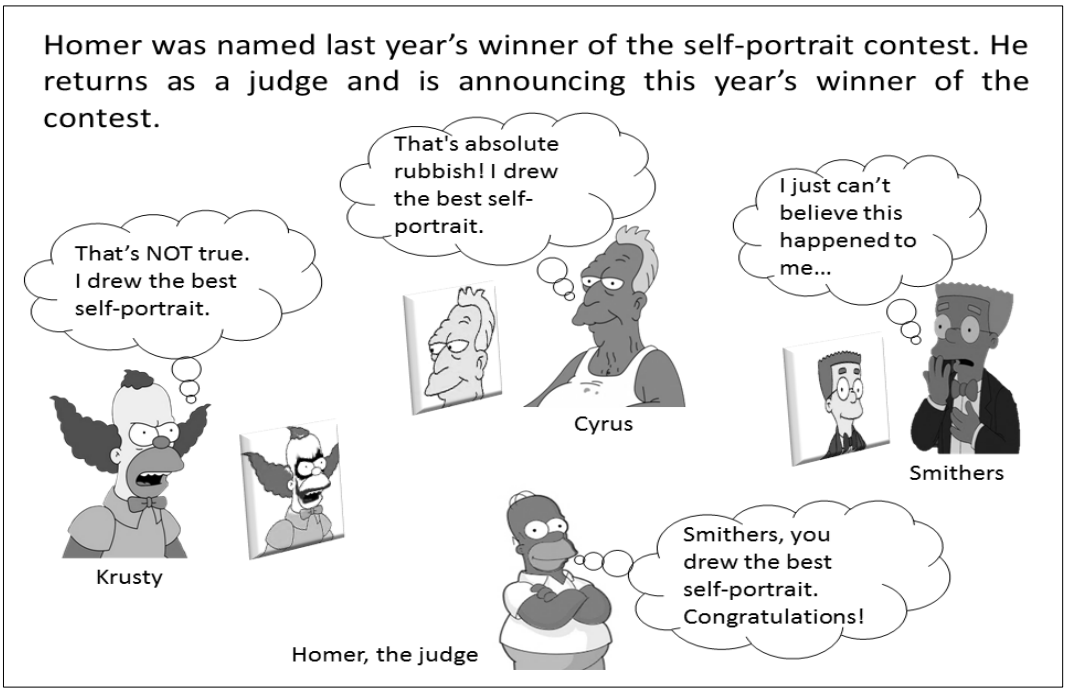


Figure 7 Context for NSCO Question

(146) NSCO trial

a. Who said he drew the best self-portrait?
b. Homer. (Single referent interpretation)
c. Krusty and Cyrus. (Multiple referent interpretation)

The NSCO questions, such as (146a), appeared with either a single referent answer (146b) or a multiple referent answer (146c). By way of brief explanation, the disjoint referent, *Smithers*, in Figure 7 didn't describe his drawing as the best self-portrait; he acted in an obviously different way. This results in a mismatch between the context and the structure. Consequently, a disjoint referent answer to the NSCO question combination will inevitably be denied by the context, not by the structure. It is comparable to other combinations where such a mismatch does not exist. For example, a question-answer pair, such as (145c), will be rejected in an obvious way by the context and by the structure. It is for that reason that the answer types for the NSCO question had to be manipulated in such a way. The answer types were also balanced: Half were single referent answers and half were multiple referent answers. Both single and multiple referent answer were set up as a true judgment, since the NSCO question is ambiguous.

The purpose of NSCO questions is to investigate whether the L2 speakers allow the coreferential interpretation for the NSOC question, not for the SCO question (Crain & Thornton, 1998). The purpose of SCO questions is to establish whether L2 speakers recognise allowed and disallowed interpretations of wh-questions in English, constrained by SCO. If L2 speakers have built the target-like syntactic representation of wh-movement in English, the SCO constraint must be obeyed. If not, they will treat the SCO question and the NSCO question alike. This could indicate whether L2 speakers utilise genuine wh-movement strategies to disambiguate semantic interpretations of wh-questions in English.

In weak crossover trials, test items were manipulated by two variables: answer type and structural position of quantifier. Of 12 target items, half contained wh-questions with quantifiers in embedded object positions, namely, weak crossover (WCO) questions (147a) and half included wh-questions with quantifiers in matrix subject positions, that is, non-weak crossover (NWCO) questions (148a). For each question types, there were two answer types: single answer (147b) and pair-list answer (147c). They were balanced across the target sentences. All test items appeared with either the single answer or the pair-list answer. Since the WCO question is unambiguous, the single answer was set up as a true judgment; the pair-list answer was set up as a false judgment. By contrast, the NWCO question is ambiguous, so that both single and pair-list answer were set up as a true

judgment. Experimental stimuli are illustrated in Figures (8)–(9). A full list of test items is provided in Appendix (2).

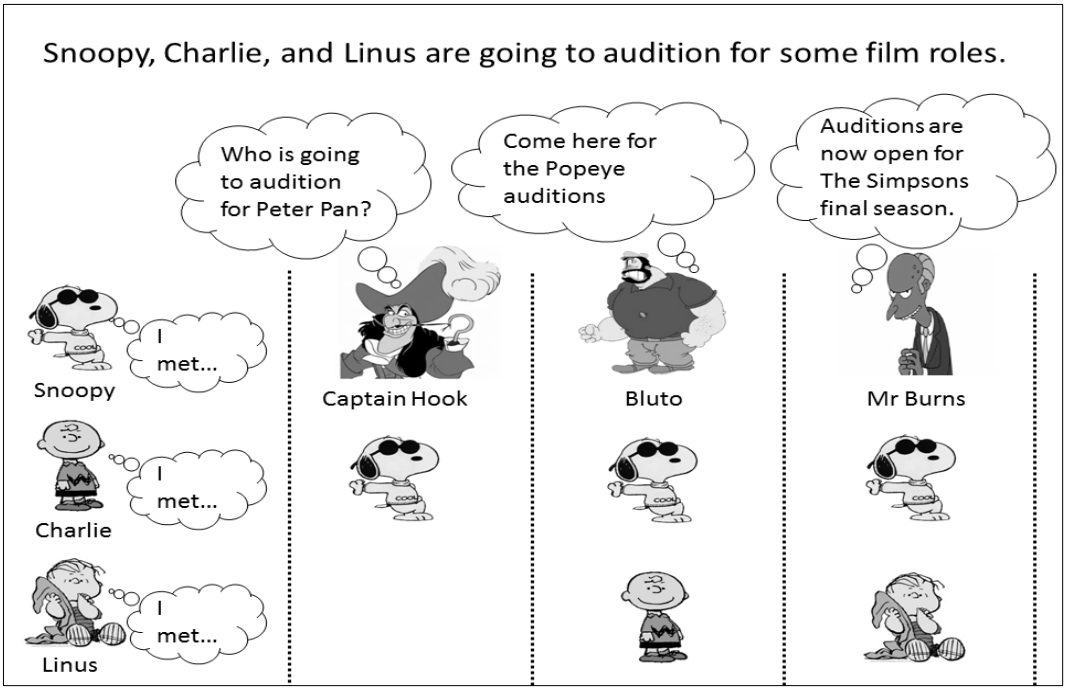


Figure 8 Context for WCO Question

(147) WCO trial

a. Who said he met every casting director?

b. Snoopy. (Single answer)

c. *Snoopy met Captain Hook, Bluto, and Mr. Burns, Charlie met Bluto, and Linus met Mr. Burns. (Pair-list answer)

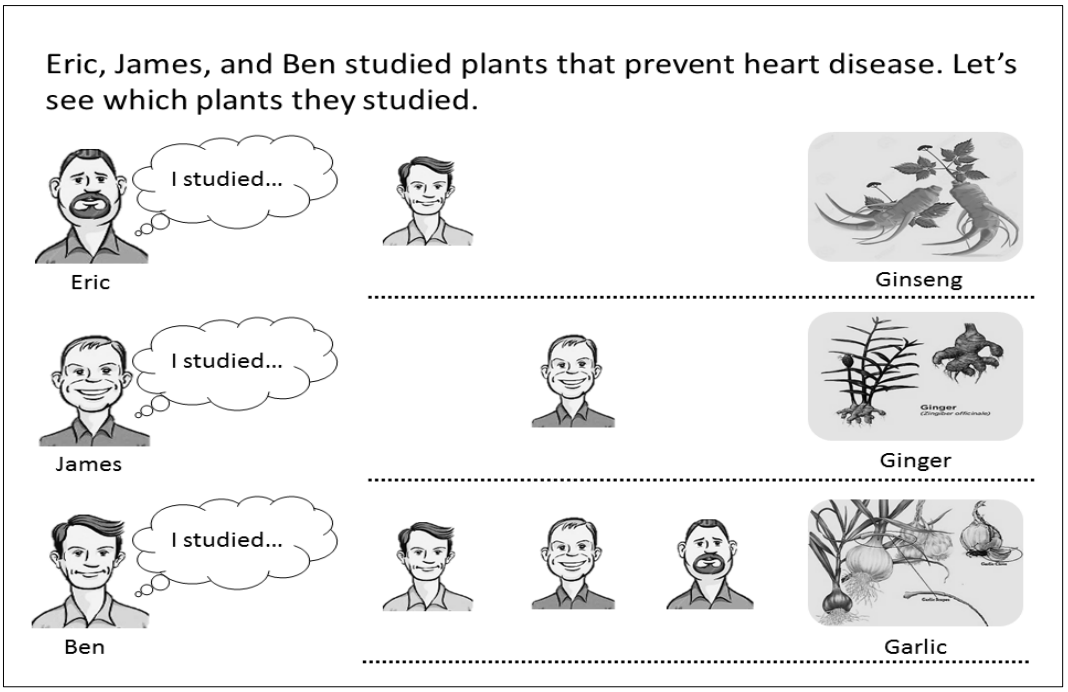


Figure 9 Context for NWCO Question

(148) NWCO trial

a. What did everyone say he studied for heart disease?
b. Garlic. (Single answer)
c. Eric studied garlic, James studied garlic and ginger, and Ben studied garlic and ginseng. (Pair-list answer)

Note that the pronoun *he* is intentionally inserted to fix a set of referents in the discourse, since it is bound by the wh-word in (147a) and by the quantifier in (148a). For that reason, it presupposes a possible set of members in the discourse. Crucially, the inclusion of a singular pronoun *he* removes the availability of a pair-list answer in (147a); that is, by letting the wh-word *who* serve as an antecedent for the singular pronoun *he*, the effects of plurality related to wh-words disappear, ruling out the possibility of a distributive reading (Sloan, 1991; Chierchia, 1993).

The purpose of NWCO questions is to assess the availability of a pair-list answer in L2 grammars. If L2 speakers have constructed the target-like syntactic representation, they will

observe the scope ambiguity in (148a), allowing both the single-and pair-list answer for the NWCO question. The purpose of WCO questions is to establish whether L2 speakers are aware of the WCO constraint on the availability of pair-list answers. If the WCO constraint is operative in L2 grammars, L2 speakers will be able to resolve wh-quantifier scope ambiguity in English. If not, L2 speakers will not be able to disambiguate wh-quantifier scope ambiguity, allowing the single answer and the pair-list answer for the WCO question. This would indicate the non-target-like syntactic representation of wh-movement in English, resulting in non-target-like behaviours at the syntax-semantics interface in L2.

3.4.3 Procedure

The experiment was run on a laptop PC, using PowerPoint presentation with animated slides. Each test item consisted of two slides: a story and a corresponding question-answer pair. The question-answer pair was preceded by the story containing pictures and words. Being animated, the pictures and words appeared by pressing an arrow key on the keyboard. Participants were instructed to press the key until a sign, indicating end of story, appeared on the screen. They were then asked to judge whether the answer is true or false, based on the story. Participants were asked to indicate their choice on the answer sheet provided (see Appendix 3, for a sample of answer sheet). If they chose false, participants were asked to write a correct answer on the answer sheet. During the experiment, participants were allowed to go back to the story that they just read in order to check their understanding, but they were not allowed to navigate the previous items they had already judged. Before they undertook the task, participants were given four practice items In order to familiarise them with the task. The target items were presented with the fillers in a quasi-random order. The experiment, including instructions and practice, lasted approximately fifty minutes to an hour and half to complete. All participants were tested individually.

3.5 Results

For the data analysis, each correct judgement was given a score of 1, and each incorrect judgement was given a score of 0. For example, if a participant choose ‘FALSE’ and provide correct answer for the question, a score of 1 was given; if not, it was classified ‘random answers’ as it included inappropriate justification for their correction. For example, several

participants chose the following question-answer pair 'FALSE' and provided the multiple referents as a corrected answer.

Q: Who did he say had the best moustache?

A: Ned and Sam.

Some of the participants provided all the characters in the picture as a corrected answer. Others provided a disjoint referent and one of the multiple referents as a corrected answer.

The results for SCO questions are shown in Table 28. A one-way ANOVA conducted on answer types shows between-group effects for disjoint interpretation, $F(4, 75) = 31.787$, $p = .000$, and for coreference interpretation, $F(4, 75) = 24.222$, $p = .000$. Note that the analysis here does not rely solely on p-values; rather, the group differences are analysed in terms of the CI and effect size, due to the sample size (Lason-Hall & Plonsky, 2015).

Table 28

Acceptance Rates of Disjoint and Coreference Interpretation of SCO Questions

	Disjoint reference			Coreference		
		95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	83% (31)	68	98	13% (26)	0.4	26
GA	61% (44)	38	84	36% (42)	15	58
GI	57% (32)	37	77	42% (34)	20	63
KA	47% (42)	17	77	48% (39)	21	76
KI	26% (36)	10	42	64% (40)	46	82

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

The data in Table 27 reveal that the NC group appears not to allow coreference in the SCO questions, showing an 83% acceptance of disjoint interpretation. The German advanced (GA) group appears to distinguish between allowed and disallowed interpretation; the mean acceptance rate of the disjoint reference for the GA group (61%) is not within the CI for the NC group [68, 98] and not vice versa, suggesting the difference between the GA and NC group is not significant. However, the mean acceptance rate of coreference for the GA group (36%) is not within the CI for the NC group [0.4, 26] and conversely. The effect size is medium (Cohen's *d* = 0.7). There appears to be no significant difference between the advanced groups; the acceptance rate of disjoint reference for the GA group (61%) is within the CI for the KA group [17, 77] and vice versa. The same thing holds for the acceptance rate of coreference; the mean rate for the GA group (36%) is within the CI for the KA group [21, 76] and vice versa.

Turning into the KA group, they appear to be significantly different from the NC group in the SCO condition; the mean acceptance rate of the disjoint reference for the KA group (47%) is not within the CI for the NC group [68, 98] and the other way around. The effect size is large (Cohen's *d* = 1.1). Additionally, the mean acceptance rate of coreference for the KA group (48%) is not within the CI for the NC group [0.4, 26] and vice versa. The effect size is large (Cohen's *d* = 1.1).

Moving on the intermediate groups, there appear to be a significant difference between the GI and NC group. The mean acceptance rate of disjoint reference for the GI group (57%) is not within the CI for the NC group [68, 98] and vice versa. The effect size is large (Cohen's *d* = 0.8). The mean acceptance rate of coreference for the GI group (42%) is not within the CI for the NC group [0.4, 26]. The effect size is large (Cohen's *d* = 1.0), suggesting that the difference is significant. Furthermore, the GI group appears not to differ significantly from the advanced groups; the mean acceptance rate of disjoint reference for the GI group (57%) is within the CIs for the GA group [38, 84] and for the KA group [17, 77]. The same thing holds for true in acceptance rate of coreference; the mean rate for the GI (42%) is within the CIs for the GA group [15, 58] and for the KA group [21, 76]. The difference between the KI and GI group is significant; the acceptance rate of disjoint reference for the KI group (26%) is not within the CI for the GI group [37, 77] and vice versa;

and that of coreference for the KI group (64%) is not within the CI for the GI group [20, 63] and in reverse. The effect sizes are medium with Cohen's *d* value of 0.7.

The KI group's low acceptance of disjoint reference is quite distinct from the other four groups. It seems that the KI group tends to prefer the coreference interpretations: 26% of acceptance of disjoint reference and 64% acceptance of coreference. The KI group appears to differ significantly from the NC group; the mean acceptance rate of disjoint reference is not within the CI for the NC group [68, 98] and vice versa with Cohen's *d* value of 1.7, and that of coreference for the KI (64%) is now within the NC group [0.4, 26] and conversely with Cohen's *d* value of 1.5. In addition, the KI group appears to differ significantly from the GA group, but not from the KA group; the mean acceptance rate of disjoint reference for the KI group (26%) is not within the CI for the GA group [38, 84] and the other way around. The effect size is large (Cohen's d = 0.9). There is a significant difference between the KI and GA group in the acceptance rate of coreference; the mean acceptance rate of coreference for the KI (64%) is now within the CI for the GA group [15, 58].

All in all, the results are somewhat unexpected based on the hypotheses formulated in Section 3.4. In particular, the GI group as well as the KA group performed against the hypotheses. The GA group demonstrated interpretive difference between the SCO and NSCO condition; nonetheless, their acceptance rate of disjoint reference is relatively low compared to the NC group. The KI group is in line with the hypotheses. As in Experiment 1, lack of target syntactic knowledge continues to affect their performance at the interpretive level, due to the consistent L1 interference.

We now turn to the NSCO cases where coreference interpretation is permitted. The results for NSCO questions are given in Table 28. A one-way ANOVA performed on answer types does not reveal between-group effects for disjoint interpretation, $F(4, 75) = 1.203$, $p = .317$, and for coreference interpretation, $F(4, 75) = 1.215$, $p = .318$.

Table 29

Acceptance Rates of Disjoint and Coreference Interpretation of NSCO Questions

	Disjoint reference reading			Coreference reading		
		95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	3% (6)	-0.4	6	95% (10)	90	99
GA	0% (0)	0	0	97% (7)	94	100
GI	7% (19)	-5	19	88% (20)	75	100
KA	3% (7)	-2	8	93% (12)	85	102
KI	2% (5)	-1	4	89% (20)	80	98

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

The data in Table 28 show that all of the group accept coreference in NSCO questions, and the rates of acceptance are considerably high: 95% in the control group, 97% in the GA group, 93% in the KA group, 88% in the GI group, and 89% in the KI group. No significant differences are found between the groups as the mean acceptance rates of coreference for each of the groups do fall within the CIs for each of the groups.

The results from the German groups are as expected since German allows bound variable interpretations of pronouns. However, as discussed in Section 3.2.1, Korean does not allow bound use of pronouns; nevertheless, the Korean groups have substantially high rates of acceptance of coreference interpretations. This suggests that their grammars may utilise pronoun binding mechanism such as Reinhart's Generalisation if we assume that they have wh-movement grammar. In fact, the acceptance rates of coreference decrease in the SCO questions as in Table 29.

Table 30

Acceptance of Disjoint Reference and Coreference across the Conditions

	Disjoint reference interpretation		Coreference interpretation	
Group[a]	NSCO	SCO	NSCO	SCO
NC	3% ⇢	83%	95% ⇢	15%
GA	0% ⇢	61%	97% ⇢	36%
GI	7% ⇢	57%	88% ⇢	42%
KA	3% ⇢	47%	93% ⇢	48%
KI	2% ⇢	26%	89% ⇢	64%

Note. Arrows indicates the changes of L2 groups' acceptance rate in each of the conditions; [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

The data patterns in Table 29 show a sharp decrease in L2 groups' acceptance rates of coreference in the SCO questions. If we look at it the other way around, there is an apparent increase in L2 groups' acceptance rates of disjoint reference in the SCO questions. This implies that coreference reading of pronouns transmutes by the SCO effect. The L2 groups become sensitive to structural distinctions between the SCO and NSOC sentences. They do not answer randomly. Table 30 implies that processing difficulties may occur when parsing the SCO sentences since extraction from the matrix subject position less complex than the extraction from the embedded subject position.

We now move on to the results from wh-quantifier scope interaction, namely the WCO constraint. For the data analysis, the same method was carried out as in the SCO trials; each correct judgement was given a score of 1, and each incorrect judgement was given a score of 0. If a participant chose 'FALSE' and provided correct answer for the question, a score of 1 was given; if not, it was classified 'random answers' as it included inappropriate justification for the correction. For example, several participants chose the following

question-answer pair 'FALSE' and provided answers such as '*No one said he met every director*', '*he → they*', '*No agreement of person in questions and answers*'.

Q: Who said he met every casting director?

A: Snoopy met Captain Hook, Bluto, and Mr. Burns, Charlie met Bluto, and Linus met Mr. Burns.

Table 30 presents the results from the WCO questions where only a single answer reading is allowed. A one-way ANOVA conducted on the answer types yields between-group effects for SGA, $F(4, 75) = 4.616$, $p = .002$, and for PLA, $F(4, 75) = 7.617$, $p = .000$.

Table 31

Acceptance of SGA and PLA in WCO Questions

	Single answer reading			Pair-list reading		
		95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	75% (20)	65	84	23% (21)	13	33
GA	69% (23)	57	81	29% (23)	17	41
GI	67% (19)	55	79	33% (19)	21	45
KA	85% (21)	70	100	15% (21)	0	30
KI	92% (19)	83	100	3% (7)	0	6

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

A noticeable observation is that the acceptance of PLA readings in the WCO questions is considerably low in all of the groups as expected: 23% in the control group; 29% in the GA group; 15% in the KA group; 33% in the GI group; 3% in the KI group. The data indicates that all of the L2 groups respect the WCO constraint in wh-subject/Qu-object questions – not to mention of the control group: 75% in the control group; 69% in the GA group; 85% in the KA group; 67% in the GI group; 92% in the KI group.

No significant differences are found between the German group; the mean acceptance rate of SGA reading for the GA group (69%) is within the CIs for the GI groups [55, 79] and contrariwise; the same pattern is observed for the mean rating of PLA reading for the GA group (29%), which is within the CI for the GI group [21, 45] and vice versa. The German group does not differ significantly from the NC group; the mean acceptance rates of SGA reading for the GA group (69%) and for the GI group (67%) are within the CI for the NC group [65, 84] and vice versa; those of PLA reading for the GA group (29%) and for the GI group (33%) are within the CI for the NC group [13, 33] and conversely.

However, the German group is significantly different from the KA group; the mean acceptance rates of the SGA reading for the KA group (89%) is not within the CIs for the GA group [57, 81] and for the GI group [55, 79], and the other way around. The effect size is large with Cohen's *d* value of 0.8. The PLA reading does not show significant difference between the KA and German group as the mean rate for the KA (29%) falls within the CIs for the GA group [17, 41] and for the GI group [21, 45]. The KA group is not significantly different from the NC group, either; the mean rate of SGA reading for the NC (75%) is within the CIs for the KA group [70, 100]; that of PLA reading for the NC group (23%) is within the CI for the KA group [0, 30].

The KI group is significantly different from the NC group as well; the mean rate of SGA reading for the KI (92%) is not within the CI for the NC group [65, 84] and vice versa. The effect size is large (Cohen's d = 0.9). The same pattern is observed in the mean acceptance rate of PLA reading for the KI group (3%) is not within the CI for the NC group [13, 33] and conversely. The effect size is large (Cohen's d = 1.3). The KI group also differs significantly from the German group; the mean rate of SGA reading for the KI (92%) is not within the CIs for the GA group [57, 81] and for the GI group [55, 79] and vice versa. The

effect size is large on the average (Cohen's *d* = 1.9). The mean rate of PLA reading for the KI (3%) is not within the CIs for the GA group [17, 41] and for the GI group [21, 45] and vice versa. The effect size is extremely large on the average (Cohen's *d* = 2.1). No significant differences are present between the Korean groups; each of the mean rates is within the CIs for each of the groups.

All in all, each of the L2 groups display target-like differentiation between answer types in the WCO questions. The Korean groups, the KI group in particular, demonstrated higher rates of acceptance of the SGA readings. This might be L1 transfer benefits since PLA readings are not available in Korean. If the KI group show differentiation between answer types in NWCO condition, then it will manifest that they have target-like grammar.

We now turn to the NWCO questions. The results from the NWCO questions are given in Table 31. A one-way ANOVA performed on the answer types do not show between-group effects for SGA, $F(4, 75) = 1.198$, $p = .319$, and for PLA, $F(4, 75) = 1.124$, $p = .352$.

Table 32

Acceptance of SGA and PLA in NWCO Questions

	Single answer reading			Pair-list reading		
		95% CI			95% CI	
Group[a]	*M* (*SD*)	*LB*	*UB*	*M* (*SD*)	*LB*	*UB*
NC	52% (24)	40	63	48% (24)	37	60
GA	36% (21)	26	47	62% (22)	51	73
GI	53% (26)	36	70	40% (26)	24	57
KA	47% (35)	22	72	53% (35)	28	78
KI	38% (36)	22	54	51 (33)	36	65

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

The data in Table 31 reveal that all of the groups allow the PLA readings in NWCO questions with a similar acceptance rates to the SGA reading, except for the GA group. The GA group appears to have a preference to the PLA readings. All in all, the PLA readings are well accepted in wh-object/Qu-quantifier questions. The Korean groups appear to have wh-movement in their interlanguage grammars based on Chierchia (1993). Let us consider L2 groups' patterns in accepting the SGA and PLA readings in the WCO and NWCO questions.

Table 33

Acceptance of SGA and PLA Reading across the Conditions

	Single answer reading		Pair-list reading	
Group[a]	SGA in NWCO	SGA in WCO	PLA in NWCO	PLA in WCO
NC	39% ⇢	75%	35% ⇢	23%
GA	36% ⇢	69%	62% ⇢	29%
GI	53% ⇢	67%	40% ⇢	33%
KA	47% ⇢	85%	53% ⇢	15%
KI	38% ⇢	92%	51% ⇢	3%

Note. Arrows indicates the transmutation of L2 groups' acceptance of two answer types; [a]NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22).

The data patterns in Table 32 show that L2 groups' acceptance rates of the SGA readings increase in the WCO questions. Looking at the NWCO questions, the acceptance rates of the PLA readings decrease. These patterns entail that L2 groups do not answer randomly; rather, they are able to differentiate two answer types depending on the structural types.

The experiment on crossover constraints yielded the following findings: (a) all four L2 groups demonstrate target-like judgement on the WCO, the NWCO, and NSCO questions; (b)

with the SCO questions, the judgements differ: The GA group show target-like acceptance, whereas the KA, GI, and KI group appear not to differentiate allowed and disallowed interpretation in the SCO condition; (c) However, the judgement patterns are not random; rather they are sensitive to the structural distinction.

3.6 Discussion

Let us recall our research questions and hypotheses before we discuss the finding of the current experiment.

(149) Research questions

a. Do L2 speakers of English display sensitivity to crossover constraints in complex wh-questions?
b. Does the L1 influence the acquisition of syntax-semantics interface knowledge?
c. Does proficiency affect the acquisition of syntax-semantics interface knowledge?

(150) Hypotheses

a. Crossover configurations will be problematic for the intermediate L2 speakers of English due to the lack of syntactic representation of the target language.
b. The advanced L2 speakers will be able to establish c-command relations between the wh-trace and the pronoun in crossover configuration; thus, crossover configurations are unproblematic for the advanced L2 speakers of English.
c. Even if L2 speakers of wh-in-situ languages have acquired wh-movement grammar, they are vulnerable to crossover constraints due to processing difficulties.

Based on the findings from the current experiment, we cannot give the proper answers to the research questions and hypotheses since although all four L2 groups, regardless of their L1s and proficiency, demonstrate target-like differentiation between allowed and disallowed interpretation with the WCO, NWCO, and NSCO questions, their behaviours vary

in the SCO questions. The German advanced group demonstrate target-like contrast between disjoint reference and coreference as we predicted, while the Korean group and the German intermediate group do not make such contrast. Therefore, the hypotheses in (150a)–(150b) are rejected.

The answer to the research question (149a) would be partly affirmative since the intermediate group and the Koran advanced group behaved differently depending on the structural types. However, even for the German advanced speakers, the SCO questions appeared to be problematic. L2 syntax-semantics interface may be subject to structural variation. All of the groups showed good knowledge of WCO, NWCO, and NSCO questions; nonetheless, their knowledge of interpretive interface is limited to certain configurations such as the SCO questions. This may answer the research question (149c). The results suggest that proficiency affects the acquisition at the interpretive interface. In fact, the German advanced group's QPT score was higher than the Korean advanced group. As far as proficiency concerned, L2 acquisition at the syntax-semantics interface is affected by L2 speakers' proficiency, which is the case in L2 syntax. If this is the case, the Korean advanced speakers are not fully reconfigured the Q-projection parameter. Potentially related to this, it is reasonable to assume that L2 grammars are flexible with respect to the feature composition in functional categories. In the case of QP, L2 speakers, even advanced speakers, may project Q_{WH}-particle without the EPP in the sense of Hegarty (2005). Hegarty claims that L1 English children produce wh-question without T-to-C movement, resulting in wh-questions such as *Where daddy go?* This is held to be because children project C without a feature responsible T-to-C movement, that is, [WH] without [Q], say. Consequently, non-adult-like grammar is likely to be generated in children's grammars. Taken into consideration, the Korean advanced speakers, in particular, project Q_{WH}-particle without the EPP. As a result, they may accept coreference interpretation in the SCO questions, being tempted by the options available in their L1 such as wh-scrambling. By employing wh-scrambling they apply Condition C to the pronoun at the surface structure as in NSCO questions. This is possible especially when L2 speakers encounter target structures that are difficult to parse. Therefore, L2 knowledge of interpretive interface is subject to variation, which is manifested in the WCO, NWCO, and NSCO questions.

In fact, the SCO constraint involves quite complex mechanisms to parse. The parser must relocate the position of the extracted wh-word and establish the semantic relations between the wh-word and the pronoun. The acceptance patterns provided in the previous section may help understand structural variation at L2 syntax-semantics interface. We already witnessed a sharp increase in acceptance rates of disjoint interpretation with the SCO questions, which was almost absent in the NSCO questions. We also observed that acceptance rates of coreference decrease in the SCO questions. This entails that the allowed and disallowed interpretations are not selected randomly; rather it reflects L2 speakers' systematic knowledge of the target languages. Moreover, considering that the L2 speakers in the current experiment are the same participants in Experiment 1, the Korean advanced speakers has already demonstrated that they have fully acquired syntactic properties of long-distance wh-movement in English. Nonetheless, the SCO constraint appears to be problematic to parse. This performance factor may influence the differentiation between two answer types with the SCO question. Thus, hypothesis (150c) is tentatively accepted for the moment.

Given that the availability of the target grammar, Q-projection, lead to differentiation in interpretation preference, the SCO questions remains as a particular wh-path they have to go through. Put the SCO configuration aside, our L2 speakers of English manifest that target-like knowledge of syntax-semantics interface properties is acquirable despite the typological distinction between L1 and L2; hence, UG is operative at L2 syntax-semantics interface (Dekydtspotter, Sprouse, & Swanson, 2001; Marsden, 2008). Yet processing would affect L2 speakers' target-like performance on the SCO constraint related to the syntax-semantics interface (see also Sorace, 2005; Sorace & Filiaci, 2006).

Chapter 4

Processing Crossover Constraints in Second Language Acquisition

4.1 Introduction

This chapter investigates how L2 speakers make use knowledge of phenomena at the syntax-semantics interface during online processing of complex wh-questions. Studying how L2 speakers build a syntactic representation with incoming input helps broaden understanding the nature of L2 acquisition. For example, L2 speakers' performance on the target structures could be disrupted by processing difficulties as discussed in the previous chapters. In this regard, the basic assumption behind the L2 processing is thus about whether L2 speakers make use of the same processing mechanisms that L1 speakers have. Lack of target-like processing mechanisms could cause confusion in L2 speakers' performance on the target language. Processing of filler-gap dependencies would be a good candidate to examine such assumption.

Pursuing this line of assumption, this chapter takes a further step to extend L2 processing into the phenomena of the syntax-semantics interface. To this end, this chapter explores L2 processing of crossover phenomena, which is rarely touched on L2 literature. For example, processing of SCO configurations such as (151) requires that L2 speakers identify not only the gap, but also the potential antecedent for the pronoun simultaneously.

(151) Which waitress$_i$ did the busboy say she had blamed t_i for slow service?

As for WCO configurations such wh-quantifier scope relations (152), L2 speakers must not only identify the gap, but also determine scope relation between the filler and the quantifier at the same time.

(152) What$_i$ did everyone say he bought t_i after the dinosaur tour?

For L2 speakers, this definitely imposes a heavy processing load, which in turn results in slow processing of the target structure. However, if L2 speakers have constructed right syntactic representation, they would demonstrate similar processing patterns with L1 speakers. If the current experimental study provide such evidence, L2 speakers seemingly non-target-like performance would then be explained; that is, the difference between L1 and L2 acquisition is boiled down to processing difficulties of the target structures.

4.2 Processing in L2

The long-standing issue of L2 syntactic knowledge is about whether L2 grammars are UG-constrained. An issue of L2 processing proceeds in a similar vein; that is, whether L2 processing differ fundamentally from L1 processing; whether L1 and L2 processing employ the same processing mechanism (Clahsen & Felser, 2006; Dekydtspotter, Schwartz & Sprouse, 2006; Juffs, 2006). The debate is sparked off by Shallow Structure Hypothesis (SSH), which predicts that that L2 processing is qualitatively different from L1 processing, and as such L2 processing is restricted in the use of relevant syntactic information (Clahsen & Felser, 2006).

The SSH precludes the role of L1 as well as L2 proficiency with respect to processing resources available to L2 speakers. In other words, the difference between native and non-native speakers during online processing cannot be attributed to L2 speakers' L1s or proficiency since L2 processing is fundamentally different from L1 processing in the sense of Bley-Vroman (1990) and Clahsen and Muysken (1986, 1989). L2 speakers, after all, are to be shallow parsers for Clahsen and Felser (2006).

Studies on wh-dependencies reveal that L2 speakers do not make use of syntactic information during online processing, lending support to the SSH. For example, Marinis, Robert, Felser, and Clahsen (2005) investigated processing filler-gap identification at each trace position as in (153). Marinis et al. tested, using a self-paced reading task, advanced L2 speakers of English with wh-ex-situ (German and Greek) and wh-in-situ languages (Chinese and Japanese).

(153) a. The nurse who$_i$ the doctor argued t_i that the rude patient had angered t_i is refusing to work late.

b. The nurse who$_i$ the doctor's argument about the rude patient had angered t_i is refusing to work late.

(Marinis et al., 2005, p. 61)

In (153), the filler-gap identification is resolved after the verb *angered*. However, in (153a), the filler-gap identification can be facilitated by the intermediate gap after the verb *argued*. In (153b), on the other hand, due to the absence of the intermediate gap, the filler-gap identification would be delayed since the parser must process all of the elements between the filler and the gap. Consequently, a reading time slowdown is then expected after the verb *angered* in (153b), but not for (153a).

The results confirm that a facilitation effect is available for the native controls English natives, but not for the L2 groups, irrespective of their L1s. Marinis et al. (2005) conclude that the L2 speakers' use of syntactic information during online processing is restricted to that of native speakers.

However, other studies on processing wh-dependencies reveal the opposite results. For example, Aldwayan, Fiorentino and Gabriele (2010) investigated, using a self-paced reading task, whether the filler-gap identification is resolved in an island with advanced Najdi Arabic speakers of English whose L1 is a wh-in-situ language.

(154) a. My sister wondered if the boring comments about **John's** used car were intended to entertain the group.

b. My sister wondered who the boring comments about **John's** used car were intended to entertain ___.

(Aldwayan et al., 2010, p. 72)

In (154b), a complex noun phrase *the boring comments about John's used car* constitutes a complex NP island for movement of *who*, and there are two potential gaps: after the preposition *about* and after the verb *entertain*, which is not in the case in (154b). If L2 speakers do not respect the island constraint, the filler-gap identification is then resolved after the preposition *about*; consequently, a reading time slowdown is expected at *John's*. The results show that no slowdown is observed at *John's* for both the L2 speakers and native speakers. Aldwayan et al. (2010) conclude that L2 speakers make use of syntactic information during online processing.

Based on the SSH and previous studies, I take into consideration the role of L1 and L2 proficiency in processing crossover constraints. We now start out Experiment 3.

4.3 Experiment 3: Processing strong crossover constraint

This experiment aims to explore how L2 speakers make use of the strong crossover constraint in the interpretation of complex wh-questions during online comprehension. The processing of the strong crossover construction requires two structural dependencies: wh-dependency and referential dependency (Fraizer, Ackerman, Baumann, Potter, & Yoshida, 2015; Kush, 2013). That is, in order for L2 speakers to process the strong crossover construction, they need to associate a wh-dependency that is forward process to locate the wh-element's gap with a referential dependency that is backward process to search for a potential antecedent that was already processed (Fraizer et al., 2015, see also Kazanina, Lau, Lieberman, Yoshida, & Phillips, 2007). By investigating how two such structural dependencies interact online, this experiment makes an attempt to discover how and when L2 speakers analyse the strong crossover configuration in the context where a wh-phrase can be a potential antecedent for a pronoun. In this context, the parser must ignore the wh-phrase that matches the pronoun in gender as a possible antecedent since its candidature is delimited by the strong crossover constraint. This consequently will indicate whether or not L2 speakers utilise genuine wh-movement during online comprehension of complex wh-questions in English. Furthermore, the interpretation of a certain structure that exhibits L1-L2 asymmetry, such as wh-movement, would most likely result in delayed activation of syntactic computations in L2 grammar development. It is thus assumed that L2 processing

utilises either L1 syntactic representation or L2 syntactic representation during online comprehension (VanPatten & Jegerski, 2010). The following research questions are formulated:

(155) Do L2 speakers utilise target syntactic knowledge to process strong crossover constraint online?

(156) Does the L1 influence the process of strong crossover constraint online?

(157) Does proficiency affect the process of strong crossover constraint online?

In Experiment 2, the SCO questions are viewed as a possible locus of L2 flexibility of Q-projection. The following hypotheses are formulated in term of Q-projection flexibility.

(158) While the intermediate speakers and advanced Korean speakers will show gender mismatch effect in the NSCO conditions, they will also demonstrate gender mismatch effect in the SCO conditions due to the Q-projection flexibility. Therefore, they would show slow-downs at the pronoun or at the post-pronoun in the gender mismatch condition, but not for the gender match condition, regardless of structural distinction.

(159) The advanced German speakers, on the other hand, will not show gender mismatch effect in the SCO conditions. Therefore, they would show slow-downs at the pronoun or at the post-pronoun in the SCO, gender match condition.

4.3.1 Participants

Four experimental groups participated in Experiment 3: 22 intermediate Korean speakers, 10 advanced Korean speakers, 12 intermediate German speakers, 17 advanced German speakers of English. Also, 19 native speakers of British English participated as a control group for comparison. The participants were the same as in Experiment 1.

4.3.2 Materials

A self-paced reading task (SPRT) was designed to test the hypotheses. The task was similar to the paradigm in Fraizer et al. (2015) and Kush (2013), but the materials that were used here were different from them. Each test item consisted of a complex wh-question rather than an embedded wh-question. All target items were finite without complementisers. Specifically, a caution was made to the selection of words that carry an impact on the determination for coreference between a wh-phrase and a pronoun. In order to remove conflicts with lexical information associated with gender, test items included gender-specific words, such as *prince* and *princess*, rather than gender-stereotyped words, such as *doctor* and *nurse*, or gender neutral words, such as *teacher* and *manager* (see Kennison & Trofe, 2003 for discussion on this issue). In order for the task to be more feasible for L2 speakers, proper names were not included in the experimental items since they could be ambiguous or unfamiliar in terms of gender for Korean speakers of English, in particular. Each target stimulus consisted of 12 words. They were balanced across each condition. Another factor that was balanced across each condition was the gender of the pronoun.

Sixteen experimental items were constructed with this in mind. Target items were manipulated by two factors, yielding four conditions: gender congruency between the wh-phrase and the pronoun (match vs. mismatch) and extraction position of the wh-phrase (SCO vs. NSCO). Four test stimuli were created for each condition. Target stimuli are illustrated in (160)–(163). A full list of test items is provided in Appendix 4.

(160) SCO, match

Which waitress did the busboy say she had blamed for slow service?

(161) SCO, mismatch

Which princess did the queen say he had insulted at the reception?

(162) NSCO, match

Which salesman said the chairwoman had flattered him on talents for sales?

(163) NSCO, mismatch

Which monk said the knight had followed her into the old Cathedral?

In SCO conditions, the wh-phrase either matches the pronoun in gender, resulting in SCO effect (160); or it mismatches the pronoun in gender, causing a gender-mismatch effect (161). The matrix subject, which is structurally accessible, always mismatches the pronoun in gender. By removing the matrix subject as a potential antecedent for the pronoun, the parser does not observe any referential dependency between the matrix subject and the pronoun. This was done to establish whether L2 speakers make use of the target syntactic knowledge in processing SCO construction. In (160), for instance, the parser must inevitably link the wh-phrase that matches the pronoun in gender but is structurally inaccessible as a possible antecedent. This consequently will lead to processing difficulty, putting an extra load on memory, since there is no structurally accessible antecedent. Thus, a slowdown is expected at the pronoun or after the pronoun during online processing. If L2 speakers obey the SCO constraint, a slow-down is predicted at the pronoun or after the pronoun, reflecting processing difficulty. If not, then no slow-down is expected at the pronoun or after the pronoun. This could indicate that L2 speakers do not utilise target syntactic knowledge due to the absence of target-like syntactic representation of wh-movement, so that they have to rely on L1 syntactic representation or non-syntactic strategies, such as linear order, in order to interpret complex wh-questions in English. A gender mismatch effect is expected in (161) since there is no structurally and lexically accessible antecedent for the pronoun. This will also lead to processing difficulty: A slowdown is expected at the pronoun or after the pronoun.

On the other hand, in NSCO conditions, the wh-phrase matches the pronoun in gender, resulting in coreferential interpretation (162); the wh-phrase mismatches the pronoun in gender, causing a gender-mismatch effect (163). The embedded subject always mismatches the pronoun in gender, so as to remove it as a possible antecedent. This was done to ensure that the parser do not engage in any referential dependency between the embedded subject and the pronoun. A gender mismatch effect is expected in NSCO conditions. No slow-down is predicted at the pronoun or after the pronoun in (162) since

wh-dependency and referential dependency are facilitated by processing. That is to say, the wh-phrased must be processed before the pronoun. In (163), on the other hand, a possible slow-down is expected at the pronoun or after the pronoun, as there is no gender-matching antecedent for the pronoun. L2 speakers are expected to display qualitatively similar processing patterns as the natives do since NSCO conditions do not involve long-distance wh-dependency.

In addition to the target stimuli, there were 16 fillers to mask the test sentences, giving a total of 32 items. The filler items were all declarative sentences, sharing similar factors with the experimental items: gender match/mismatch between a pronoun and a matrix/embedded subject. Also, the length of filler items was the same as the target items. Half of the items, including the fillers, were followed by yes/no comprehension questions.

4.3.3 Procedure

Experiment 3 was run on a laptop PC, using PsychoPy (Pierce, 2007). In PsychoPy, the initial word is not covered, so that a hashtag was inserted at the beginning of each trial. Each item was presented in a centre noncumulative format with word-by-word segmentation. Participants were able to read a sentence one word at a time, by pressing the space bar on the keyboard. Each press of the space bar disclosed a new word, and at the same time the previous word disappeared from the screen. Participants were instructed to read each sentence at their own speed for comprehension. There was a breathing space placed in between trials to allow participants to gear themselves up for an incoming item and to pause or relax while performing the task. Reading times were recorded for each word.

Half of the trials, including the distractors, were presented with a yes/no comprehension question, asking about information of the sentence. Participants answered the questions, by pressing 1 (*yes*) or 0 (*no*). No feedback was given about their responses. The purpose of the comprehension question is to ensure that participants pay attention to the meaning of the sentence and that participants do not press the space bar mechanically to finish the task (see Jegerski, 2012 for discussion on comprehension questions). The experimental trials were presented with the distractor trials in a mixed random order. Before beginning the experiment, participants were given a list of vocabulary used in the experiment materials to avoid the issue of lexical access (Marinis, 2010). That is, problems

with unfamiliar words may result in slow reading times during L2 processing, which may mask L2 speakers' syntactic parsing during comprehension on target items. Participants were also given four practice items in order to familiarise them with the task before they undertook the task. The experiment, including instructions and practice, took approximately fifteen to twenty minutes to complete. All participants were tested individually.

4.3.4 Results

Prior to the data analysis, reading times (RT) that were below 200ms or above 6000ms were eliminated. Furthermore, RTs that were 2.5 standard deviations above or below the group mean were also removed (mean response time ± 2.5 standard deviations). This affected less than 5% of the trial in each group. Participants were also screened based on the comprehension question scores. Participant whose comprehension question accuracy that was below 2 standard deviations from the mean were removed from data analysis (Kazanina et al. 2007). Due to outlying participant one native control, one German advanced speaker, and two intermediate Korean speakers were excluded. Thus data from 18 native controls, 16 German advanced, 10 Korean advanced, 12 German intermediate, and 20 Korean intermediate speakers entered into the data analysis. Table 33 presents comprehension question results by conditions.

Table 34

Mean Comprehension Question Accuracy

	SCO		NSCO			
Group	Gmis	Gmat	Gmis	Gmat	M	SD
NC	74%	68%	66%	84%	79%	14
GA	68%	68%	82%	59%	77%	18
GI	46%	63%	54%	63%	55%	18
KA	55%	70%	85%	70%	71%	17
KI	52%	52%	77%	73%	68%	12

Note. NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22). SCO = strong crossover; NSCO = noncrossover; Gmis = Gender mismatch; Gmat = Gender match

The Repeated Measures (RM) ANOVAs conducted on the critical region and post critical region with Congruency (Gender match, Gender mismatch) and Constraint (SCO, NSCO) as within-subject variables and Group (English, German advanced, German intermediate, Korean advanced, Korean intermediate) as a between-subjects factor for each of the two regions of interest. For the critical region, the RM ANOVA do not reveal a main effect of Constraint, $F(1, 71) = .035$, $p = .853$, and no interaction between Constraint and Group is found, $F(4, 71) = .031$, $p = .998$. There is a main effect of Congruency, $F(1, 71) = 24.93$, $p = .000$, and a two-way interaction between Congruency and Group is found, $F(4, 71) = 3.04$, $p = .022$.

For the post-critical region, the RM ANOVA shows a main effect of Constraint, $F(1, 71) = 5.53$, $p = .022$. There is a two-way interaction between Constraint and Congruency, $F(4, 75) = 3.616$, $p = .009$. In addition, between-subjects effects was present, $F(4, 71) = 4.69$, $p = .002$. There is a main effect of Congruency, $F(1, 71) = 16.86$, $p = .000$. A two-way interaction is also found, $F(1, 71) = 6.14$, $p = .016$. Let us see how Constraint and Congruency factors affect reading times in the SCO questions. Reading times at the critical pronoun region and post-critical region are boldfaced in Table 34.

Table 35

Reading Times of SCO in Gender Mismatch Condition

SCO gender match	*Wh*	*N1*	*did*	*the*	*N2*	*say*	***Pro***	***had***	*V-ed*	*Prep*	*Mod*	*N3*
Native controls	542	560	515	481	620	589	**699**	**640**	794	558	527	698
German												
Advanced	580	739	620	590	899	698	**915**	**742**	924	619	654	905
Intermediate	557	774	584	516	767	623	**603**	**587**	646	554	512	1001
Korean												
Advanced	532	982	710	555	1167	843	**994**	**1007**	1103	847	643	905
Intermediate	617	1238	666	580	1242	980	**921**	**668**	1026	630	537	1071

Table 34 gives reading times of the SCO questions with gender mismatch condition to the SCO effect, and as such slow reading times are expected at the pronoun or at the post-pronoun region if L2 speakers respect Condition C; otherwise, no slowdown is observed at those regions. As the RM ANOVAs indicated, the main effect of Congruency is found at the pronoun. Descriptively, for native controls, there is a gender mismatch effect at the pronoun with a slow-down of 110ms. The German advanced group shows a gender mismatch effect at the pronoun with a slow-down of 217ms. The Korean advanced group also demonstrates a gender mismatch at the pronoun with a slow-down of 151ms. Both advanced groups appear to pattern with the native controls and to employ target-like processing mechanism, showing gender mismatch effect for the incoming wh-word. This in turn implies that the advanced group are able to make use of abstract grammatical knowledge online processing. However, intermediate groups do not slow down at the pronoun or at the post pronoun, which indicates non-target-like processing mechanisms involved in their grammars. This is due to the fact that they are insensitive to grammatical restrictions on the filler-gap dependencies. If the advanced group is employing wh-movement grammar online processing, they will show a similar gender mismatch effect at the pronoun or at the post pronoun in the SCO with gender match condition. Mean RTs in the SCO with gender match condition is presented in Table 35.

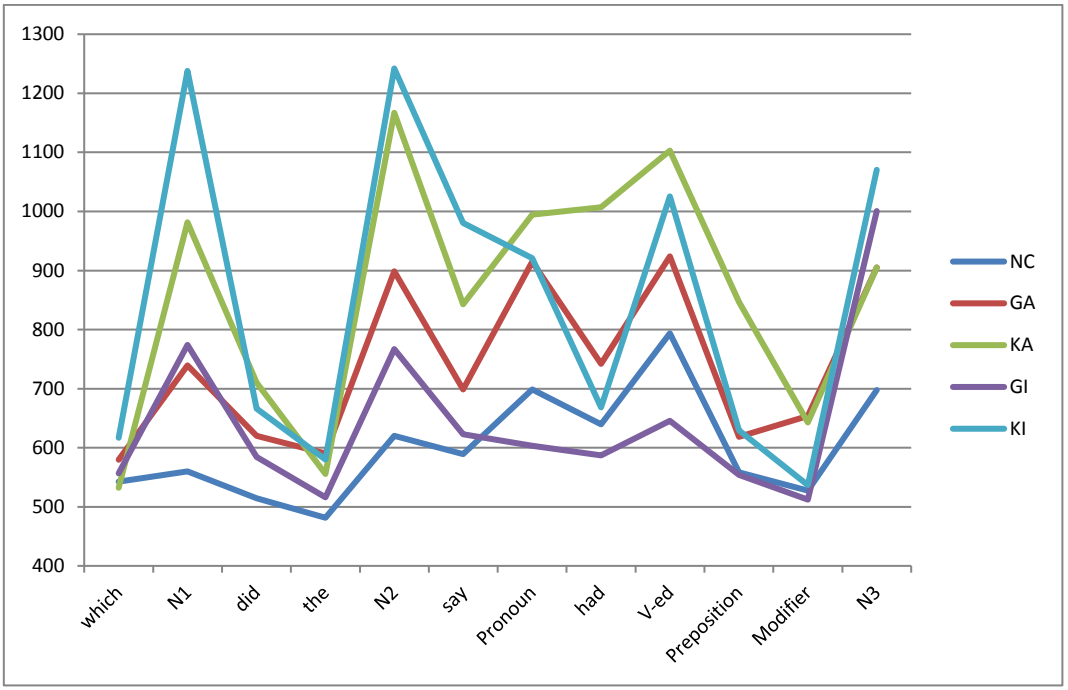
Table 36

Reading Times of SCO in Gender Match Condition

SCO gender match	*Wh*	*N1*	*did*	*the*	*N2*	*say*	***Pro***	***had***	*V-ed*	*Prep*	*Mod*	*N3*
Native controls	497	503	499	468	579	608	**567**	**644**	639	608	501	693
German												
Advanced	601	613	609	603	801	711	**719**	**771**	974	702	548	817
Intermediate	563	595	576	496	692	610	**560**	**537**	734	521	517	729
Korean												
Advanced	587	616	744	549	1272	965	**784**	**919**	814	584	627	881
Intermediate	540	673	707	645	1259	879	**773**	**569**	1038	616	549	946

The main effect of Constraint at the post-pronoun region means that the control group does not link the gender-matched wh-word to the pronoun as its antecedent due to Condition C. By contrast, the intermediate groups appear not to respect the SCO constraints; their reading times start to decrease from the critical pronoun region. Both advanced groups respect the SCO constraints with their slowdown at post-pronoun region, indicating that they were not tempted to link the gender-matched wh-word to the pronoun in the SCO configuration The RTs in Table 34 show that in the native controls, a slow-down with 77ms is observed at the post-pronoun. In the German advanced group, a slow-down with 52ms is demonstrated at the post-pronoun. In the he advanced Korean group, a slow-down with 135ms occurs at the post-pronoun. Both advanced group, patterning with native controls, appear to build a structure incrementally. This indicates that they construct filler-gap dependencies actively after encountering wh-word, and are sensitive to the grammatical restriction on filler-gap dependencies, namely, strong crossover constraint. That is, both advanced group are sensitive to structural restriction on c-command between the pronoun and the wh-trace. This in turn manifests that L2 speakers are able to make use of abstract grammatical knowledge online; they were still experiencing processing delay at both the critical and the post-critical region due to the gender-matched wh-word.

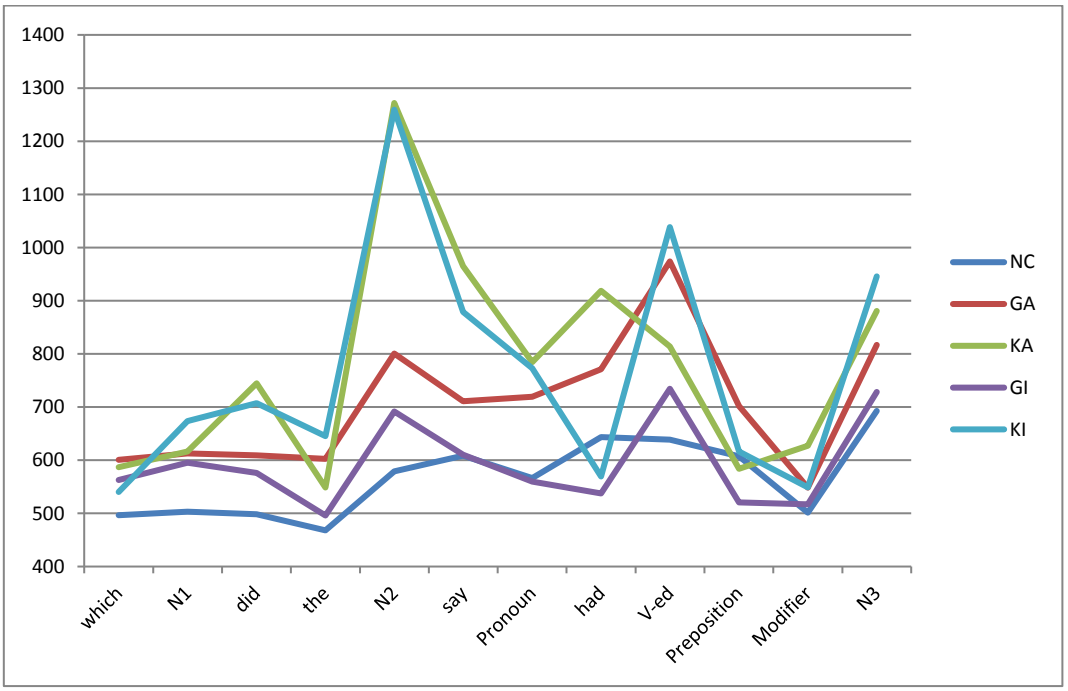
However, the intermediate groups do not slow down at the pronoun or at the post pronoun in the same way as in the SCO with gender mismatch condition. This suggests that the intermediate groups' processing mechanisms is different from those of the advanced groups as well as the native control. However, the intermediate groups indeed are able to utilise wh-movement grammar online. Figures 10–11 show the L2 groups’ reading time patterns of SCO questions graphically.



NC = Native controls, GA = German advanced, KA = Korean advanced,

GI = German intermediate, KI = Korean intermediate

Figure 10 Reading Times of SCO in Gender Mismatch Condition



NC = Native controls, GA = German advanced, KA = Korean advanced,

GI = German intermediate, KI = Korean intermediate

Figure 11 Reading Times of SCO in Gender Match Condition

Table 37

Comparison of the RTs at the Slow-down Region in the SCO Condition

	Gender mismatch condition				Gender match condition			
	at the pronoun				at the post-pronoun			
			95% CI				95% CI	
Group[a]	M	SD	LB	UB	M	SD	LB	UB
NC	699	345	527	870	644	276	507	781
GA	915	386	709	1121	771	282	621	921
KA	994	622	549	1439	919	384	644	1193

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 18); GA = German advanced (n = 16); KA = Korean advanced (n = 10).

Table 36 presents the RT from the regions where slow-downs occurred. We first compare the RTs to see whether the gender mismatch arise in the SCO condition. If Condition C is activated during online processing there should be no gender mismatch effect in the SCO condition. This will prove whether L2 speakers make use of syntactic knowledge online. For the NC group, there is no significant difference between the two conditions. The mean RT for the gender mismatch condition (699ms) is within the CI for the gender match condition [507, 781] and vice versa, which provide evidence for online sensitivity to crossover constraint on filler-gap dependencies.

Turning to the GA group, no significant difference is found between the two conditions. The mean RT for the gender mismatch condition (915ms) is within the CI for the gender match condition [621, 921] and vice versa. The GA group is also sensitive to crossover constraint on filler-gap dependencies.

Moving on the KA group, no significant difference is observed between the two conditions. The mean RT for the gender mismatch condition (994ms) is within the CI for the gender match condition [644, 1193]. The KA group show online sensitivity to crossover constraint on filler-gap dependencies.

The data suggest that both L2 groups utilise abstract grammatical knowledge online processing.

Table 38

Reading Times of NSOC in Gender Mismatch Condition

NSCO gender match	*Wh*	*N1*	*said*	*the*	*N2*	*had*	*V-ed*	***Pron***	***Prep***	*Md1*	*Md2*	*N3*
Native controls	506	500	496	517	583	544	544	**691**	**724**	490	491	661
German												
Advanced	562	566	572	581	759	613	803	**832**	**770**	646	614	717
Intermediate	546	506	525	527	751	573	635	**550**	**546**	480	501	626
Korean												
Advanced	545	668	692	617	994	640	955	**1150**	**729**	573	530	652
Intermediate	512	646	592	720	1331	787	976	**926**	**688**	530	544	802

RM ANOVAs reveals the main effect of Congruency at the pronoun and at the post-pronoun, which means that the gender mismatch effect is observed at the pronoun or at the post-pronoun in the NSCO condition. Table 37 shows that a slow-down of 146ms at the pronoun is found in the control group, and it is spilled over into the post-pronoun. The gender mismatch is also found in the GA and KA group. In the GA group, a gender mismatch is found, which is demonstrated by a slow-down of 29ms at the pronoun. A gender mismatch is also found in the KA group; a slow-down of 195ms occurs at the pronoun.

However, the intermediate speakers do not slow down at the pronoun or at the post-pronoun. The data prove that the intermediate speakers are not involved in structural building during online processing. It seems that the intermediate speakers parse the SCO sentences as they do with the NSOC sentences.

Table 39

Reading Times of NSOC in Gender Match Condition

NSCO gender match	*Wh*	*N1*	*said*	*the*	*N2*	*had*	*V-ed*	***Pron***	***Prep***	*Md1*	*Md2*	*N3*
Native controls	472	539	543	500	591	529	534	**604**	**498**	488	486	676
German												
Advanced	601	632	624	617	811	760	742	**795**	**645**	641	620	672
Intermediate	569	747	609	536	701	539	667	**604**	**502**	539	506	625
Korean												
Advanced	515	736	735	641	776	649	898	**688**	**601**	543	517	655
Intermediate	581	885	764	648	896	645	947	**771**	**616**	664	560	733

In the NSCO with gender match, a slow-down with 70ms is observed at the pronoun in native control group. A slow-down with 53ms is found at the pronoun in GA group. The other groups show no slow-downs at the pronoun. The results from Table 36 and Table 37 will be compared to see whether gender mismatch arise in the NSCO condition. In efforts to find out gender mismatch effect in the NSCO condition, the area of interest in the gender match condition would be the region where no slow-downs are observed. Thus the post-pronoun region would be the one for the NC and GA group; for the KA group, it would be the pronoun region

Table 40

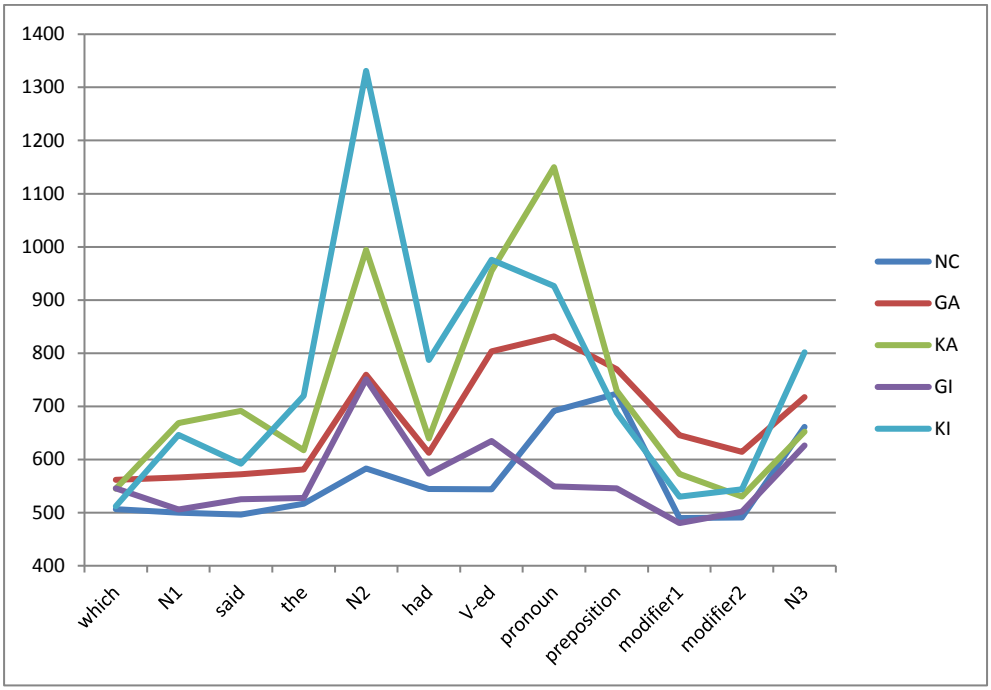
Comparison of the RTs at the Slow-down Region in the NSCO Condition

	Gender mismatch condition				Gender match condition			
	Slow-down at the pronoun				at the pronoun			
			95% CI				95% CI	
Group[a]	M	SD	LB	UB	M	SD	LB	UB
NC	691	304	540	842	498	79	459	538
GA	832	352	644	1019	645	181	549	741
KA	1150	510	785	1514	688	258	504	872

Note. CI = confidence interval; *LB* = lower bound; *UB* = upper bound. [a]NC = native control (n = 18); GA = German advanced (n = 16); KA = Korean advanced (n = 10).

As for the NC group, a significant difference is found between the two conditions. The mean RT for the gender mismatch condition (691ms) is not within the CI for the gender match condition [459, 538] and vice versa, indicating a gender mismatch in the NC group. In the GA group, a significant difference is found between the two conditions. The mean RT for the gender mismatch condition (832ms) is not within the CI for the gender match condition [549, 741] and not vice versa. In the KA group, a significant difference is observed between the two conditions. The mean RT for the gender mismatch condition (1150ms) is not within the CI for the gender match condition [504, 872] and vice versa, which suggests that there is a gender mismatch effect in the KA group.

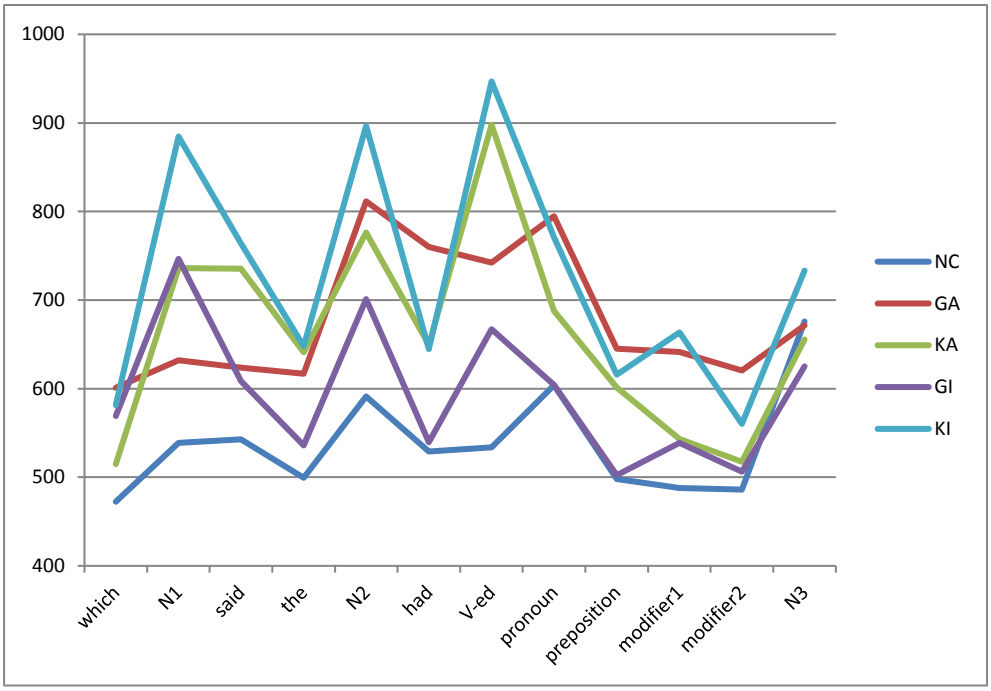
Figures 12–13 show the L2 groups' reading time patterns of NSCO questions graphically.



NC = Native controls, GA = German advanced, KA = Korean advanced,

GI = German intermediate, KI = Korean intermediate

Figure 12 Reading Times of NSCO in Gender Mismatch Condition



NC = Native controls, GA = German advanced, KA = Korean advanced,

GI = German intermediate, KI = Korean intermediate

Figure 13 Reading Times of NSCO in Gender Match Condition

4.3.5 Discussion

Let us recall our research questions and hypotheses before we discuss the finding of the current experiment.

(164) Research questions

a. Do L2 speakers utilise target syntactic knowledge to process strong crossover constraint online?

b. Does the L1 influence the process of strong crossover constraint online?

c. Does proficiency affect the process of strong crossover constraint online?

(165) Hypotheses

a. While the intermediate speakers and advanced Korean speakers will show gender mismatch effect in the NSCO conditions, they will also demonstrate gender mismatch effect in the SCO conditions due to the Q-projection flexibility. Therefore, they would show slow-downs at the pronoun or at the post-pronoun in the gender mismatch condition, but not for the gender match condition, regardless of structural distinction.

b. The advanced German speakers, on the other hand, will not show gender mismatch effect in the SCO conditions. Therefore, they would show slow-downs at the pronoun or at the post-pronoun in the SCO, gender match condition.

In general, the intermediate groups appear not to respect the SCO constraint at the alleged regions during online processing; it is likely that L2 proficiency affects processing SCO configurations. The intermediate groups do not show online sensitivity to crossover constraint on filler-gap dependencies. The hypothesis (165a) is then rejected. It seems that the intermediate group do make use of syntactic knowledge. They may be flexible with respect to Q-projection during online processing. However, their RTs at the embedded verb position imply that they do parse with wh-movement grammar. This is also manifested in

Experiment 2. Although intermediate speakers' grammar is not fully set for the target language, they are able to make use of the target grammar available from the input such as wh-Quantifier interaction. The findings from the online experiment may support such argument. As in Experiment 2, the intermediate speakers were not sensitive to strong crossover configuration, and as such their Q-projection is flexible; it is projected with the EPP in some occasion. Strong crossover might be an instance of such cases. This is what the Feature Reassembly Hypothesis assumes in L2 grammatical deployment. If we assume further wh-path for L2 acquisition is hierarchical, strong crossover will be located far away from the low proficiency learners. This is why the intermediate speakers do not make use of wh-movement grammar when parsing. Intermediate speakers may employ wh-movement grammar when parsing wh-quantifier interaction as they did in Experiment 2. We will see it shortly whether this is the case.

The advanced groups do show online sensitivity to strong crossover constraint on filler-gap dependencies. This is evidenced by the gender mismatch effect in the SCO and NSCO condition. Unfortunately, the CI comparison for the GA group does not reveal significant difference in the NSCO condition. Descriptively the difference is large; 187ms difference in RT would sufficient to support the gender mismatch effect in the NSCO condition.

The findings from Experiment 4 suggest that L2 speakers are able to abstract grammatical knowledge online. L1 has little influence online processing of the target languages. L2 speakers of wh-in-situ languages may experience more processing load when parsing; however, this does not affect their use of target grammar proper. It is therefore suggested that L2 processing is not fundamentally different from L1 processing – it involves deep processing.

4.4 Experiment 4: Processing weak crossover constraint

This experiment aims to investigate how L2 speakers associate the target syntactic representation of wh-movement online to the process of resolving wh-quantifier scope ambiguity. This ambiguity results from different LF representations (Aoun & Li, 1993; May, 1985), and these LF representations are subject to constraint by weak crossover (Chierchia,

1993). By examining how L2 speakers associate the different LF representations to analyse wh-quantifier scope ambiguity, this experiment makes an attempt to discover how and when wh-quantifier scope ambiguity is resolved by L2 syntactic representations during online processing. The processing routines applied in the resolution of wh-quantifier scope ambiguity will help determine whether L2 speakers make use of the target syntactic representation in the resolution of wh-quantifier scope ambiguity in English. In order to find out how L2 parsing constructs the LF representation during online processing, it is necessary to provide an appropriate context that induces a felicitous interpretation of the target structures since a particular interpretation of an ambiguous sentence is determined by the context given. This allows the parser to entertain its process of resolving scope ambiguity, associating the syntactic structures to the contexts. Previous processing research supports the idea as such – that is, the resolution of structural ambiguities is influenced by the interaction with the context (Altmann & Steedman, 1985; Crain & Steedman, 1985; Villalta, 2003; see also Anderson, 2004, for an opposite view on the role of context). The parsing mechanism behind this argument is that when multiple factors, such as syntax and context, compete with each other, processing difficulties arise in the resolution of the scope ambiguity. In this regard, another aim of this experiment is to examine how a given context guides the construction of LF representation during L2 processing. The following research questions are formulated:

(166) Do L2 speakers employ the target syntactic knowledge online to resolve wh-quantifier scope ambiguity?
(167) Does the context guide L2 speakers' parsing decision on the resolution of wh-quantifier scope ambiguity online?
(168) Does L1 influence the process of resolving wh-quantifier scope ambiguity online?
(169) Does proficiency affect the process of resolving wh-quantifier scope ambiguity online?

Based on Experiment 3, it is hypothesised that the advanced L2 speakers of English show target-like patterns in processing wh-quantifier scope ambiguity resolution. On the other hand, the intermediate speakers of English will behave differently from the advanced

speakers. Since their Q-projection is prone to be flexible non-target-like parsing will dominate their processing routines.

4.4.1 Participants

Four experimental groups participated in Experiment 4: 22 intermediate Korean speakers, 10 advanced Korean speakers, 12 intermediate German speakers, 19 advanced German speakers of English. Also, 19 native speakers of British English participated as a control group for comparison. The participants were the same as in Experiment 1.

4.4.2 Materials

A self-paced reading task, adopted from Villalta (2003), was designed to test the hypotheses. Similar to those in the WCO trials in Experiment 2, each experimental item comprised a question and a brief story with pictures and words. Each question was manipulated by the position of a quantifier and the position of a wh-extraction: WCO questions with object quantifiers and NWCO crossover questions with subject quantifiers. Since the NWCO question is ambiguous, the stories for NWCO questions were modified in terms of ambiguity: The stories favour both the single and pair-list answer equally as in Figure 6, and the stories support the single answer only as in Figure 14. For WCO questions, the stories support both the single and pair-list answer as in Figure 15. Eighteen target items were created: Six were WCO questions with ambiguous contexts, six were NWCO questions with ambiguous contexts, and six were NWCO questions with unambiguous questions. The target stimuli are exemplified in Figures (14)–(16). A full list of test items is provided in Appendix (4).

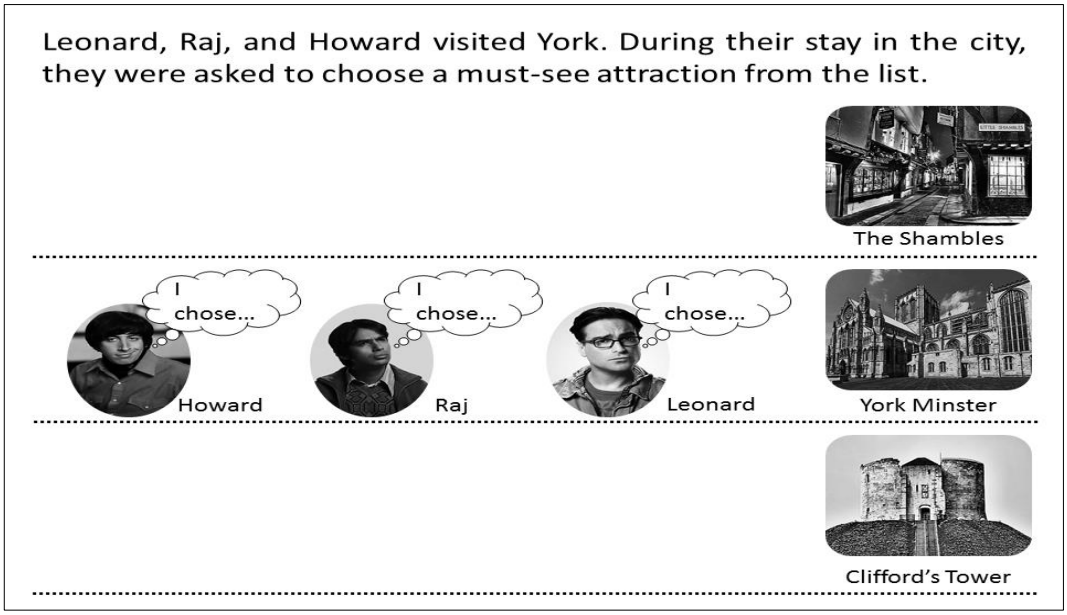


Figure 14 Unambiguous Context for NWCO Question

(170) NWCO question with single answer:

What did everyone say he chose for a must-see attraction?

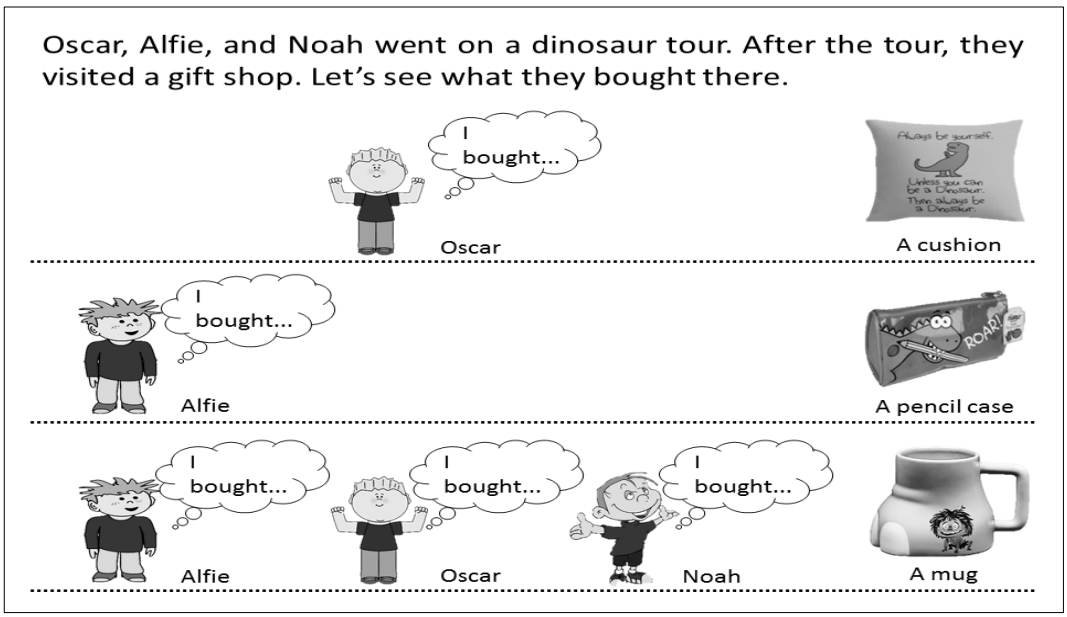


Figure 15 Ambiguous Context for NWCO Question

(171) NWCO question with pair-list answer:

What did everyone say he bought after the dinosaur tour?

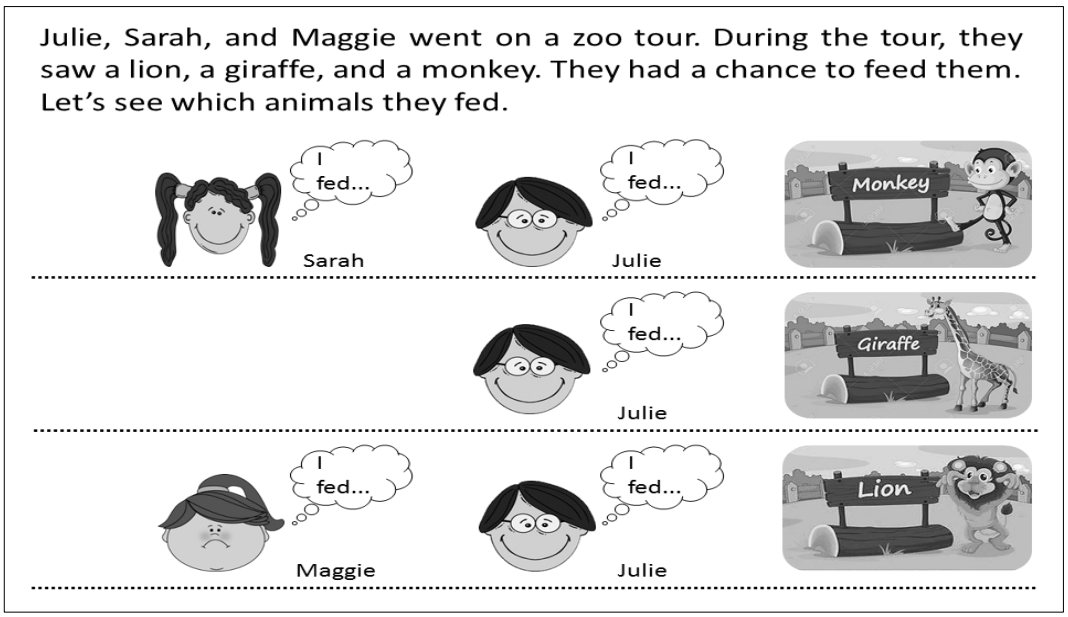


Figure 16 Ambiguous Context for WCO Question

(172) WCO question with both single and pair-list answer

Who said she fed every animal during the zoo tour?

The quantifier position was manipulated in order to find out L2 speakers' parsing strategies for wh-quantifier scope interactions online. Note that the context in each condition is ambiguous, allowing both the single and pair-list answer. It is the syntactic knowledge that plays a role in the resolution of wh-quantifier scope ambiguity during online processing. It is thus expected that a higher processing cost would be incurred in a NWCO question (172) than a WCO question (173). In (172), for instance, the wh-word enters into a scope relation with the quantifier, bearing at least two possible LF representations conflict within the given context. Upon encountering the embedded verb, the point where the wh-word takes part in the construction of LF representation, the parser could consider the two possible LF representations. After reanalysis or reordering of alternatives, the parser might retain one of the LF representations or both. Hence, processing difficulty would arise since the parser has to evaluate its initial analysis during comprehension. In (173), on the other hand, the wh-word partakes in a scope relation with the quantifier, forming only one possible LF representation that has the same order as the surface structure. The parser, that being so,

analyses the quantifiers one after the other as it encounters them. It is thus predicted that the processing cost would be lower than in the NWCO questions. If L2 speakers are aware of such a structural asymmetry, they would experience greater difficulties in processing NWCO questions than WCO questions. If not, similar processing patterns would be observed between WCO and NWCO questions. This consequently would indicate whether L2 speakers bring genuine wh-movement into play of the process of resolving wh-quantifier scope ambiguity during online processing.

The context for NWCO questions was controlled in order to see whether L2 speakers' parsing strategies are guided by the context in the resolution of wh-quantifier scope ambiguity. The processing mechanism behind this is that a wh-word must establish its antecedent in the previous discourse context, and then enter into a scope relation with the quantifier in order to be interpreted (Villalta, 2003). In Figure 14, for instance, the parser easily and clearly identifies a set of antecedents in the context, which results in lower processing cost during comprehension. In Figure 15, by contrast, a higher processing cost, putting an extra load on memory, would be predicted since the context contains more than one possible set of antecedents; the parser does not entertain its search for an antecedent post-haste in the context given. As a result, processing difficulties would be incurred, making the parser wrestle with the ambiguous context in the time course of wh-quantifier scope ambiguity resolution. Thus, when processing NWCO questions, higher reading times would be expected at or after the embedded verb position in the ambiguous context than the unambiguous context. If L2 speakers have constructed the right syntactic representation of wh-movement in English, there would be context effect on the processing of NWCO questions, showing higher reading times at or after the embedded verb in the ambiguous context than the unambiguous context. If not, there would be no context effect on the processing NWCO questions, displaying similar reading times at or after the embedded verb in both the ambiguous and unambiguous context.

4.4.3 Procedure

The experiment was run on a laptop PC, using PsychoPy (Pierce, 2007). Each trial began with a story, followed by a corresponding question or statement. Similar to the procedure in Experiment 3, each question or sentence was presented noncumulatively at the centre of

the screen. Participants read a sentence word-by-word, by pressing the space bar on the keyboard. Each time participants pressed the space bar, a new word appeared and simultaneously previous word disappeared from the screen. Participants were instructed to press the space bar at their own speed for comprehension. While participants read a sentence, the story remained on the screen. Participants could take a break between trials while performing the task. PsychoPy recorded the reading times for each word.

As in Experiment 3, half of the items, including the fillers, were presented with a yes/no comprehension question, asking about information of the story. Participants answered the questions, by pressing 1 (yes) or 0 (no). Participants were given no feedback about their responses. This was done to hold the attention of participants to the story and the meaning of the corresponding sentence and to avoid participants' pressing the space bar without thought and spontaneously. The experimental items were presented with the fillers in a quasi-random order. Before they undertook the task participants were given four practice items in order to familiarise them with the task. The experiment, including instructions and practice, took approximately fifteen to twenty-five minutes to complete. All participants were tested individually.

4.4.4 Results

Prior to data analysis, response times (RT) that were below 200ms or above 6000ms were removed. Furthermore, RTs that were 2.5 standard deviations above or below the group mean were excluded (mean response time ± two standard deviations). This affected less than 5.3% of the trial in each group. Participants were also screened based on the comprehension question scores. Participant whose comprehension question accuracy that was below 2 standard deviations from the mean were removed from data analysis (Kazanina et al. 2007). Due to outlying participant one native controls, and one intermediate Korean speaker were excluded. Thus data from 18 native controls, 17 German advanced, 10 Korean advanced, 12 German intermediate, and 21 Korean intermediate speakers entered into the data analysis. Table 40 presents comprehension question results by conditions.

Table 41

Mean Comprehension Question Accuracy

Group	WCO	NWCO_Unamb	NWCO_Amb	M	SD
NC	93%	100%	96%	96%	4
GA	96%	98%	84%	95%	6
GI	97%	94%	86%	94%	6
KA	100%	100%	87%	97%	4
KI	92%	95%	88%	93%	6

Note. NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22). WCO = weak crossover; NWCO_Unamb = non-weak crossover unambiguous context; NWCO_Amb = non-weak crossover ambiguous context.

The Repeated Measures (RM) ANOVAs conducted on the critical region and post critical region with Context (ambiguous, unambiguous) as within-subject variables and Group (English, German advanced, German intermediate, Korean advanced, Korean intermediate) as a between-subjects factor for each of the two regions of interest. The RM ANOVA shows a main effect of Context for the critical region, $F(1, 73) = 9.73$, $p = .003$. No interaction between Context and Group is found, $F(4\ 73) = 1.39$, $p = .246$. The RM ANOVA does not indicate between-subject effects for the critical region, $F(4, 73) = 2.24$, $p = .072$.

For the post-critical region, the RM ANOVA does not reveal a main effect of Context, $F(1, 73) = 1.55$, $p = .218$. There appears a two-way interaction between Context and Group, $F(4, 73) = 2.67$, $p = .039$. No between-subjects effects occur, $F(4, 73) = 1.61$, $p = .181$. Reading times at the critical pronoun region and post-critical region are boldfaced in Tables 41–42.

Table 42

Reading Times of NWCO in Unambiguous Context

	Wh	*did*	*Qu*	*say*	*Pron*	***V-ed***	***Prep***	*Mod1*	*Mod2*	*N*
Native controls	504	353	319	349	337	**380**	**395**	357	404	614
German										
Advanced	495	367	411	402	365	**416**	**427**	390	445	718
Intermediate	460	363	427	409	383	**422**	**419**	406	462	548
Korean										
Advanced	543	403	441	387	403	**481**	**462**	473	506	854
Intermediate	554	411	492	400	431	**459**	**526**	416	514	830

Table 43

Reading Times NWCO in Ambiguous Context

	Wh	*did*	*Qu*	*say*	*Pron*	***V-ed***	***Prep***	*Mod1*	*Mod2*	*N*
Native controls	464	344	359	358	380	**401**	**447**	390	482	1021
German										
Advanced	486	385	368	412	393	**435**	**473**	425	574	1370
Intermediate	574	413	416	429	433	**493**	**433**	381	617	946
Korean										
Advanced	619	396	422	454	498	**581**	**485**	422	775	1337
Intermediate	505	376	427	464	395	**482**	**480**	407	809	1074

At a first glance, it is hardly noticeable to find the main effect of Context on the critical and post-critical region in two sentence types. The main effect of Context indicates that the parser was facilitated at the critical and post-critical region by the context during online processing. Still it is not clear to observe an effect of context. In order to find out Context effect on reading, RTs from each of the group has been explored.

Table 44

Mean RTs at the Critical Region in (Un)ambiguous Context

	Unambiguous context				Ambiguous context			
			95% CI				95% CI	
Group	M	SD	LB	UB	M	SD	LB	UB
NC	380	119	321	439	401	129	337	465
GA	416	96	366	465	435	130	369	502
KA	481	202	337	626	581	219	425	738
GI	422	97	361	484	493	154	395	591
KI	460	118	406	513	482	157	410	554

Note. NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22). WCO = weak crossover; NWCO_Unamb = non-weak crossover unambiguous context; NWCO_Amb = non-weak crossover ambiguous context.

When the mean RTs are compared on the basis of the context types, CI comparisons do not reveal any significant difference between the conditions. At the critical region where scope ambiguity is resolved, all of the L2 groups tend to process the critical region more slowly when a contextual ambiguity arises along with the target question. We now move on to the post-critical region to see whether spillover effects incurred.

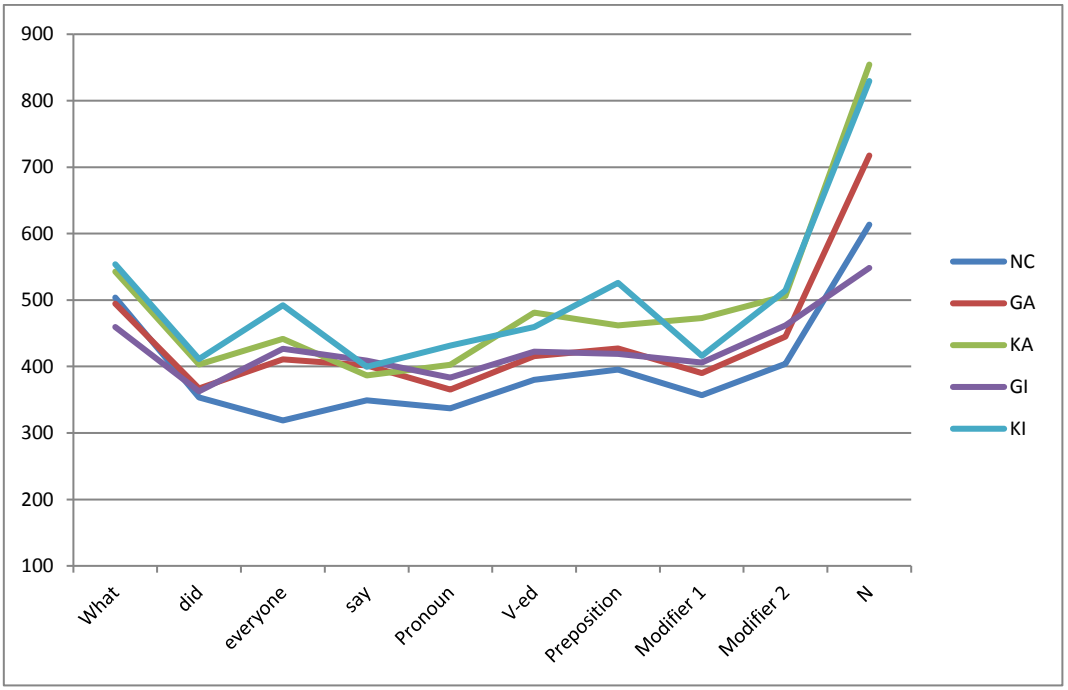
Table 45

Mean RTs at the Post-critical Region in (Un)ambiguous Context

	Unambiguous context				Ambiguous context			
			95% CI				95% CI	
Group	M	SD	LB	UB	M	SD	LB	UB
NC	395	102	344	446	447	167	364	530
GA	427	76	388	466	473	110	416	530
KA	462	63	417	506	485	134	390	582
GI	419	73	372	466	433	70	389	478
KI	526	179	444	607	480	137	417	542

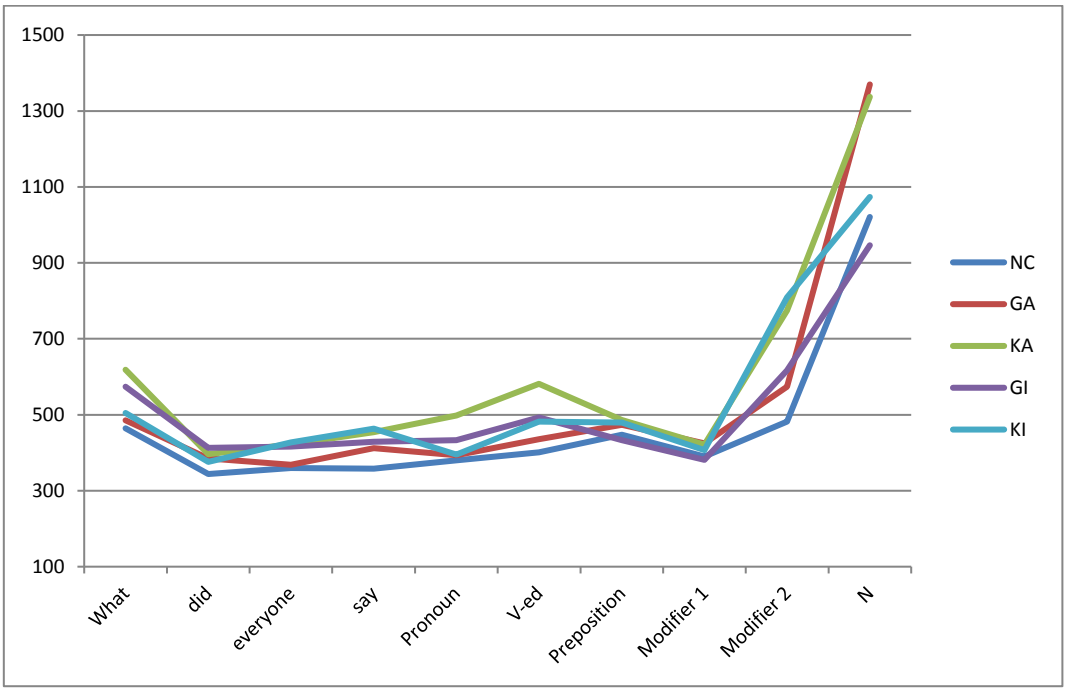
Note. NC = native control (n = 19); GA = German advanced (n = 17); GI = German intermediate (n = 12); KA = Korean advanced (n = 10); KI = Korean intermediate (n = 22). WCO = weak crossover; NWCO_Unamb = non-weak crossover unambiguous context; NWCO_Amb = non-weak crossover ambiguous context.

At the post-critical region, reading times were not facilitated by the context. CI comparison does not yield any differences between the context types. The context does not seem to guide L2 speakers' parsing decision at the post-critical region. Nonetheless, we observe that RTs differ when the ambiguity arise from the context. RTs slowed down when the structural ambiguities are influenced by the interaction with context. Each of the groups has a unique parsing routine to resolve scope ambiguity. In the NC and GA group, for example, the parsing routine appears at the post-critical region. The parsing routine occurs at the critical region in the GA, KI, and KA group. We observe the end-of sentence warp-up effect at the sentence final region *N* (Just, Carpenter, & Wooley, 1982). L2 groups' reading time patterns are graphically depicted in Figures 17–18.



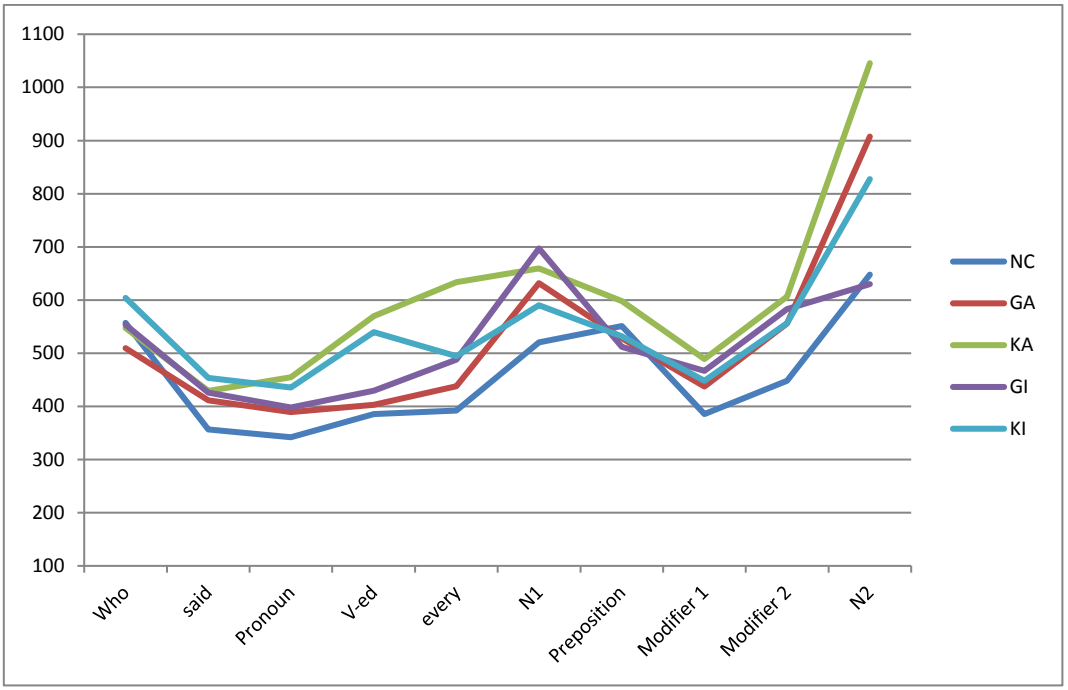
NC = Native controls, GA = German advanced, KA= Korean advanced,
GI = German intermediate, KI = Korean intermediate.

Figure 17 Self-paced Reading of NWCO in Unambiguous Context



NS = Native controls, GADV = German advanced, KADV = Korean advanced,
GINT = German intermediate, KINT = Korean intermediate

Figure 18 Self-paced Reading of NWCO in Ambiguous Context



NS = Native controls, GADV = German advanced, KADV = Korean advanced,

GINT = German intermediate, KINT = Korean intermediate

Figure 19 Self-paced Reading of WCO in Ambiguous Context

We now move on to the results from self-paced reading of WCO constraint. L2 groups' reading time patterns are graphically depicted in Figure 19.The Repeated Measures (RM) ANOVAs conducted on the critical region and post critical region with Constraint (WCO, NWCO) as within-subject variables and Group (English, German advanced, German intermediate, Korean advanced, Korean intermediate) as a between-subjects factor. The RM ANOVA does not demonstrate a main effect of Constraint for the critical region, $F(1, 73) = .303$, $p = .583$. No interaction between Constraint and Group was found, $F(4, 73) = 4.29$, $p = .787$. The RM ANOVA yields between-subjects effects for the critical region, $F(4, 73) = 4.471 = .003$. For the post-critical region, the RM ANOVA shows a main effect of Constraint, $F(1, 73) = 46.643$, $p = .000$. No interaction is observed between Constraint and Group, $F(4, 73) = 2.152$, $p = .083$. Between-subjects effects do not occur, $F(4, 73) = .746$, $p = .564$.

Reading times at the critical pronoun region and post-critical region are boldfaced in Table 45. The regions containing *every* and *N1* are assumed to be critical regions of interest by the assumption that scope relation happen when encountering a quantifier or a spillover region. Table 40 is repeated here as Table 46 for comparison.

Table 46

Reading Times of WCO in Ambiguous Context

	Wh	*said*	*Pron*	*V-ed*	***every***	***N1***	*Prep*	*Mod1*	*Mod2*	*N2*
Native controls	557	356	342	385	**392**	**520**	551	385	448	648
German										
Advanced	509	411	389	403	**438**	**632**	528	437	556	908
Intermediate	554	426	398	430	**488**	**697**	512	467	583	630
Korean										
Advanced	548	429	454	570	**633**	**660**	598	489	607	1046
Intermediate	604	454	435	540	**494**	**590**	532	448	557	827

Table 47

Reading Times of NWCO in Ambiguous Context

	Wh	*did*	*Qu*	*say*	*Pron*	***V-ed***	***Prep***	*Mod1*	*Mod2*	*N*
Native controls	464	344	359	358	380	**401**	**447**	390	482	1021
German										
Advanced	486	385	368	412	393	**435**	**473**	425	574	1370
Intermediate	574	413	416	429	433	**493**	**433**	381	617	946
Korean										
Advanced	619	396	422	454	498	**581**	**485**	422	775	1337
Intermediate	505	376	427	464	395	**482**	**480**	407	809	1074

The data pattern indicates that each of the groups shares the same parsing routine when encountering the WCO questions, which differs from the NWCO questions. The end-of-sentence wrap-up effect is observed at the sentence final region *N* in the NWCO and *N2* in

the WCO. The wrap-up effect on the NWCO appears to be larger than the WCO, due to the scope ambiguity. We now compare the mean RTs between the NWCO and WCO.

Table 48

Comparison Mean RTs at the Post-critical Region in NWCO and WCO

	NWCO				WCO			
			95% CI				95% CI	
Group	M	SD	LB	UB	M	SD	LB	UB
NC	447	167	364	530	520	214	414	627
GA	473	110	416	530	632	198	530	733
KA	485	134	390	582	660	243	486	833
GI	433	70	389	478	697	279	520	874
KI	480	137	417	542	590	225	488	692

The WCO read more slowly than the NWCO. CI comparison yields a significant difference between the NWCO and WCO in the GA group; the mean RT for the NWCO is not within the CI for the WCO [530, 733] and vice versa. In the KA group, the mean RT for the NWCO is not within the CI for the WCO [486, 833] and the other way around, suggesting that the difference is significant. In the GI group, the mean RT for the WCO is not within the CI for the WCO [520, 874] and conversely, indicating that the difference is significant. A significant difference is found in the KI group; the mean RT for the WCO is not within the CI for the WCO [488, 692] and vice versa. In the NC group, no significant difference is found between the NWCO and WCO. It turns out that L2 speakers have online sensitivity to weak crossover constraint, which blocks a c-command relationship between the distributive quantifier and an argument trace of the wh-word (Chiercia, 1993). The WCO is a mechanism that blocks a pair-list reading and applies at LF. If we view the WCO as a mechanism that minimises differences between the surface strings and LF, L2 speakers' processing of the WOC may be overloaded with minimising possible c-command relations between the quantifier and the

wh-trace. In fact, we have observed that both intermediate and advanced L2 speakers are able to resolve wh-quantifier scope ambiguity in Experiment 2. Interestingly, when it comes to the strong crossover, L2 speakers were not as good as WCO cases.

4.4.5 Discussion

Let us recall our research questions and hypotheses before we discuss the finding of the current experiment.

(173) Research questions

a. Do L2 speakers employ the target syntactic knowledge online to resolve wh-quantifier scope ambiguity?
b. Does the context guide L2 speakers' parsing decision on the resolution of wh-quantifier scope ambiguity online?
c. Does L1 influence the process of resolving wh-quantifier scope ambiguity online?
d. Does proficiency affect the process of resolving wh-quantifier scope ambiguity online?

(174) Hypothesis

Based on Experiment 3, it is hypothesised that the advanced L2 speakers of English show target-like patterns in processing wh-quantifier scope ambiguity resolution. On the other hand, the intermediate speakers of English will behave differently from the advanced speakers. Since their Q-projection is prone to be flexible, non-target-like parsing will dominate their processing routines.

The findings of Experiment 4 suggest that all of the L2 groups have no processing difficulties in parsing the WCO questions; their processing strategies pattern with the control group. In addition to this, L2 speakers' parsing is facilitated by the given context; that is, L2 speakers are able to adjust their parsing strategies according to the context. Furthermore, L2

speakers' processing patterns of the WCO and NWCO questions provide the evidence that they have acquired target grammar that is applicable to the WCO/NWCO configurations. L2 speakers, that being so, possess target-like LF representations. The findings explain their target-like interpretation of the WCO questions in Experiment 2. However, L2 speakers are prone to be flexible; we do not know yet how flexible they are. We know that at least crossover phenomena in L2 become flexible.

The hypothesis (175) does not hold. It is suggested that L2 proficiency, at least in this experiment, does not influence processing of wh-quantifier scope interaction. The role of L1 and L2 proficiency are kept to be minimum as far as the WCO concerned.

Chapter 5

Concluding Remarks

We started out this thesis with Q-particle. By showing a Q-particle is a universal property for any given language, we, along with Cable (2010), were able to achieve a unique typological characterisation of wh-questions between three languages: English, German, and Korean. We undertook discussion of current view on wh-question formation and provided a Q-based model of wh-question formation. I argued that wh-question formation is irrelevant to language specific feature specification; rather languages – at least those three languages – enter into the derivation with the same Q-feature specification. Thus, learning problems are reduced to Q-particles' behaviours, that is, whether they are adjoined to a wh-word or take it as its sister. In this way languages employ the same algorithm for wh-question formation – moving a Q.

And we had four groups of L2 speakers in a series of experiments: German and Korean speakers of English. In Chapter 2, we saw how L2 speakers demonstrated their knowledge of wh-movement in English and made predictions based on current two competing models of L2 acquisition: the Interpretability Hypothesis and the Feature Reassembly Hypothesis. The findings may support the view laid out in the feature reassembly model. The L2 speakers demonstrated their linguistic abilities although their performance was somewhat deviant. I considered somewhat deviant nature of their interlanguage grammars due to processing difficulties. Wh-questions they encountered by and large were complex to entertain. Lower proficiency speakers of English too showed target-like knowledge of wh-movement in English. It was suggested that L2 initial state is identical regardless of L2 speakers' L1s. That was valuable to reconsider the initial state of L2 grammar; they do not rely solely on their L1s. And this has an implication on the issue of L1 transfer. With respect to this, I assumed that L2 grammar may be prone to flexible in the process of acquisition. In terms of Q-particle, I suggested that L2 speakers sometimes project Q without an EPP, which is essential in the formation of wh-question in English. Such flexibility may affect L2 competence and performance as well.

Leaving this issue open, we moved on to more complex ones that require more than movement. Those were so-called crossover phenomena. In Chapter 3, we were keen on whether L2 speakers were able to distinguish allowed and disallowed interpretation constrained by movement of wh-words across pronouns or quantifiers. This time I assumed that crossover-like properties would be problematic for the intermediate speakers, but not for the advanced speakers. I further assumed that L2 interpretive knowledge may be affected by the parsing difficulties. Despite lack of input from environment they were exposed to, again they well demonstrated target-like interpretation strategies. L2 speakers' judgement patterns varied depending on the structures they encountered. For example, high acceptance of coreference interpretation (i.e., non-strong crossover) decreased when L2 speakers were faced with a structure that does not induce coreference interpretation (i.e., strong crossover). I thus suggested that L2 speakers have an immediate access to phenomenon at the syntax-semantics interface; rather, parsing difficulties intervened in their performance. On the basis of their judgement algorithm, it was suggested that L2 speakers have a target-like syntactic representation, which in turn guides them to the right direction – under the guidance of UG.

So I decided to examine whether L2 speakers' judgement on the target structures is disrupted by processing difficulties. In Chapter 4, L2 speakers were invited to a self-paced reading task, asking L2 speakers to read one word at time so that we are able to see how they build a target structure online. At first, lower proficiency L2 speakers appeared not to respect a structural constraint. However, higher proficiency L2 speakers demonstrated online sensitivity to the strong crossover constraint on filler-gap dependencies. Even though lower proficiency L2 speakers did not show online sensitivity to the strong crossover constraint, they demonstrated target-like sensitivity to the weak crossover constraint in the subsequent experiment. From the findings, it is suggested that L2 processing is not fundamentally different from L1 processing, that is, it involves deep processing.

It is time to answer the general research questions that I put forward in the introductory chapter:

- Do L2 speakers show divergence in L2 grammars distinct from their L1?

L2 data from Experiment 1-2 provide a negative answer to the question, supporting the view that L2 grammars are not fundamentally different from the L1 (Schwartz & Sprouse, 1998; Ladiere, 2009). The data suggest that L2 linguistic behaviour differs quantitatively, but not qualitatively. That is to say, L2 grammars are ultimately acquirable and systematic; L2 speakers' judgement patterns are not random, which conveys the implication for the involvement of UG in L2 acquisition.

- Does the divergence in L2 grammars force shallow processing?

  L2 data from Experiment 3-4 provide a negative answer to the question, supporting the view that L2 grammars in fact involve deep processing (Dekydtspotter et al., 2006). L2 speakers demonstrated target-like online sensitivity to crossover constraints on filler-gap dependencies; L2 processing differs quantitatively, but not qualitatively.

References

Abels, K. (2003). *Successive-cyclicity, anti-locality, and adposition stranding*. Doctoral thesis. University of Connecticut.

Adger, D. & Svenonius, P. (2011). Features in minimalist syntax. In C. Boeckx (Ed.), *The oxford handbook of minimalist syntax* (pp. 27–51). Oxford: Oxford University Press.

Aldwayan, S., Fiorentino, R., & Gabriele, A. (2010). Evidence of syntactic constraints in the processing of wh-movement: A study of Najdi Arabic learners of English. In B. Van Patten & J. Jegerski (Eds.), *Research in second language processing and parsing* (pp. 65–86). Amsterdam: John Benjamins B.V.

Alexiadou, A. & Anagnostopoulou, E. (1998). Parametrizing Agr: Word order, V-movement and EPP-checking. *Natural Language and Linguistic Theory*, *16*, 491–539.

Altmann, G. T. M. & Steedman, M. (1988). Interaction with context during human sentence processing. *Cognition*, *30*, 191–238.

Aoun, J. & Li, Y-H. A. (1993). *Syntax of scope*. Cambridge, MA: MIT Press.

Baker, C. L. (1970). Notes on the description of English questions. *Foundations of Language*, *6*, 197–219.

Baker, C. M. (2003). *Lexical categories: Verbs, nouns and adjectives*. Cambridge: Cambridge University Press.

Beck, S. & Gergel, R. (2014). *Contrasting English and German grammar: An introduction to syntax and semantics*. Berlin: De Gruyter Mouton.

Bhatt, R. & Yoon, J. (1991). On the composition of COMP and parameters of V2. In D. Bates (Ed.), *Proceedings of the 10th West Coast Conference on Formal Linguistics* (pp. 41–52). Stanford: CSLI Publications.

Biskup, P. (2009). *The phase model and adverbials*. Doctoral thesis. University of Leipzig.

Bley-Vroman, R. (1990). The logical problem of foreign language learning. *Linguistic Analysis*, *20*, 3–49.

Bley-Vroman, R., Felix, S., & Ioup, G. (1988). The accessibility of Universal Grammar in adult language learning. *Second Language Research*, *4*, 1–32.

Boeckx, C. (2008). *Understanding minimalist syntax: Lessons from locality in long-distance dependencies*. Malden, MA: Blackwell.

Boeckx, C. & Grohmann, K. (2007). Remark: Putting phases in perspective. *Syntax*, *10*(2), 4–22.

Bošković, Ž. (2005). On the Locality of left branch extraction and the structure of NP. *Studia Linguistica*, *59*, 1–45.

Bošković, Ž. (2007). On the locality and motivation of move and agree: An even more minimal theory. *Linguistic Inquiry*, *38*, 589–644.

Bošković, Ž. (2013). Phases beyond clauses. In L. Schürcks, A. Giannakidou & U. Etxeberria (Eds.), *The nominal structure in Slavic and beyond* (pp. 75–128). Berlin: De Gruyter.

Bowers, J. (1993). The syntax of predication. *Linguistic Inquiry*, *24*, 591–656.

Bresnan, J. (1972). *Theory of complementation in English syntax*. Dotoral thesis. Massachusetts Institute of Technology.

Bruening, B. (2007). Wh-in-situ does not correlate with wh-indefinites or question particles. *Linguistic Inquiry*, *38*(1), 139–166.

Büring, D. (2004). Crossover situations. *Natural Language Semantics*, *12*, 23–62.

Büring, D. (2005). *Binding theory*. Cambridge: Cambridge University Press.

Cable, S. (2007). *The grammar of Q: Q-particles and the nature of wh-fronting, as revealed by the wh-questions of Tlingit*. Doctoral thesis. Massachusetts Institute of Technology.

Cable, S. (2010). *The grammar of Q: Q-particles, wh-movement, and pied-piping*. Oxford: Oxford University Press.

Caponigro, I. (2003). *Free not to ask: On the semantics of free relatives and wh-words cross-linguistically*. Doctoral thesis. University of California, Los Angeles.

Cheng, L. L.-S. (1991). *On the typology of wh-questions*. Doctoral thesis. Massachusetts Institute of Technology.

Cheng, L. L.-S. & Rooryck, J. (2000). Licensing wh-in situ. *Syntax*, *3*, 1–19.

Chierchia, G. (1993). Questions with quantifiers. *Natural Language Semantics*, *1*, 181–234.

Cho, J. H. (1994). *Scrambling in Korean: Crossover, reconstruction, and binding thoery*. Doctoral thesis. University of Connecticut

Choe, H. S. (1994). Syntactic Wh-movement in Korean and Licensing. In Y. Kim-Renaud (Ed.), *Theoretical issues in Korean linguistics*. Stanford, CA: Center for the Study of Language and Information.

Choe, J. H. (2005). Structures and semantic interpretations of Korean universal quantifier construction. *Hankul*, *267*, 89–118.

Choe, J. W. (1987). LF movement and pied-piping. *Linguistic Inquiry*, *18*, 348–353.

Choi, M. H. (2009). *The acquisition of wh-in-situ constructions in second language acquisition*. Doctoral thesis. Georgetown University.

Choi, Y. S. (2003). QP and wh-scope interaction: How questions are answered. *Studies in Generative Grammar*, *13*(1), 61–76.

Choi, Y. S. (2002). Against LF pied-piping. *Language and Information*, *6*(2), 1–15.

Choi, Y. S. (2004). Reconstruction, weak crossover, and binding in Korean scrambling: Some theoretical implications. *The Linguistic Association of Korean Journal*, *12*(2), 185–206

Chomsky, N. (1973). Conditions on transformations. In S. Anderson & P. Kiparsky (Eds.), *A festschrift for Morris Halle* (pp. 232–86). New York: Holt, Rinehart, and Winston.

Chomsky, N. 1977. On wh-movement. In P. Culicover, T. Wasow & A. Akmajian (Eds.), *Formal syntax* (pp. 71–132). New York: Academic Press.

Chomsky, N. (1981). *Lectures on government and binding*. Dordrecht: Foris.

Chomsky, N. (1986). *Barriers*. Cambridge, MA: MIT Press.

Chomsky, N. (1995). *The minimalist program. Cambridge*, MA: MIT Press.

Chomsky, N. (2000). Minimalist inquiries. In R. Martin & D. Michaels & J. Uriagereka (Eds.), *Step by step: Essays on minimalist syntax in honor of Howard Lasnik* (pp. 89–155). Cambridge, MA: MIT Press.

Chomsky, N. (2001). Derivation by phase. In M. J. Kenstowicz (Ed.), *Ken Hale: A life in Language* (pp. 1–52). Cambridge, MA: MIT Press.

Chomsky, N. (2004). Beyond explanatory adequacy. In A. Belletti (Ed.), *Structures and beyond* (pp. 104–131). Oxford: Oxford University Press.

Chomsky, N. (2007). Approaching UG from below. In U. Sauerland & H. M. Gärtner (Eds.), *interfaces + recursion = language?* (pp. 1–30). Berlin: Mouton De Gruyter.

Chomsky, N. (2008). On phases. In, R. Freidin, C. P. Otero & M. L. Zubizarreta (Eds.), *Foundational Issues in linguistic theory* (PP. 133–166). Cambridge, MA: MIT Press.

Chomsky, N. & Lasnik, H. (1993). Principles and parameters theory. In J. Jacobs, A. von Stechow, W. Sternefeld, & T. Vennemann (Eds.), *Syntax: An international handbook of contemporary research* (pp. 506–569). Berlin: de Gruyter.

Chung, D. H. (1996). *On the representation of Q and Q-dependencies*. Doctoral thesis, University of Southern California.

Chung, S. (1994). Wh-agreement and referentiality in Chamorro. *Linguistic Inquiry*, *25*, 1–44.

Citko, B. (2014). *Phase theory: An introduction*. Cambridge: Cambridge University Press.

Clahsen, H. & Muysken, P. (1986). The availability of Universal Grammar to adult and child learners: A study of the acquisition of German word order. *Second Language Research*, *2*, 93–119.

Clahsen, H. & Muysken, P. (1989). The UG paradox in L2 acquisition. *Second Language Research*, *5*, 1–29.

Clahsen, H. & Felser, C. (2006). Grammatical processing in language learners. *Applied Psycholinguistics*, *27*, 3–42.

Conroy, A., Takahashi, E., Lidz, J., & Phillips, C. (2009). Equal treatment for all antecedents: How children succeed with Principle B. *Linguistic Inquiry*, *40*, 446–486.

Cole, Peter. & Hermon, G. (1998). The typology of wh-movement: wh-questions in Malay. *Syntax*, *1*, 221–258.

Crain, S. & Steedman, M. (1985). On not being led up the garden path: The use of context by the psychological parser. In D. Dowty, L. Karttunnen, & A. Zwicky (Eds.), *Natural language parsing*. Cambridge: Cambridge University Press.

Crain, S. & Thornton, R. (1998). *Investigations in universal grammar: A guide to experiments on the acquisition of syntax*. Cambridge, MA: MIT Press.

Culicover, P. & Jackendoff, R. (1995). Something else for the binding theory. *Linguistic Inquiry*, *26*, 249–275.

Dekydtspotter, L, Sprouse, R., & Swanson, K. (2001). Reflexes of the mental architecture insecond language acquisition: The interpretation of discontinuous combien extractions in English-French interlanguage. *Language Acquisition*, *9*, 175–227.

Dekydtspotter, L., Schwartz, B., & Sprouse, R. (2006). The comparative fallacy in L2 processing research. In M. G. O'Brien, C. Shea, & J. Archibald (Eds.), *Proceedings of the 8th Generative Approaches to Second Language Acquisition Conference* (pp. 33–40). Somerville, MA: Cascadilla Proceedings Project.

Dryer, M. (2004). Typological database. [blog post]. Retrieved from linguistics.buffalo.edu/people/faculty/dryer/dryer/database.

Epstein, S. D. & Seely, T. D. (2002). Rule applications as cycles in a level-free syntax. In S. D. Epstein & T. D. Seely (Eds.), *Derivation and explanation in the minimalist program* (pp. 65–89) Oxford: Blackwell.

Felser, C. (2004). Wh-copying, phases, and successive cyclicity. *Lingua*, *114*(5), 543–574.

Fox, D. (1999). Reconstruction, binding theory, and the interpretation of chains. *Linguistic Inquiry*, *30*, 157–196.

Fox, D. (2000). *Economy and semantic interpretation*. Cambridge, MA: The MIT Press.

Frazier, M., Ackerman, L., Baumann, P., Potter, D., & Yoshida, M. (2015). Wh-filler-gap dependency formation guides reflexive antecedent search. *Frontiers in Psychology*, *6*, 1504. http://doi.org/10.3389/fpsyg.2015.01504

Gallego, Á. (2010). *Phase theory*. Amsterdam and Philadelphia: John Benjamins.

Gordon, P. (1996). The truth-value judgment task. In D. McDaniel, C. McKee, & H. Cairns (Eds.), *Methods for assessing children's syntax* (pp. 211–232). Cambridge, MA: MIT Press.

Hagstrom, P. (1998). *Decomposing questions*. Doctoral thesis. Massachusetts Institute of Technology.

Hegarty, M. (2005). *A feature-based syntax of functional categories: The structure, acquisition, and specific impairment of functional systems*. New York: Mouton de Gruyter.

Kim, K. M. & Han, J. H. (2016) Inter-speaker variation in Korean pronouns. In P. Grosz & P. Patel (Eds.), *The impact of pronominal form on interpretation: Studies in generative grammar series* (pp. 347–372). Berlin: De Gruyter Mouton.

Haspelmath, M (1997). *Indefinite pronouns*. Oxford: Oxford University Press.

Hawkins, J. A. (1999). Processing complexity and filler-gap dependencies across grammars. *Language 75*(2), 244–285.

Hawkins, R. (2001). The theoretical significance of universal grammar in SLA. *Second Language Research*, *17*(4), 345–367.

Hawkins, R. (2005). Revisiting wh-movement: The availability of an uninterpretable [wh] feature in interlanguage grammars. In L. Dekydtspotter et al. (Eds.), *Proceedings of the 7th Generative Approaches to Second Language Acquisition Conference* (pp. 124–137). Somerville, MA: Cascadilla Proceedings Project

Hawkins, R. & Hattori, H. (2006). Interpretation of English multiple wh-questions by Japanese speakers: A missing uninterpretable feature account. *Second Language Research*, *22*, 269–301.

Heim, I. (1982). *The semantics of definite and indefinite noun phrases*. Doctoral thesis, University of Massachusetts, Amherst.

Heinat, F. (2008). *Probes, pronouns and binding in the minimalist program*. Saarbrücken: VDM Verlag.

Henry, A. (1995). *Belfast English and standard English: Dialect variation and parameter setting*. Oxford: Oxford University Press

Hicks, G. (2009). *The derivation of anaphoric relations*. Amsterdam: John Benjamins.

Higginbotham, J. (1983). Logical form, binding, and nominals, *Linguistic Inquiry*, *14*, 395–420.

Hong, S. S. (1985). *A and A' binding in Korean and English: Government-binding parameters*. Doctoral thesis. University of Connecticut.

Hong, S. H. (2005). *Aspects of the syntax of wh-questions in English and Korean*. Doctoral thesis, University of Essex.

Hornstein, N. (2009). *A theory of syntax. Cambridge*: Cambridge University Press.

Huh, C. G. (2011). The Grammar of the particle 'inka' in Korean. *Woorimal*, *28*, 99–128.

Jegerski, J. (2012). The processing of temporary subject-object ambiguities in native and near-native Mexican Spanish. *Bilingualism: Language and Cognition*, *15*(4), 721–735.

Joo, S. Y. (1989). *A cross-linguistic approach to quantification in syntax*. Doctoral thesis, University of Wisconsin, Madison.

Juffs, A. (2006). Grammar and parsing and transition theory. *Applied Psycholinguistics*, *27*, 69–71.

Jung, Y. J (1992) *A restrictive theory of functional categories and their parametric variation*. Doctoral thesis. University of Washington

Kang, M. Y. (1988). *Topics in Korean syntax: Phrase structure, variable binding, and movement*. Doctoral thesis. Massachusetts Institute of Technology.

Kang, N. K. (2000). *Reflexives and the linking theory in universal grammar*. Doctoral thesis. University of Oxford.

Kazanina, N., Lau, Ellen., Lieberman, M., Yoshida, M., & Phillips, C. (2007). The effect of syntactic constraints on the processing of backwards anaphora. *Journal of Memory and Language*, *56*, 384–409.

Katz, J. & Postal, P. (1964). *An integrated theory of linguistic descriptions*. Cambridge, MA: MIT Press.

Kennison, S. M. & Trofe, J. L. (2003). Comprehending pronouns: A role for word-specific gender stereotype information. *Journal of Psycholinguistic Research*, *32*, 355–378

Kim, A. R. (2000). Korean wh-phrases void of operator. *Japanese/Korean Linguistics*, *9*, 311–324.

Kim, S. W. (1989). Wh-Phrases in Korean and Japanese are QPs. *MIT Working Papers in Linguistics*, *11*, 119–138.

Kim, Y. H. (2006). Q-particles vs. I-particles: Licensors of the question and the indefinite wh-words. *Studies in Generative Grammar*, *16*(3), 461–490.

Kishimoto, H. (2005). Wh-in-situ and movement in Sinhala questions. *Natural Language & Linguistic Theory*, *23*, 1–51.

Kim, Y. H. (2001). Wh-agree vs. wh-licensing. *Studies in Generative Grammar*, *11*, 97–150.

Kim, K. S. (2003). QR and minimalism. *Studies in Modern Grammar*, *31*, 47–69.

Koak, H. S. (2008). A morpho-syntactic approach to pronominal binding. *University of Pennsylvania Working Papers in Linguistics*, *14*(1), 227–240.

Koopman, H. & D. Sportiche. (1982). Variables and the bijection principle. *Linguistic Review*, *2*, 139–160.

Kratzer, A. & Shimoyama, J. (2002). Indeterminate pronouns: The view from Japanese. [Manuscript]. Retrived from http://www.semanticsarchive.net

Kush, D. (2013). *Respecting relations: Memory access and antecedent retrieval in incremental sentence processing*. Doctoral thesis. University of Maryland, College Park.

Kwon, M. B. (2007). Quantifier scope ambiguity and minimalist program. *Journal of Language Science*, *14*(2), 1–21.

Lardiere, D. (2009). Some thoughts on the contrastive analysis of features in second language acquisition. *Second Language Research*, *25*, 173–227.

Lahne, A. (2008). *Where there is fire there is smoke: Local modelling of successive-cyclic movement*. Doctoral thesis. University of Leipzig.

Lasnik, H. (2001). Subjects, objects, and the EPP. In W. Davies & S. Dubinsky (Eds.), *Objects and other subjects* (pp. 103–121). Dordrecht: Kluwer.

Lasnik, H. & J. Uriagereka. (1988). *A course in GB syntax: Lectures on binding and empty categories*. Cambridge, MA: MIT Press.

Lasnik, H. & Stowell, T. (1991). Weakest crossover. *Linguistic Inquiry*, *22*, 687–720.

Lason-Hall, J. & Plonsky, L. (2015). Reporting and interpreting quantitiative research findings: What gets reported and recommendations for the field. *Language Learning*, *65*(1), 127–157.

Lee, H. R. (2006). A Study on scrambling in Korean: The minimalist approach. *Studies in Generative Grammar*, *16*(3), 425–460

Lee H. R. (2009). Wh-phrases and the left periphery. *Studies in Generative Grammar*, *19*(4), 495–503.

Lee. J. C. (2006). Wh-islands and additional wh-effects. *Studies in Modern Grammar*, *43*(1)–31.

Lee, Y. S. (1993). *Scrambling as case driven obligatory movement*. Doctoral thesis. University of Pennsylvania.

Li, X. (1998). Adult L2 accessibility to UG: An issue revisited. In S. Flynn, G. Martohardjono & W. O'Neill (Eds.), *The generative study of second language acquisition* (pp. 89-110). Mahwah, NJ: Erlbaum.

Marinis, T., Roberts, L., Felser, C., & Clahsen, H. (2005). Gaps in second language sentence processing. *Studies in Second Language Acquisition*, *27*, 53–78.

Marsden, H. (2004). *Quantifier scope in non-native Japanese: A comparative interlanguage study of Chinese, English, and Korean-speaking learners*. Doctoral thesis. University of Durham.

Marsden, H. (2008). Pair-list readings in Korean-Japanese, Chinese-Japanese, and English-Japanese interlanguage. *Second Language Research*, *24*(2), 189–226.

Martohardjono, G. (1993). *Wh-movement in the acquisition of a second language: A cross-linguistic study of three languages with and without movement*. Doctoral thesis. Cornell University.

May, R. (1985). *Logical form: Its structure and derivation*. Cambridge, MA: MIT Press.

McCloskey, J. (2002). Resumption, successive cyclicity, and the locality of operations. In S. D. Epstein & T. D. Seely (Eds.), *Derivation and explanation in the minimalist program* (pp. 184–226). Oxford: Blackwell

McDaniel, D. (1989). Partial and multiple wh-movement. *Natural Language and Linguistic Theory*, *7*(4), 565–604.

Mitchell, D. C. (1984). An evaluation of subject-paced reading tasks and other methods of investigating immediate processes in reading. In D. E. Kieras & M. A. Just (Eds.), *New methods in reading comprehension research*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Miyagawa, S. (2001). The EPP, scrambling, and wh-in-situ. In Kenstowicz. M (Ed.), *Ken Hale: A life in language* (pp. 293–338). Cambridge, MA: MIT Press.

Montalbetti, M. M. (1984). *After binding: On the interpretation of pronouns*. Doctoral thesis. Massachusetts Institute of Technology.

Müller, G. (1995). *A-bar syntax*. Berlin: Mouton de Gruyter.

Miyamoto, Y. & Toratani, K. (1996). Strong crossover in second language acquisition. *University of Connecticut Working Papers in Linguistics*, *6*, 39–55.

Nishigauchi, T. (1990). *Quantification in the theory of grammar*. Dordrecht: Kluwer.

Oxford University Press. (2001). *Quick placement test: Paper and pen test quick placement test series*. Oxford: Oxford University Press.

Pankau, A. (2013). *Replacing copies: The syntax of wh-copying in German*. LOT Publications.

Patterson, G. & Caponigro, I. (2016). The puzzling degraded status of who free relative clauses in English. *English Language and Linguistics*, *20*(2), 341–352.

Pesetsky, D. (1982). *Paths and categories*. Doctoral thesis. Massachusetts Institute of Technology.

Pesetsky, D. & Torrego, E. (2001). T-to-C movement: Causes and consequences. In M. Kenstowicz (Ed.), *Ken Hale: A life in language* (pp. 355–426). Cambridge, MA: The MIT Press.

Pesetsky, D. & Torrego, E. (2007). The syntax of valuation and the interpretability of features. In S. S. Karimi, V. Samiian, & W. Wilkins (Eds.), *Phrasal and clausal architecture: Syntactic derivation and interpretation* (pp. 262–294). Amsterdam: John Benjamins.

Peirce, J. W. (2007). PsychoPy – psychophysics software in python. *J Neurosci Methods*, *162*(1–2), 8–13.

Postal, P. (1971). *Crossover phenomena*. New York: Holt, Rinehart and Winston, Inc.

Postal, P. (1993). Remarks on weak crossover effects. *Linguistic Inquiry*, *24*, 539–556.

Rackowski, A. & N. Richards. (2005). Phase edge and extraction: A Tagalog case study. *Linguistic Inquiry*, *36*, 565–99.

Reinhart, T. (1976). *The syntactic domain of anaphora*. Doctoral thesis. Massachusetts Institute of Technology.

Rizzi, L. (1990). *Relativized minimality*. Cambridge, MA: MIT Press.

Rizzi, L. (1997). The fine structure of the left periphery. In L. Haegeman (ed.) *Elements of grammar: Handbook in generative syntax* (pp. 281–337) Dordrecht: Kluwer.

Rizzi, L. (2004). Locality and left periphery. In Structures, Vol. 3, A. Belletti (Ed.), *Structures and beyond: The cartography of syntactic* (pp. 223–251). Oxford: Oxford University Press.

Rizzi, L. (2013). Locality. *Lingua*, *130*, 169–186.

Schachter, J. (1989). Testing a proposed universal. In S. Gass & J. Schachter (Eds.), *Linguistic perspectives on second language acquisition* (pp. 73–88). Cambridge: Cambridge University Press.

Schachter, J. (1990). On the issue of completeness in second language acquisition. *Second Language Research*, *6*(2), 93–124.

Schwartz, B. D. & Sprouse, R. A. (1996). L2 cognitive states and the full transfer/full access model. *Second Language Research*, *12*(1), 40–72.

Šimiḱ, R. (2011). *Modal existential wh-constructions*. LOT Publications.

Slavkov, N. (2015). Long-distance wh-movement and long-distance wh-movement Avoidance in L2 English: Evidence from French and Bulgarian speakers. *Second Language Research*, *31*(2), 179–210.

Sloan, K. (1991). Quantifier-WH interaction. In L. Cheng & H. Demirdache (Eds.), *MIT Working Papers in* Linguistics: More papers on wh-movement, *15*, 219-237.

Sorace, A. (2005). Syntactic optionality at interfaces. In L. Cornips & K. Corrigan (Eds.), *Syntax and variation: reconciling the biological and the social* (pp. 46–111). Amsterdam: John Benjamins.

Sorace, A. & Filiaci, F. (2006). Anaphora resolution in near-native speakers of Italian. *Second Language Research*, *22* (3), 339–368.

Sorace, A. & Serratrice, L. (2009). Internal and external interfaces in bilingual language development: Beyond structural overlap. *International Journal of Bilingualism*, (13), 195–210.

Tsimpli, I. & Sorace, A. (2006). Differentiating interfaces: L2 performance in syntaxsemantics and syntax-discourse phenomena. In D. Bamman, T. Magnitskaia, & C, Zaller. *Proceedings of the 30th Annual Boston University Conference on Language Development* (pp. 653–664). Somerville, MA: Cascadilla Proceedings Project.

Starke, M. (2001). *Move dissolves into merge: A theory of locality*. Doctoral thesis. University of Geneva.

Suh, J. H. (1990). *Scope phenomena and aspects of Korean syntax*. Doctoral thesis. University of Southern California.

Svenonius, P. (2004). On the edge. In D. Adger, C. de Cat, & G. Tsoulas (Eds.), *Peripheries: Syntactic edges and their effects* (pp. 261–87). Dordrecht: Kluwer.

Thornton, R. (1990). *Adventures in long-distance moving: The acquisition of complex wh-questions*. Doctoral thesis, University of Connecticut.

Tsai, W.-T. D. (1994) *On economizing the theory of Ā-dependencies*. Doctoral thesis. Massachusetts Institute of Technology.

Tsimpli, I. M. & Dimitrakopoulou, M. (2007). The interpretability hypothesis: Evidence from wh-interrogatives in second language acquisition. *Second Language Research*, *23*(2), 215–242.

Ultan, R. (1978). Some general characteristics of interrogative systems. In H. Joseph (Ed.), *Greenberg universals of human language, vol. 4* (pp. 211–248). Stanford: Stanford University Press.

VanPatten, B. & Jegerski, J. (2010). *Research in second language processing and parsing*. Amsterdam: John Benjamins.

Villalta, E. (2003). Role of context in the resolution of quantifier scope ambiguity. *Journal of Semantics*, *20*, 115–162.

Wasow, T. (1972). *Anaphoric relations in English*. Doctoral thesis. Massachusetts Institute of Technology.

White, L. (1992). Subjacency violations and empty categories in SLA. In H. Goodluck & M. Rochemont (Eds.), *Island constraints: Theory, acquisition and processing* (pp. 445–464). Dordrecht: Kluwer.

White, L. (2003). *Second language acquisition and universal grammar*. Cambridge: Cambridge University Press.

White, L. (2011). Second language acquisition at the interfaces. *Lingua*, *121*(4), 577–590.

White, L. & Genesee, F. (1996). How native is near-native? The issue of ultimate attainment in adult second language acquisition. *Second Language Research*, *12*, 233–265.

White, L. & Juffs, A. (1998). Constraints on wh-movement in two different contexts of non-native language acquisition: Competence and processing. In S. Flynn, G. Martohardjono, & W. O'Neill (Eds.), *The generative study of second language acquisition* (pp. 11–129). Mahwah, NJ: Erlbaum.

Yang, D. W. (1991). A comparative study on quantified expressions between English and Korean. *Linguistic Journal of Korea*, *16*(2), 331–356

Yeo, N. (2010). *Unifying optional wh-movement*. Doctoral thesis. University of York.

Yoon, J. M. 1999. Decomposing wh-question formation: Wh-in-situ and island constraint in Korean. *Studies in Generative Grammar*, *9*(2), 153–198.

Yoon, J. M. (2001). Successive cyclic movement, feature percolation, and a typological approach to cross-linguistic variation in pied-piping. *Studies in Generative Grammar*, *11*, 167–221.

Yoon, J. M. (2012). Wh-island effects in Korean wh-in-situ questions: Degradedness or misinterpretation? *Korean Journal of Linguistics*, *37*, 357-382.

Zepter, A. (2003). *Phrase structure directionality: Having a few choices*. Doctoral thesis. Rutgers University.

Zimmermann, M. (2016). MM3: Syntax-semantic interface [Class handout]. Retrived from https://www.ling.uni-potsdam.de/~zimmermann/teaching/Syntax-Semantic_Interface/Handouts/May-QuantifierRaising.pdf

Appendix 1: Acceptability judgement task items

A. Grammatical sentences

a. Subject extraction

- Who did the police announce shot John Lennon? (who – subject)
- Who does the archaeologist believe arrived here first? (who – subject)
- Who did the professor say wrote the best essay? (who – subject)
- Who does he say was the first Asian Member of Parliament? (who – subject)
- What does Ashley believe is making her son sick? (what – subject)
- What does new research say prevent a hangover? (what – subject)
- What did many people believe caused the accident? (what – subject)
- What do experts believe is making global warming accelerate? (what – subject)
- Which countries did the teacher explain do not have enough food? (which N – subject)
- Which actor did Paul say was the best James Bond in the history of 007 films? (which N – subject)
- What team do the gamblers expect will win FIFA world cup 2018? (what N – subject)
- What country did the teacher say has the world's highest murder rates? (what N – subject)

b. Object extraction

- Who does Erin say she will marry again? (who – object)
- Who did Matthew say he voted for the general election? (who – object)
- Who does Eric suspect his girlfriend met at the party? (who – object)
- Who does Donald Trump say he would meet for talks? (who –object)

- What did the scientists warn countries in Asia could face by 2020? (what – object)
- What did the company confirm their CEO had done? (what – object)
- What did Mary say she would sell at the car boot sale tomorrow? (what – object)
- What did the spokesman announce the Prime Minister had done? (what – object)
- Which candidate did he say the company decided to hire? (which N – object)
- Which actor does everyone think the director won't cast in his new film? (which N – object)
- What roles does the article say Shakespeare performed in his own plays? (what N – object)
- What company does she believe Google will take over? (what N – object)

B. Ungrammatical sentences

a. No T-to-C movement

- Who Alice said came to the college reunion yesterday? (who – subject)
- What Professor Hawkins says will destroy all life on Earth? (what – subject)
- Who Natalie said everyone wanted to invite at the party? (who – object)
- What Collin promises he will never do again? (what – object)

b. Double marking of tense

- Who does Albert says will join the army after college? (who – subject - present)
- What did the doctor said would play an important role in the fight against flu? (what – subject - past)
- What does Ryan worries they will ban due to its explicit contents? (what – object – present)

- Who did the police said they arrested on suspicion of selling drugs? (who – object – past)

c. No pied-piping

- Which did Brandon mention book is his favourite? (which N – subject)
- Which did the BBC announce programme will close in September? (which N – subject)
- What does Angela say she is cooking food for the party? (what N – object)
- What did the reporter say WikiLeaks released documents? (what N – object)

C. Subjacency violations

a. Wh-island

- Who did Rachel wonder when Tom invited to the party? (who – object)
- Who did Susan explain why she had to break up with? (who – object)
- What did Robert wonder whether she was fit for? (what – object)
- What did Emma want to know how Princess Kate lost? (what – object)

b. Complex noun phrase

- Who did David started the rumour that Nicole had an affair with? (who – object)
- Who did Benjamin overhear the comment that the police had arrested for drunk driving? (who – object)
- What did they raise doubts about the report that North Korea had? (what – object)
- What did George relay the message that NASA had identified on the surface of Mars? (what – object)

c. Relative clause

- Who did Kathy love the book that described? (who – object)
- Who did the police interview the victim that survived? (who – object)
- What did Winston interview the artist that composed? (what – object)
- What did the reporter criticise the company that produced? (what – object)

d. Adjunct

- Who did the police interview him before they questioned? (who – object)
- Who did Marvin hate Charlotte because she used to hang out with? (who – object)
- What did Anna shake her head while she flipped through? (what – object)
- What did Grace call Erin after he heard at work? (what – object)

Appendix 2: Truth value judgement task items

A. Strong crossover

   a. Who did he say had the best moustache?

   b. Who did she say had the best voice?

   c. Who did he say bought fresh fruit?

   d. Who did she say made the best beer?

   e. Who did she say was the best cheese maker?

   f. Who did he say had the best smile?

   g. Who said he was the greatest leader in the world?

B. Non-strong crossover

   a. Who said he drew the best self-portrait?

   b. Who said she was the winner of the competition?

   c. Who said he was the best jumper?

   d. Who said he was flying in the air?

   e. Who said he built the best model ship?

   f. Who said he met every casting director?

C. Weak crossover

   a. Who said she read every poet on the poetry day?

   b. Who said he watched every superhero movie at the movie night?

   g. Who said he attended every film festival?

   h. Who said he travelled every place around Europe?

   i. Who said he played every composer at the charity concert?

j. Who said he met every casting director?

D. Non-weak crossover

a. What did everyone say he tasted at the beer festival?

b. What did everyone say he learned at the language centre?

c. What did everyone say she baked for the Bake Sale?

d. What did everyone say she read in the waiting room?

e. What did everyone say he studied for heart disease?

f. What did everyone say he ate at the food festival?

Appendix 3: Truth value judgement task answer sheet

Answer Sheet

1	True	False	If you choose “FALSE”, please write a correct statement or answer here.	
2	True	False		
3	True	False		
4	True	False		
5	True	False		
6	True	False		
7	True	False		
8	True	False		
9	True	False		
10	True	False		
11	True	False		
12	True	False		
...	...	...	...	...
48	True	False		

Appendix 4: Self-paced reading task items

A. Strong crossover

a. Strong crossover gender mismatch

- Which stuntwoman did the actress say he had injured due to negligence?
- Which princess did the queen say he had insulted at the reception?
- Which clergyman did the bridegroom say she had invited to wedding reception?
- Which sportsman did the businessman say she had sponsored at the Olympics?

b. Strong crossover gender match

- Which boy did the girl say he had taunted in the playground? (
- Which man did the policewoman say he had humiliated at the party?
- Which prince did the newswoman say he had associated with political corruption?
- Which waitress did the busboy say she had blamed for slow service?

c. Non-strong crossover gender mismatch

- Which lady said the hostess had surprised him with a birthday cake?
- Which girl said the headmistress had familiarised him with the new environment?
- Which boy said the policeman had saved her after a car accident?
- Which monk said the knight had followed her into the old Cathedral?

d. Non-strong crossover gender match

- Which woman said the boy had fooled her over and over again?
- Which salesman said the chairwoman had flattered him on talents for sales?
- Which maid said the butler had helped her with many difficult jobs?
- Which saleswoman said the chairman had congratulated her on recent sales success?

B. Weak Crossover

a. Unambiguous context

- Wh-object/Qu-subject
  - Which snack did everyone say he had during the break time?
  - Which poet did everyone say she read on the poetry day?
  - Which food did everyone say she brought to the birthday party?
  - Which animal did everyone say he raised on the animal farm?
  - Which plant did everyone say he studied for the research project?
  - Which cake did everyone say she baked for the fundraising event?

b. Ambiguous context

- Wh-object/Qu-subject
  - Which gift did everyone say he bought after the dinosaur tour?
  - Which tool did everyone say he bought for the gardening experience?
  - Which gift did everyone say he brought to the housewarming party?
  - Which composer did everyone say he played at the piano competition?
  - Which animal did everyone say she fed during the zoo tour?
  - Which place did everyone say she chose for the summer holidays?

- Wh-subject/Qu-object
    - Which man said he watched every film at the film festival?
    - Which woman said she played every sport at the school club?
    - Which man said he enjoyed every show at the water park?
    - Which woman said she learned every instrument at the music school?
    - Which woman said she bought every animal at the livestock market?
    - Which woman said she read every magazine in the waiting room?