Syntactic Competence and Processing: Constraints on Long-distance A-bar Dependencies in Bilinguals

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Linguistics)
in the University of Michigan
2015

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Dedicated to my parents and teachers

ACKNOWLEDGEMENTS

My real interest in theoretical linguistics began when I was a graduate student at Eastern Michigan University from 2008 to 2010. Thanks to Professor Daniel Seely, who opened my eyes to this fascinating field of study. If I had not taken his Syntactic Analysis class in winter 2010, I would not have even considered applying to a PhD program in linguistics. Even after my enrolment at the University of Michigan (UoM), he has been generous with his time to provide feedback on my work whenever I requested. Given this, it is more appropriate to begin this acknowledgement by thanking Daniel.

At the University of Michigan, I was extremely fortunate to be advised by Professor Acrisio Pires and Professor Samuel D. Epstein. They were always prepared to listen to my concerns, questions, worries and frustrations whenever I had any. As my primary advisor (and also the chair of this dissertation committee), I owe a lot to Acrisio for any success that I have achieved at UoM during the last few years. Not only has he been a mentor, but also 'a friend.' He has been extremely patient and helpful whenever I had difficulties either with my coursework or progress in research. Also, out of the nine semesters that I worked as a Graduate Student Instructor (GSI) at UoM, I worked five semesters with Acrisio. The training, guidance and motivation that he has provided during those semesters have helped me a lot to succeed as a teaching assistant at the department. Finally, special thanks to Acrisio for the opportunity to collaborate with him on several research projects.

Next, I also owe a lot to Sam (Samuel D. Epstein) for his concern, detailed feedback on my research and teaching and the amount of encouragement and motivation that he has provided to me during these five years. No matter however busy he was, he had time whenever I wanted to discuss my research with him or wanted his feedback on my work. During his regular tours across the passageway leading to GSI offices (though less frequent since he became the director of the Weinberg Institute for Cognitive Science) he remembered to add a few words of motivation and encouragement. His humor always reduced the pressure in a graduate student's life.

Next, I must thank Julie Boland, the cognate member of my committee. She was always prepared to help me whenever I needed her. I must especially thank her for her guidance and help with the statistical analysis during the final stages of the project. Also, thanks to Julia Herschensohn from the University of Washington for accepting our invitation to serve on my committee and providing her extensive feedback on the prospectus and the dissertation.

Next I must thank the department chair, Robin Queen, the graduate chair Andries Coetzee and the entire faculty at the Department of Linguistics at UoM for their help in many ways. I must especially thank Andries and Marlyse for their encouraging words whenever I ran into them either on the hallway or at a department event. Thanks to Carmel for inviting me to be a language consultant in her field methods class which enriched my learning experience on field methods a lot. Also thanks to Nick Ellis for providing his feedback on my initial proposal on the language processing study and the cooperation he extended during the data collection. I also would like to thank all the members of the Syntax-Semantics Discussion group for their feedback on my research.

Among my friends at UM, I must especially thank Tim Chou with whom I worked on a project on case marking in Sinhala. Tim helped me a lot when I first came to Ann Arbor and he was always available for help whenever I needed him. Special thanks to Alan Ke for his help with the SPR study and Will Nediger for his time in proofreading this dissertation. I'd also like to thank all my fellow graduate students at UoM, including Jae-Young Shim, Michel Opper, Cameron Rule, Thridha Chaterge, Stephen Tyndall, Will Nediger, Harim Kwon, Joseph Tyler, David Medeiros, Batia Snir, Marcus Berger, Dave Ogden and Alan Ke. Life at the department was always easy because there were three people in the department office who were always prepared to help: Talisha, Sandie, Jennifer. Thanks to all three of them.

The Sri Lankan community in Ann Arbor and surrounding cities deserves a special note of thanks. Their company at regular community events made our stay in Ann Arbor a pleasant and memorable one. They were very helpful with my research and were always prepared to take part in the experimental studies on Sinhala. Also, thanks to Hemantha P. Diunugala (Senior Lecturer, Department of Social Statistics, University of SJP, Sri Lanka) for his help with the statistical analysis. Further, I would like to thank my undergraduate research assistants (Department of Linguistics) for their help in many ways.

Last but not least, I thank my wife Sakura for her love, encouraging words and patience. Without her support and encouragement, my reaching this milestone would not have been a possibility. Finally, thanks to my sons Savindu and Nelith for the joy they have brought to our lives.

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Chapter 1

Introduction

This dissertation investigates the syntactic competence and processing of A-bar dependencies by adult Sinhala/English bilinguals in their L2 English. Our specific focus is on *Wh-dependencies* and *Topicalization*, two syntactic phenomena typologically distinct across the two languages (Chapter 2). It presents results from a series of planned experiments using Grammaticality Judgment, Truth-value Judgment and Self-paced Reading (Chapters 4 & 6), and re-evaluates two recent hypotheses in generative SLA — the Interpretability Hypothesis (Hawkins & Hattori, 2006; Smith & Tsimpli, 1995; Tsimpli, 2003; Tsimpli & Dimitrakopoulou, 2007) and the Shallow Structure Hypothesis (Clahsen & Felser, 2006a/2006b; Marinis, Roberts, Felser & Clahsen, 2005; Cunnings, Batterham, Felser & Clahsen, 2009) —which make strong predictions concerning what kind of ultimate attainment is possible in post-childhood L2 acquisition. The study is expected to shed some light on a variety of debated issues in current generative SLA,[1] including the nature of the access to Universal Grammar (UG) in adult L2 acquisition, the nature of L2 sentence processing, the relation between age of onset and the properties of steady-state L2 grammars, and the relation between interlanguage[2] development and L1 transfer effects on L2 grammatical knowledge.

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[1]This dissertation adopts the generative approach to language acquisition pioneered by Chomsky (1957, 1965) and thereafter. Hence, our discussion will not include any review of other approaches to language acquisition such as Emergentism and Constructionism (see Brown, 2007 for a review of these approaches).

[2] Following Corder (1967) and Selinker (1972), we use the term 'interlanguage' to refer to the developing language system of L2 learners/speakers.

The experimental subjects in the various experiments included two groups of L1 Sinhala/L2 English bilinguals. The first group consisted of adult L2ers who are immersed in English in an academic environment at a local university in Sri Lanka. The second group included bilinguals who are fully immersed in English in the US. Both groups of bilinguals have arguably attained a steady state in their L2 English. A majority of them are no longer classroom L2 learners (see Chapter 4 and 6) but bilinguals who regularly use the L2 either for their academic or employment purposes. For the bilingual group in the US, English has gradually become the language they predominantly use both at home and at their workplace — i.e. even at home, most conversations take place in English, given that their children have grown up to be English monolinguals. Even though the situation of the L2 group in Sri Lanka is slightly different, they are also immersed in an English-speaking academic environment at a local university, where they use English in 70% of day-to-day communication (as reported in a background survey). Given that Sri Lanka is a country in which English is used as a *lingua franca* (see Gunasekara, 2005), it is not uncommon for the subjects who participated in this study to use some English on a regular basis in day-to-day communication both in and outside of the academic setting. Thus, the investigation of this population (L2 speakers and regular users, rather than just learners) will contribute to our understanding of ultimate attainment in SLA, a topic that has received extensive discussion in recent SLA literature (for a review see e.g., Birdsong, 1992, 2008; Herschensohn, 2009; Lardiere, 2013).

1.1 Ultimate Attainment in L2

Before we move on to explaining the background of the proposed study, a description is in order for *ultimate attainment* in L2 acquisition. It is a term commonly used in the L2 acquisition literature to refer to steady-state grammars that L2 speakers develop as a result of long-term

immersion or instruction. As Hopp (2007, p. 19) defines it, *ultimate attainment* is a term that refers to "an interlanguage system after prolonged and sustained exposure, and high levels of proficiency that is structurally stable in the sense that further acquisition other than vocabulary is not likely." It could also be understood as "the state of knowledge actually attained at a stabilized endpoint of development in a particular domain" (Lardiere, 2013, p. 670). The domain could be as broad as phonology, morpho-syntax or semantics or as narrow as bilabial stops, past tense markers, wh-movement and topicalization. Thus, as suggested by both Hopp (2007) and Lardiere (2013), the term *ultimate attainment* does not necessarily imply that an L2 group in question has converged on the target grammar in all respects. It could well be the case that they have a more stable grammar in one domain but not the other. Hence, *ultimate attainment* is not a term synonymous with native or near native proficiency even though such level of proficiency could be a possible outcome of L2 acquisition, at least according to some researchers (see e.g. Birdsong, 2001, 2009; Herschensohn, 2013; Lardiere, 2013 and references therein). It could even be a state which is characterized by fossilization (Selinker, 1972), which is less likely to further develop in a given domain, or stabilization (Long, 2003), characterized by less variability. In summary, from a generative perspective, the study of ultimate attainment in L2 acquisition can be understood as the investigation of the steady state of L2 competence, similarly to what is considered regarding L1 acquisition. In this respect, the term can equated with the end point of L2 acquisition.

As Birdsong (2001, 2009) rightly points out, the study of second language speakers who are at the end point of acquisition is going to contribute to our understanding of the possible limits of L2 acquisition, if any (p. 83). Starting with what has already been acquired by proficient L2ers, one can move backwards "to try to account for how such knowledge could have been acquired in

principle" (Lardiere, 2013, p. 672). Still, how one can determine whether a group of L2ers has reached a steady state in a given domain in the target language is a debated issue in SLA (see Birdsong, 2001, 2009 for discussion). In this study, following common practice in SLA research, we rely on several sources — results of a proficiency test, length of immersion in L2 English, L2ers' performance in each experiment (compared to English monolinguals), and information of a background survey on the use of the target language — as evidence for a steady state in the target language syntax for at least some of our L2ers.

According to Birdsong (2001, p. 707), the issue of ultimate attainment in L2 acquisition involves two fundamental questions. The first question concerns whether there are competence differences between proficient L2ers and native speakers (NS) of a given target language. This, as we will discuss in Chapter 3, is a debated issue in generative literature (see White, 2003 and Herschensohn, 2009 for a review). The second question concerns the locus of the divergence in the ultimate attainment between L2 speakers and native speakers. At least according to some accounts, such divergence results from a deficiency in the functional domain of L2 speakers' mental grammars for the target language (e.g., Hawkins & Hattori, 2006; Tsimpli, 2003). According to an alternative view, this may not necessary result from a deficiency in competence but from characteristic properties to do with L2ers' real-time language comprehension (e.g. Clahsen & Felser, 2006a, 2006b; Epstein et al. 1996). As we elaborate below, this dissertation mainly focuses on these two issues — L2ers' syntactic competence and processing.

1.2 UG and L2 Syntactic Competence

As is well-known, the generative inquiry of human language, pioneered by Chomsky (1957, 1965 and thereafter), is driven by two main goals: (i) providing an accurate characterization of the knowledge (competence) of native speakers of any given language (descriptive adequacy)

and (ii) explaining how such knowledge emerges in the mind of a speaker given the nature of the Primary Linguistic Data (PLD) that one is exposed to as a child (explanatory adequacy) (Chomsky, 2000, p. 90; Richards, 2013, p. 1). The goals of generative approaches to second language research are similar. Using various experimental methods, second language acquisition researchers explore the acquired competence of L2 speakers and how interlanguage grammars undergo development over time, in connection with learners' exposure to the target language input (see White, 2009).

In generative theories of first language acquisition, it is hypothesized that children acquiring their native language are aided by Universal Grammar (UG), a genetic endowment underlying the mental structure of human language. Chomsky (1971) defines UG as follows:

> UG [universal grammar] may be regarded as a characterization of the genetically determined language faculty. One may think of this faculty as a 'language acquisition device,' an innate component of the human mind that yields a particular language through interaction with present experience, a device that converts experience into a system of knowledge attained: knowledge of one or another language.
>
> (Chomsky, 1971, p. 3)

Also, UG can be understood as the 'initial state' of the Faculty of Language (FL): "an expression of the genes" (Chomsky, 2000, p. 90). The Principles & Parameters (P&P) approach to linguistic theory assumes that the human language building capacity (UG) encompasses abstract invariant properties (principles), in parallel to mechanisms that allow constrained variation across languages (parameters). Under this approach, a child's task in acquiring his/her native language involves setting parameter values appropriate for the language being acquired. A child does so in response to the PLD that he/she is exposed to. For example, let's consider the Wh-parameter (Huang, 1982; Rizzi, 1991), one phenomenon that we investigate in this study. The Wh-parameter specifies how the wh-feature [+wh] of C must be checked (or valued, in current terms)

in a derivation. In wh-in-situ languages (Japanese, Chinese, Sinhala), this feature is checked/valued at Logical Form (LF) (or after so-called Spell-out of the features mapping to a phonological representation). In English-type languages, it is checked/valued at Surface Structure,[3] or narrow syntax in current Minimalist theorizing (see Chapter 2). So, this variation (parameter) is also an option provided by UG itself.

In Minimalism, parameter setting is understood as a process of constructing a language-specific lexicon by selecting features appropriate for a given language from the universal set made available by UG. Chomsky (2000, p. 100) writes:

> UG makes available a set F of features (linguistic properties) and operations C_{HL} (the computational procedure for human language) that access F to generate expressions. The language L maps F to a particular set of expressions *Exp*…
>
> On these (fairly conventional) assumptions, acquiring a language involves at least selection of the features [F], construction lexical items *Lex*, and refinement of C_{HL} in one of the possible ways—parameter setting.

Evidence for the role of UG in L1 acquisition comes from the Poverty of the Stimulus argument (Chomsky, 1965, 1986 and thereafter): the gap between the acquired knowledge and the kind of input that a child is exposed to. The core of the argument is that if it were not for UG, it would not be possible for a child to acquire complex, subtle, abstract properties of a linguistic system from the input alone. Further, following Lenneberg (1967), it is generally assumed that native language acquisition is subject to a *Critical Period* (age two to puberty) after which the acquisition of native-like competence from natural linguistic input alone is impossible.

In contrast to L1 acquisition, the role of UG in L2 acquisition is a debated issue. According to *Full-Access* approaches (e.g., Epstein, Flynn & Martohardjono, 1996; Schwartz & Sprouse,

[3] However, this does not mean that LF wh-movement is completely absent in English, see e.g. Pesetsky (1987). For an alternative proposal and further references, see Pires and Taylor (2007).

1996; White, 1989, 2003), L2 learners have direct access[4] to the complete inventory of features (along with basic syntactic operations and principles) in UG without any restrictions imposed by a critical period. More importantly, they assume that native-like cognitive representations are possible in L2 syntax despite any interference from the learner's L1 grammar and a *Poverty of the Stimulus* (Chomsky, 1965) problem imposed by the target language input: "L2 learners acquire complex and subtle properties of language that could not have been induced from the L2 input" (White, 2003, p. 22).

However, according to an alternative view, UG accessibility in L2 acquisition is restricted in the domain of functional categories (see White, 2003 for a review of early proposals on this issue). These proposals are generally referred to as Representational Deficit (RD) accounts. One recent hypothesis that advocates this view is the *Feature Interpretability Hypothesis* (Hawkins & Hattori, 2006; Smith & Tsimpli, 1995; Tsimpli, 2003; Tsimpli & Dimitrakopoulou, 2007). Under this hypothesis, uninterpretable syntactic features (see Chapter 2 for a formal definition) that are not instantiated in learners' native language are not available for L2 syntactic computation. In that account, the reason is that uninterpretable syntactic features, unlike their interpretable counterparts, are subject to an early critical period. Thus, proponents of the Feature Interpretability Hypothesis assume that the grammatical competence/knowledge differences between native speakers and L2ers in a given language results from a deficit in narrow syntax: L2ers' target language mental representations are impoverished, lacking uninterpretable syntactic features.

[4] Full Access Approaches are also alternatively known as *Direct Access Approaches*. See White (2003, p. 16) for details.

Even though various studies have evaluated the predictive power of the Interpretability Hypothesis, reported findings in this regard are mixed (Chapter 3). Some studies have reported that the successful acquisition of uninterpretable syntactic features is possible in post-childhood L2 acquisition (see e.g., Campos-Dintrans et al., 2014; Foucart & Frenck-Mestre, 2012; Gess & Herschensohn, 2001; Umeda, 2008). However, other studies argue that despite their apparent native-like performance, L2 speakers' underlying mental representations are different from those of native speakers of a given target language. In L2 grammars, they use alternative strategies borrowed from their L1 to account for the target language input (see Hawkins & Hattori, 2006; Hawkins & Chan, 1997; Tsimpli & Dimitrakopoulou, 2007). Also, despite many studies testing the Interpretability Hypothesis, not much is known about L2ers who at least initially learn a target language predominantly in a classroom setting. A widespread view in the field (despite counter evidence; see references above and also Epstein, Flynn & Martohardjono, 1996; Schwartz & Sprouse, 1996; White & Juffs, 1998) still seems to be that UG has no role in their L2 acquisition/learning (see e.g. Hawkins & Chan, 1997 for discussion).

In this vein, in the first part of this dissertation (Chapters 3 & 4), we re-evaluate the predictive power of the Interpretability Hypothesis, by presenting novel empirical results from proficient Sinhala/English bilinguals who acquired English as a second language in a non-immersion context. Our focus is on wh-dependency formation, which is typologically distinct across the two languages (Chapter 2). Sinhala is a wh-in-situ language (e.g. Gair, 1998; Kishimoto, 2005) and wh-elements do not undergo overt wh-movement from their canonical first-merged position in narrow syntax. This implies that Sinhala lacks the uninterpretable feature [*uwh**] (Adger 2003, Edge or EPP feature for Chomsky, 2001) which forces the overt movement of a wh-phrase into the CP domain, differently from English. As a result, syntactic locality

constraints associated with complex wh-questions in English, namely Relativised Minimality/Superiority and Subjacency constraints, are not instantiated in L1 Sinhala. Crucially, if Representational Deficit accounts (Hawkins & Hattori, 2006; Tsimpli, 2003; Tsimpli & Dimitrakopoulou, 2004; Tsimpli & Mastropavlou, 2007) are on the right track, the acquisition of English overt wh-movement and corresponding constraints is expected to pose a learnability problem for Sinhala native speakers acquiring L2 English. Thus, in exploring the syntactic competence of Sinhala/English bilinguals, in the first part of the dissertation (Chapters 3 & 4), we present new experimental research that addresses the following research questions:

(1) Do proficient L2ers (in their steady state) provide evidence of native-equivalent knowledge of locality constraints on wh-questions in the target language syntax, showing that they have successfully acquired new uninterpretable syntactic features that underlie this knowledge in the target L2 and are not instantiated in the learners' L1?

(2) Does this evidence of knowledge of locality constraints on wh-questions by L2 learners constitute clear evidence against Representational Deficit accounts of L2 acquisition, and in favor of approaches supporting full access to UG in this empirical domain?

(3) What is the role of UG in the acquisition of wh-questions by L2 learners whose exposure to English (at least initially) takes place predominantly in a classroom setting?

1.3 L2 Sentence Processing

As we have already discussed, Representational Deficit accounts assume that the divergence in ultimate attainment between native speakers (NSs) and L2ers results from a deficit in narrow syntax (e.g., Hawkins & Hattori, 2006; Tsimpli 2003; Tsimpli & Dimitrakopoulou, 2004; Tsimpli & Mastropavlou, 2007). Despite some counter evidence from different studies (see e.g.

Campos-Dintrans, Pires & Rothman, 2012; White, 2003 and references therein), this still remains a dominant view in second language acquisition literature.

In parallel, other studies in SLA, including Clahsen and Felser (2006a, 2006b), Felser et al. (2009), and Felser and Cunnings (2012) hypothesize that a divergence in performance between NSs and L2ers may not necessarily result from difficulties in acquiring subtle grammatical properties but from different mechanisms the two groups deploy in real-time language processing or comprehension.[5] They argue that during real-time comprehension, the native speakers of a language integrate information from a variety of different sources, which may include syntax, lexical semantics and contextual cues. But L2 speakers, in contrast, are largely restricted to non-structural information (lexical semantics and contextual cues) in processing. In the case of L2ers, this kind of shallow structure processing (the Shallow Structure Hypothesis) has been argued to take place regarding syntactic structures (e.g. A-bar dependencies) which demand the processor to build a detailed hierarchical representation in parsing. Also, shallow structure processing has been argued to take place in L2 processing irrespective of whether L2ers show evidence of competence in offline tasks.

Similar to the Interpretability Hypothesis, research findings regarding the Shallow Structure Hypothesis are mixed. Clahsen and Felser, in a series of studies (reviewed in Chapter 5) with their collaborators, have provided evidence indicating that in real-time processing of complex structures, even proficient L2ers underuse syntactic information (which Clahsen and Felser argue may be the case even if the L2ers have the corresponding competence). But other studies such as Dong (2014), Hopp (2006), Omaki and Schulz (2011) and Sagarra and Herschensohn (2008)

[5] For a similar view, see Epstein et al. (1996).

report results which indicate that proficient L2ers, similar to native speakers of a given language, are capable of deep syntactic structure building in real-time processing. Still, there are at least two main issues in L2 processing, the status of which is debated in current SLA processing literature: (i) the role of L1 syntax on L2 online processing and (ii) the relation between L2 proficiency and parsing mechanisms used during real time language comprehension (see Omaki and Schulz, 2011). The first issue concerns whether the presence or absence of particular syntactic features in L2 speakers' native language has an impact on L2 processing. The second issue is related to whether more proficient L2ers employ less shallow processing than beginner/intermediate L2 speakers, or whether shallow processing is a temporary strategy only observed during some early stages of interlanguage development. In re-testing the predictions of the Shallow Processing Hypothesis, in this dissertation, we intend to shed some light on both of these issues.

In this dissertation, we re-evaluate the SSH hypothesis in relation to the role of subjacency (island) constraints in L2 processing. Two recent studies have reported contradictory findings in this regard. For example, Cunnings, Batterham, Felser and Clahsen (2009), in a study with L2 English learners who were Chinese and German native speakers, argue that both L2 groups were insensitive to island constraints in forming filler-gap dependencies in English Relative Clauses (RCs). But Omaki and Schulz (2011), in a study with a group of Spanish L1-English L2ers, report that their L2 speakers were not different from English monolinguals in using island constraints to guide their filler-gap dependency formation. Their focus was also on English RCs. Due to these potentially contradictory findings in the existing literature, in this dissertation we retest this phenomenon in two structural domains: Relative Clauses and Topicalization. The goal is to examine whether L2 speakers who have acquired linguistic competence in this domain can

consistently use their knowledge of island constraints in real-time second language processing, irrespective of any challenges imposed by different types of A-bar dependencies.

Therefore, in the part of this dissertation investigating L2 processing, we raise the following research questions:

(1) Are proficient L2ers (in their steady state) capable of building/accessing deep (i.e. native-like) syntactic representations during real-time processing of A-bar dependencies? Or do they underuse syntactic information by relying on lexical-semantic information?

(2) What is the role of L1 syntax on L2 sentence processing? Do L2ers process islands in the target language differently because they don't instantiate those constraints in the corresponding linguistic domain or elsewhere in their L1 syntax?

Thus, in exploring both syntactic competence and processing of A-bar dependencies, this dissertation contributes to our general understanding of 'ultimate attainment' or end-state grammars in post-childhood L2 acquisition.

1.4 Organization of the Dissertation

This dissertation is organized as follows. First, Chapter 2 provides a detailed review of the syntactic phenomena — wh-dependencies, topicalization and relative clauses in Sinhala and English — that constitute the main empirical focus of investigation in this dissertation. In this chapter, we also provide a brief overview of the Minimalist Program, the generative model of syntax adopted in this dissertation. In Chapter 3 we review generative approaches to L2 acquisition, mainly Full Access and Partial Access approaches. This chapter also reviews some selected studies which have been argued to support different approaches to L2 acquisition. Chapter 4 presents the results of the wh-acquisition study (Grammaticality Judgment and Truth

Value Judgment experiments), including a discussion in which we critically evaluate the predictions of the Interpretability Hypothesis. Chapter 5, meanwhile, provides a review of L1 and L2 processing literature which is expected to provide the necessary background for the processing experiments presented in Chapter 6. After presenting the results from two Self-Paced Reading experiments, Chapter 6 critically evaluates the predictions of the Shallow Structure Hypothesis. Chapter 7 presents the conclusions of this dissertation.

Chapter 2

Syntax of A-bar Dependencies

2.1 Introduction

This chapter offers a syntactic overview of three different kinds of A-bar dependencies, namely, *Wh-movement*, *Relativization,* and *Topicalization.* The goal is to provide the necessary theoretical background for the experimental studies presented in Chapters 4 and 5 of this dissertation. The focus in the discussion of each phenomenon is on how it is manifested in the syntax of English and Sinhala, including any differences or similarities between the two languages.

The chapter is organized as follows. In Section 2, we provide a brief overview of the *Minimalist Program*, the generative model of syntax adopted in this dissertation. In Section 3, we discuss wh-dependency formation. Section 4 reviews a formal analysis of relativization. Finally, in Section 5, we discuss the phenomenon of topicalization.

2.2 Theoretical Background: Minimalism

2.2.1 Interfaces

The Government and Binding (GB) framework (Chomsky, 1982, 1986) assumed four levels of representations for a syntactic expression, namely *Deep Structure*, *Surface Structure*, *Logical Form* and *Phonetic Form*. Under this approach, the computational system freely generates representations which are ultimately ruled out by a set of different filters or constraints (e.g. X-bar theory, Case theory, Binding, Subjacency). Instead of this representational approach,

Minimalism assumes a more derivational approach to syntactic computation, (Epstein, Groat, Kawashima & Kitahara, 1998, p. 5):

> Well-formedness conditions on phrase-structure representations (such as X'-structure) are rejected in favor of a *derivational* approach to structure-building, whereby admissible structures are determined by whether or not they can be constructed by an apparatus of Binary and Singulary Generalized Transformations (GT) — namely the rules Merge and Move, respectively.

Under a derivational approach, the access of the performance systems (*Conceptual Intentional* (CI) system and *Articulatory-Perceptual* (AP) system) is not limited to the final output of a syntactic derivation. Rather these systems have access to different stages of a syntactic derivation (see Chomsky, 1995, 2000, and 2001) thereby making both *Deep structure* and *Surface structure* levels conceptually redundant. The result of this is that Minimalism assumes only two levels of representations, *Logical Form* (LF) and *Phonetic Form* (PF). LF interfaces with the CI system by providing it with information which may include "units they can interpret and relations among them: certain arrays of semantic features, event and quantificational structure, and so on, in a form that the system can interpret" (Chomsky, 2000, p. 94). Meanwhile, the PF representation interfaces with the AP system and provides to it information on "temporal order, prosodic and syllable structure, and so on" in a format appropriate for its interpretation (Chomsky, 2000, p. 94). Under this derivational approach, filters such as *Binding Theory* and *Case Theory* are assumed to be part of 'legibility conditions' imposed by the CI interface.

2.2.2 Computational Procedure

According to Chomsky (1995 and thereafter), the Faculty of Language (FL) minimally consists of a lexicon and a set of basic operations needed for syntactic computation. Those basic operations include *Merge* and *Agree*. Merge is an operation by which two syntactic elements are combined to form a two-membered set. Merge, which is responsible for recursion in language,

can be either external or internal (Chomsky, 2001). External merge simply combines two independent syntactic elements. Internal merge is the operation by which an element already merged in the structure is displaced to occupy a different position. This displacement leaves a 'copy' behind and the "two occurrences of α constitute a chain" (Chomsky, 2000, p. 114). Finally, *Agree* refers to an operation that establishes a relation between two elements (*Probe and Goal*) so that a feature (uninterpretable) can be valued/deleted in narrow syntax, ensuring convergence (i.e. legibility leading to grammaticality) at interface levels.

2.2.3 Interpretable vs. Uninterpretable Features

In Minimalism, syntactic features are classified into two categories: *interpretable features* and *uninterpretable features*. This distinction is based on the role that they play at the (CI and AP) interfaces with other cognitive domains. Interpretable features include features that play a role in syntactic computation and carry semantic information interpretable at the *Conceptual Intentional* (CI) interface after spell-out: "interpretability of a feature is an inherent property that is accessible throughout the derivation" (Chomsky, 2001, p. 4). Some examples of those include *person*, *number* and *gender features* on nouns*, tense* and *inherent case*.

Uninterpretable features are purely syntactic and interface independent in the sense that they are not legible to either the CI or the AP interface.[1] Their role is confined to syntactic computation and they act as triggers for syntactic operations (Richards, 2013). Some examples include agreement features on verbs, structural Case and Extended Projection Principle (EPP), which are uninterpretable at the CI interface. Given that uninterpretable syntactic features are

[1] For a detailed discussion of the interpretable/uninterpretable feature asymmetry in Minimalism, see e.g. Adger (2003) Chomsky (2000), Epstein and Seely (2002), Epstein, Kitahara and Seely (2010) and Svenonius (2006).

present only during syntactic computation, in convergent derivations, Svenonius (2006) defines them as "internal features." He defines (CI-interface) interpretable features as "interface features" because they are visible to both syntax and semantics:

(1) For any F, and any modules X and Y,

a. F is an X-internal feature iff F is an X feature and not a feature of any other module.

b. F is an X-Y interface feature iff F is an X feature and a Y feature.

(Svenonius, 2006, p. 2)

These two kinds of features can further be distinguished based on the fact that an uninterpretable feature enters a derivation without a feature value or specification, which it can acquire only via *Agree* with its interpretable counterpart (Chomsky, 2001). The operation *Agree* values and removes the valued uninterpretable features from narrow syntax:

> The natural principle is that the uninterpretable features, and only these, enter the derivation without values, and are distinguished from interpretable features by virtue of this property. Their values are determined by Agree, at which point the features must be deleted from the narrow syntax.
>
> (Chomsky, 2001, p. 5)

This process makes the derivation convergent when those features reach the CI interface (*Full Interpretation*; the requirement that each element receives an appropriate interpretation at interface levels). If an uninterpretable feature remains unvalued, it is not removed and it causes a crash of the derivation at the CI interface[2]. However, the deletion of an uninterpretable feature does not mean that it is inaccessible at the PF/AP interface, i.e. even though a particular feature

[2] For a slightly different version of this proposal, see Chomsky (2004).

is LF/CI uninterpretable, it can have effects on the phonetic representation (see Chomsky, 2001, p. 5).

2.2.4 A-bar Dependencies

In this study, we adopt the following approach to A-bar movement from Chomsky (2000):

> […] feature-driven movement (IFM) subdivides into types depending on the attracting head H in the final stage: (a) A-movement when H has ϕ-features (yielding case/agreement system), or (b) Ā-movement when H has P-*features* of the peripheral system (force, topic, focus, etc.).
>
> (Chomsky, 2000, p. 108).

A slightly different version of A-bar movement is found in Chomsky (2007, p. 24): "A-bar movement is internal merge driven by EF (edge feature)." Thus, in this dissertation, the term 'A-bar movement' is used to refer to any movement operation which is either driven by a P-feature (e.g., topic, focus) or an edge feature in the domain of the Complementizer Phrase (CP).

The distinction between A-movement (e.g., *NP raising*, *passive*) and A-bar movement (e.g., *wh-movement*, *topicalization*) has been extensively discussed in generative syntax. There are at least four major syntactic properties associated with A-bar movement which have been taken to distinguish it from A-movement: A-bar movement (i) allows reconstruction, (ii) can license parasitic gaps (iii) does not create new A-binders and (iv) shows Weak Cross Over (WCO)[3] effects. In contrast A-movement has been argued to be characterized by (a) the ability to create a new A-binder (b) the suppression of WCO effects and the (c) lack of reconstruction:[4] the

[3] Weak Cross Over, originally referred to as the Leftness Condition (Chomsky 1976), is observed when a variable (represented by a movement trace) is co-indexed with a pronoun to its left, which fails to c-command the variable/trace (see also Lasnik & Stowell, 1989; Postal, 1972).

[4] Reconstruction, as discussed by Chomsky (1992), Huang (1993) and Mahajan (1990) and many others, refers to the process by which a moved phrase is interpreted back in its (external)-merged position.

invisibility of a copy of an A-moved element for semantic interpretation (e.g. Epstein & Seely, 1999/2006; Lasnik, 1999; Mahajan, 1990; Miyagawa, 2009; Saito, 2006).

In the following discussion, we will elaborate on why wh-movement, topicalization and relativization (at least in English) are considered A-bar dependencies.

2.3 The Syntax of Wh-questions

English and Sinhala are distinct regarding the way wh-interrogatives are formed. As well attested in the generative literature, English is a wh-move language. A single wh-phrase is initially merged in its base position (as an argument inside the vP domain, site of theta-interpretation, or as an adjunct), and in non-echo questions it subsequently undergoes overt syntactic movement to its surface position,[5] the specifier of a Complementizer Phrase (CP), where it is pronounced. This is illustrated in (2) and (3) below:

(2) $[_{CP}$ What$_i$ did $[_{TP}$ Siri $[_{vP}$ read t_i yesterday?]]]

(3) $[_{TP}$ Mary wondered $[_{CP}$ what$_i$ $[_{TP}$ Siri $[_{vP}$ read t_i yesterday.]]]]

Sinhala, in contrast, is a *wh-in-situ* language (e.g. Gair, 1998; Gair and Sumangala, 1991, Hettiarachchi, 2015; Kishimoto, 2005): at *Surface Structure* a wh-phrase in the unmarked case always stays in its first merged position (see the tree structure in (6) inside the domain of the vP (4)).[6, 7, 8]

[5] However, for an analysis of wh-in-situ in non-echo questions in English, see Pires and Taylor (2007).

[6] Under current Minimalist theorizing, traces and indices left after movement are considered a violation of the Inclusiveness Condition, according to which no new features beyond those made available by lexical insertion are introduced by the computational system (Chomsky, 2000, p. 113); in this dissertation, they are only intended for

(4) [$_{CP}$ [$_{TP}$ siri [$_{vP}$ mokak də kiyeww-e ?]]].

Siri.$_{NOM}$ what Q read.$_{PAST\text{-}E}$

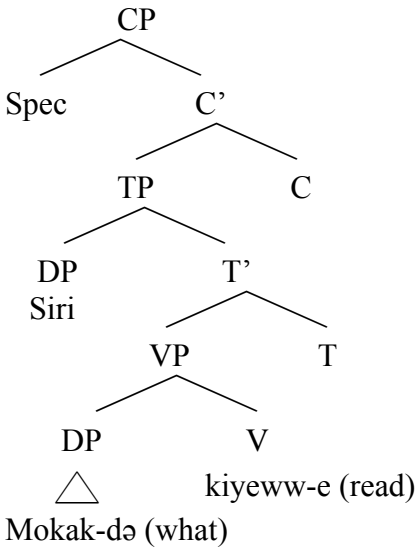
What did Siri read?

(5) [$_{TP}$ meri [$_{CP}$ [$_{TP}$ siri [$_{vP}$ mokak də kiyeww-e kiyəla] kalpəna-kəla.]]].

Mary.$_{NOM}$ Siri.$_{NOM}$ what Q read.$_{PAST\text{-}E}$ that wonder.$_{PAST.A}$

Mary wondered what Siri read.

(6)



The example in (4) shows at least two properties associated with Sinhala wh-questions: (i) in the unmarked case, the particle *də* occurs adjacent to the wh-phrase,[9] and (ii) the verb of a wh-question is obligatorily marked by the *–e* suffix[10] (Kariyakarawana, 1998). This is different from

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expository purposes. Copies of moved elements have been adopted in most minimalist approaches, and they are compatible with the proposals made here.

[7] The example in (2) shows that English matrix wh-question formation also requires an additional syntactic operation (except when a subject wh-phrase moves from Spec-TP to Spec-CP; e.g. *who left?*): the movement of the auxiliary from its Tense head position following the subject to a pre-subject position, formally analyzed as T(ense) to C(omplementizer) head movement in syntax.

[8] Tree structures in this dissertation omit the vP projection, which is not relevant for expository purposes.

[9] According to Kishimoto (2005), the Q-particle is merged with a maximal projection (DP) which includes the wh-phrase: [DP→ DP, *də*]

[10] In the absence of e-marking on the verb, the wh-element functions as an existential quantifier or negative polarity item, depending on the context (see Kariyakarawana, 1998 and Kishimoto, 2005 for discussion). This appears to be a property of (at least some) wh-in-situ languages (see, e.g. Huang, 1995; Watanabe, 2001).

structures with an *–a* suffix on the verb in neutral declaratives and yes/no questions in Sinhala, as illustrated in (7) below:

(7) a. siri potə-k kiyeww-a.
Siri.$_{NOM}$ book-$_{INDEF.ACC}$ read.$_{PAST.}$- A
Siri read a book.

b. siri potə-k kiyeww-a də?
Siri.$_{NOM}$ book.$_{INDEF.ACC}$ read.$_{PRE}$-A Q
Did Siri read a book?

The e-marking on the verb has been treated as a licensing requirement for the wh-element in Sinhala (see Kariyakarawana, 1998). In the absence of it, the wh-element functions as an existential quantifier (8)[11].

(8) sita mokak də kiyeww-a.
Sita. $_{NOM}$ what Q read. $_{PAST.}$- A
Sita read something.

Also, it has been assumed that the *–e* suffix in Sinhala is structure-specific and "cannot occur unless some constituent not including the verb is focused" in a sentence (Gair and Sumangala, 1991, p.94). This has led Gair and Sumangala (1991) and Kariyakarawana (1998) to propose that Sinhala wh-constructions, by default, are also associated with a focus interpretation.

Similar to mono-clausal wh-interrogatives illustrated in (2), complex questions involving Long Distance (LD) wh-movement show the same distinction between the two languages. As is extensively argued in syntactic theory, in a complex wh-question in English such as the one illustrated in (9), the wh-phrase undergoes overt movement to the matrix clause initial position,

[11] It is not uncommon in wh-in-situ languages that a wh-element can have multiple functions depending on the context in which it is used (see, e.g. Huang, 1995; Watanabe, 2001).

from the position in which it is first merged inside the embedded clause. Lack of overt movement yields ungrammaticality in non-echo questions, implying the obligatory nature of this operation (10). Also, as has been extensively argued in generative syntax, Long Distance (LD) wh-movement applies successive cyclically via the embedded Complementizer Phrase(s) (CP):

(9) a. [$_{CP}$ What did [$_{TP}$ Siri say [$_{CP}$ t_i [$_{TP}$ Grace [$_{vP}$ bought t_i yesterday?]]]]

(10) * Siri said Grace bought what yesterday? [non-echo interpretation]

In contrast, in the non-echo question corresponding to (9), Sinhala displays in-situ properties:

(11) [$_{CP}$ [$_{TP}$ Siri [$_{CP}$ [$_{TP}$ amma [$_{vP}$ mokak də genawa] kiyəla]] kiwwe?]]
Siri.$_{NOM}$ mother.$_{NOM}$ what Q bring.$_{PAST}$ that say-$_{E\cdot PAST}$
What did Siri say (that) mother brought?

One question that has been debated in generative syntax, especially after Chomsky's (1977) pioneering work on the phenomenon, concerns why wh-movement appears to be obligatory in some languages but not in others. In this regard, Huang (1982) argued that wh-movement is in fact a universal property of natural languages which is subject to parametric variation. Based on his work on Chinese (also a wh-in-situ language), Huang (1982) argued that languages can be parametrically variant based on whether this movement applies in overt syntax (overt wh-movement) or in the Logical Form (LF) component (covert wh-movement in a wh-in-situ language). In English, wh-movement is phonologically visible because it occurs in narrow syntax. But in wh-in-situ languages such as Chinese, Japanese and Sinhala wh-movement is assumed to take place at LF, after Spell-out maps the syntactic representation to the Phonological Form (PF). Either way, both in English and Chinese the wh-operator, being quantificational in

nature, obligatorily moves to a position from which it can take scope over the entire TP, in its c-command domain.

Evidence for the LF movement of wh-phrases in Chinese comes from the observation that in-situ wh-phrases in Chinese exhibit scopal properties similar to those associated with overtly moved wh-phrases in English. For instance, Huang shows that the embedded wh-phrase in the following Chinese sentence (12) could take either matrix or embedded scope, implying two different LF representations (13):

(12) Zhangsan zhidao [shei mai-le shu]]
Zhangsan know who bought books
a. Who does Zhangsan know bought books?
b. Zhangsan knows who bought books.

(13) a. LF Representation 1: [$_{CP}$ shei [$_{TP}$ Zhangsan zhidao [$_{CP}$ [$_{TP}$ t_i mai-le shu]]
b. LF representation II: [$_{TP}$ Zhangsan zhidao [$_{CP}$ shei [$_{TP}$ t_i mai-le shu]]]

The same ambiguity has been observed in Japanese (Lasnik and Saito, 1984), another wh-in-situ language (Watanabe, 2001, p. 216).

(14) John-wa [dare-ga kita to] omotteiru no ?
John-Top who-$_{NOM}$ came that think Q
a. Who does John think came?
b. John knows who came.

However, at least some wh-in-situ languages are characterized by the absence of this scopal ambiguity, given that they have specific restrictions associated with scope. For instance, in Hindi the scope of a wh-element is clause-bound, implying that an embedded wh-word cannot take

matrix scope[12] (e.g. Dayal, 1994; Mahajan, 1990; Manetta, 2010). This is illustrated with the following example from Mahajan (1990):

(15) *raam-ne soccaa [ki kon aayaa hE] ?
Ram-Erg thought that who come has
Who did Ram think had come?

In terms of scopal properties associated with wh-elements, Sinhala behaves differently from both wh-move languages such as English and those wh-in-situ languages that we have considered here. In Sinhala, the scope of a wh-phrase is reflected on the morphology of one of the verbs in the sentence. That is, whether an in-situ wh-phrase denotes matrix or embedded scope depends on which verb bears *e*-marking. We illustrate this with the following two examples from Kishimoto (2005, p. 5).

(16) Ranjit [kau də aaw-a kiyəla] dann**e**?
Ranjit who Q came-A that know-**E**
Who does Ranjith know came?

(17) Ranjit [kau də aaw-e kiyəla] dannəwa.
Ranjit who Q came-**E** that know-A
Ranjith know who came.

Notice that in (16), with *e*-marking on the matrix verb, the wh-element is obligatorily interpreted in the matrix clause. But in (17), the wh-element denotes only embedded scope, given that *e*-marking falls on the embedded verb. Thus, Sinhala, despite being a wh-in-situ language, exhibits some unique properties in terms of how the scope of a wh-element is denoted.

[12] In Hindi, matrix scope has been argued to be denoted when the wh-word undergoes scrambling into the matrix clause (see Dayal, 1994).

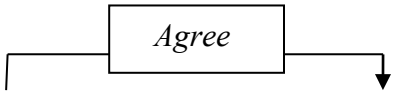
2.3.1 *Wh-movement in Minimalism*

As briefly outlined above, in the Government and Binding (GB) approach to Generative Syntax, the parametric variation between wh-in-situ and overt wh-movement languages is characterized in terms of whether the wh-movement takes place in narrow syntax (e.g. English) or at LF (e.g. Chinese). In contrast, Minimalism accounts for this variation in terms of different feature specifications on functional heads (see e.g. Chomsky, 2001; Richards, 2013).

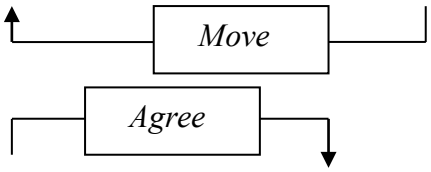
According to the Minimalist Program (Chomsky, 1995 and thereafter), wh-movement involves an agreement dependency between an uninterpretable feature in *C* (the head of the Complementizer Phrase) and a matching interpretable feature in its c-command domain. This dependency can be understood in terms of Chomsky's (2000) Probe-Goal-Agree system. In a wh-interrogative, the functional head *C* has an uninterpretable wh-q feature. This feature acts as a *Probe* to locate its matching interpretable counterpart, which typically occurs on a wh-phrase. Once the closest matching *Goal* is found, the operation *Agree* values/deletes the uninterpretable feature in *C* so that the derivation satisfies the principle of *Full Interpretation* and is legible at the CI interface.

As is generally assumed in Minimalism (see e.g. Richards, 2013), this feature valuation under Probe-Goal-Agree is universal, though it can be subject to parametric variation. In a wh-in-situ language such as Sinhala, the uninterpretable wh-q feature in *C* is valued/deleted via *Agree* without movement. But the same operation in English requires a wh-element bearing an interpretable feature to be merged with *C*. Chomsky (2000) formalizes this additional requirement in English wh-questions in terms of an EPP (Extended Projection Principle) feature in *C*: "The EPP feature of T is universal. For the phase heads v/C, it varies parametrically among languages and if available is optional" (p. 109). In the development of Minimalist theorizing, this

movement-forcing feature, which results in the displacement of a wh-element in languages such as English, has also been represented in different ways, including OCC(urrence) (Chomsky, 2001), *uwh** (Adger, 2003) and Edge Feature (Chomsky, 2007)[13]. Summarizing the discussion so far, this movement forcing feature on the functional head *C,* which we will refer to as *uwh** (following Adger 2003) in this dissertation, can be considered to be the locus of the parametric variation between English and Sinhala wh-interrogatives. Given this, syntactic operations involved in the computation of wh-interrogatives in English and Sinhala are illustrated respectively in (18) and (19) below:



(18) CP [wh] C [~~*uwh**~~ ~~*Q*~~]…….. [vP .. t_i]]].



(19) CP [C [~~*Q*~~]…… [vP ….wh]]].

2.3.2 *Constraints on English Questions: Subjacency*

According to Ross (1967), Long Distance (LD) wh-movement in English, as in (9), is subject to several *island constraints*. An 'island' is considered a syntactic domain from which an element cannot be extracted. Alternatively, it is a domain inside which a trace cannot form association with an antecedent outside the domain. For instance, the following sentence is ungrammatical in English because the complex DP (a DP in which the head noun takes a

[13] In this dissertation, I represent this requirement as *uwh**, following Adger (2003).

sentential complement) serves as a barrier for movement of the wh-phrase to the matrix clause initial position, representing a so-called 'Complex NP Island':

(20) *[$_{CP}$ Which car$_i$ did [$_{TP}$ Mary hear [$_{DP}$ the rumor [t_i $_{CP}$ that you sold t_i?]]]]

Similar to the Complex NP Island in (20), wh-movement is also barred from inside to outside Wh-islands: an embedded CP introduced by a wh-constituent. This is illustrated in (21) below:

(21) *[$_{CP}$ How$_j$ do [$_{TP}$ you wonder [$_{CP}$ which car$_i$ [$_{TP}$ Sara could buy t_i t_j]]]].

Huang (1982) observed that adjuncts also constitute islands for wh-movement:

(22) *[$_{CP}$ who did [$_{TP}$ Ravi enter the building [$_{PP}$ before [$_{TP}$ Jay called t_i]]]].

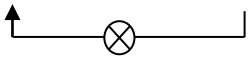
Chomsky (1973 and thereafter) proposed a more general constraint to account for the ungrammaticality associated with Ross' (1967) island violations. This is known as the '*Principle of Subjacency*,' assumed to be a property of UG. Chomsky (1973, p. 247) defines Subjacency as follows:

(23) (a) [...] if X is superior to Y in a phrase marker P [roughly, if X asymmetrically c-commands Y], then Y is 'subjacent' to X if there is at most one cyclic category C … Y such that C contains Y and C does not contain X. Thus, if Y is subjacent to X, either X and Y are contained in all the same cyclic categories or they are in adjacent cycles.

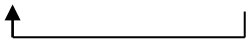
(b). No [movement] rule can involve X, Y, X superior to Y if Y is not subjacent to X.

According to this principle, the movement of a wh-element from Y to X in (24) violates Subjacency given that it crosses more than one bounding node (TP and DP in English) at a time. But in contrast, (25) is grammatical:

(24) … X… [TP… [DP… Y…]]]

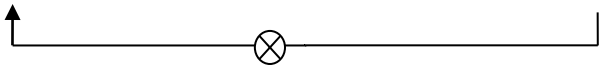


(25) …X… [TP… […Y…]]]



The principle of Subjacency requires that the movement be a local operation that takes place in short cycles via intermediate CPs. If a wh-phrase crosses more than one bounding node (TP and DP) at a time (24), it violates *Subjacency*. The principle of *Subjacency* successfully accounts for the ungrammaticality of (20) above in which the movement of the wh-phrase *which car* from the embedded clause (Y) to the matrix CP (X) crosses two bounding nodes: *TP* and *DP*.

(26) *[$_{CP}$Which car$_i$ did [$_{TP}$ Mary hear [$_{DP}$ the rumor [$_{CP}$ t_i that you sold t_i?]]]]



2.3.3 *Phase Impenetrability Condition*

In Minimalist theorizing, *Subjacency* can be subsumed under the *Phase Impenetrability Condition* (PIC), which Chomsky (2000) considers a 'strong form of Subjacency.' He defines the PIC (27) as follows (Chomsky, 2000, p. 108):

(27) Given HP = [α [H β], take β to be the *domain* of H and α (a hierarchy of one or more Specs) to be its *edge*.[…]

Phase-Impenetrability Condition [PIC]

In phase α with head H, the domain of H [=β] is not accessible to operations outside α, only H and its edge [=α] are accessible to such operations.

The PIC is based on the assumption that as soon as a phase (CP or vP) is complete, its complement undergoes Spell-Out (see e.g. Chomsky, 2000, 2001, 2004; Uriagereka, 1999) and it is only phase (CP and vP) edges that are visible for further syntactic operations. Thus, similar to Subjacency, the PIC requires movement to be local and to take place via the phase edges of *vP*

and *CP*. Under this approach, the phase edge provides an 'escape hatch' for successive cyclic movement of the wh-element[14].

2.3.4 *Constraints on English Questions: Superiority*

In addition to Subjacency, Chomsky (1973, p. 246) observed that in English multiple wh-interrogatives, the movement of one wh-phrase over the other results in ungrammaticality.

(28) $[_{CP}\text{Who}_i\ [_{TP}\ t_i\ [_{vP}\ t_i\ [_{VP}$ bought what?]]]]

(29) *$[_{CP}\text{What}_i$ did $[_{TP}$ who$_k$ $[_{vP}\ t_k\ [_{VP}$ buy t_i?]]]]

Chomsky (1973) proposed the following condition to account for the ungrammaticality in (29):

(30) *Superiority Condition:*

(a) No rule can involve X, Y in the structure. ...X...[... Z...-WYZ ...] ...
where the rule applies ambiguously to Z and Y and Z is superior to Y.

(b) The category A is superior to category B if every major category dominating A dominates B as well but not conversely.

The principle in (30), known as the *Superiority Condition*, imposes a restriction on which a wh-phrase can undergo movement into the Spec-CP position in a context when a clause consists of multiple wh-phrases. According to (30), *who* (Z) in its base position in (28) is superior to *what* (Y) given that every major category (i.e. at least every maximal projection) dominating *who* also dominates *what* (i.e. CP, TP and *v*P) but not conversely (i.e. VP dominates *what*, or its trace position, but not *who*). Given this, the movement of *what* over *who* results in a superiority violation, as shown in the tree structure in (31).[15]

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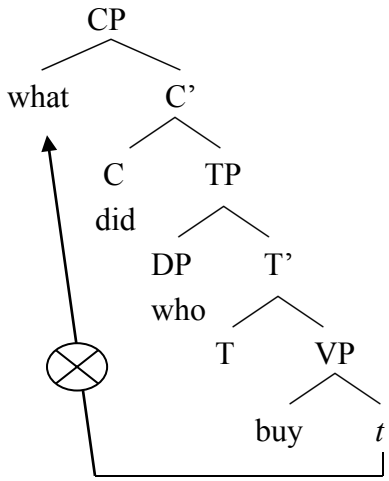
[14] See Boeckx and Grohmann (2004) for a comparison of a barriers approach to Subjacency with the PIC.
[15] However, the Superiority Condition does not apply to discourse linked wh-phrases (see e.g. Pesetsky, 1987):

(31)



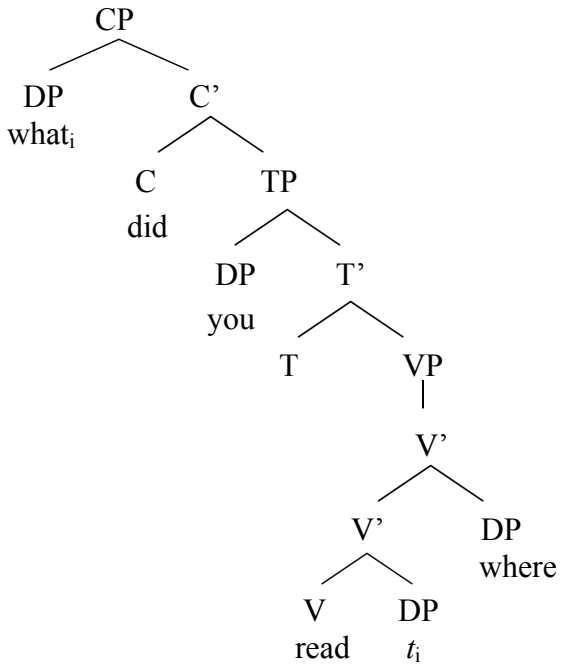
However, as discussed in Lasnik and Saito (1992), Bošković (1997) and other work, even in English the Superiority Condition, as formulated in (30), is not without exceptions. In (32b) below, the superiority condition predicts that the movement of *what* over *where* would yield ungrammaticality, as *where* is merged at a higher position than *what* in the relevant structure. Nevertheless, contra this prediction, either of the two wh-phrases can undergo movement into Spec-CP without yielding ungrammaticality, despite the Superiority violation in (32b).

(32) a. [$_{CP}$ Where did [$_{TP}$ you [$_{vP}$ [read what] t_i]]]?

b. [$_{CP}$ What did [$_{TP}$ you [$_{vP}$ [read t_i] where]]]? (Tree Structure = (33)

(i) a. Mary asked which author wrote which book.
b. Mary asked which book which author wrote.

(33)



Given this, Chomsky's superiority condition has received much discussion both in GB and Minimalist syntax (see e.g. Aoun, Hornstein & Sportiche, 1981; Aoun & Li (2003); Epstein, 1998; Epstein & Seely, 2006; Hornstein, 1995; Lasnik & Saito, 1992). Below we discuss two proposals in the generative syntax literature that have been argued to account for superiority violations in English.

2.3.5 *Relativized Minimality and Minimal Link Condition*

Rizzi (1990, 2001, 2011) proposes a more general constraint to account for locality restrictions associated with movement in syntax, which is known as *Relativized Minimality (RM)*:

(34) *Relativized Minimality*

Y is in a Minimal Configuration with X iff there is no Z such that

(i) Z is of the same structural type as X, and

(ii) Z intervenes between X and Y

(iii) An intervention happens when Z c-commands Y but not X.

RM assumes that a *Minimal Configuration* is formed between two elements (X: *antecedent*, and Y: *Trace*) as long as there is no intervening element (Z) of the same structural type between them. This principle immediately explains the Superiority violation (29).[16] In this sentence (repeated below as (35)), a wh-element *who* (Z) intervenes between a clause fronted wh-element *what* (X) and its trace (Y), obstructing the formation of a chain between the latter two.

(35) *[$_{CP}$ What$_i$ did [$_{TP}$ who buy t_i]]?
X Z Y

However, RM still fails to account for the problematic case that we discussed in (32b), repeated below as (36). Assuming that *what* and *where* are of the same structural type (i.e. wh-elements), if *where* is base-generated at a structurally higher position in the tree, it must prevent the formation of a chain between *what* and its trace, by making it ungrammatical, given RM. Contra this prediction, (36) has been argued to be grammatical at least for some speakers (see e.g. Bošković, 1997; Lasnik & Saito, 1992).

(36) (*) [$_{CP}$ What did [$_{TP}$ you [vP [$_{VP}$ read t_i] where]]]?

Chomsky (1995) proposes a revision to Rizzi's RM in terms of feature specifications on syntactic elements, under the *Minimal Link Condition.*[17]

(37) *Minimal Link Condition*
In the Configuration
… X_{+F}…Z_{+F}… Y_{+F}…

[16] In addition, RM can also account for wh-islands that we discussed earlier. However, as a general locality principle it fails to account for other instances of Subjacency violations.
[17] However, see Rizzi (2001, 2011) for a discussion on how the MLC differs from RM. The main difference between the two is that RM is a more general rule of locality that can be treated representationally, whereas the MLC is formally specified as a condition on derivations. See also Epstein (1986) for an analysis of different approaches to locality.

X_{+F} cannot attract Y_{+F} if there is an element Z_{+F} specified with the same feature +F and closer to X than Y.

According to the MLC, a relation (Attract) between X and Y is intervened by Z if Y and Z are characterized by the same features, as illustrated in (38) below:

(38) [C_{uwh} [... who_{wh}..... $what_{wh}$]] = Superiority violation (35)

However, similar to RM, even the MLC fails to account for the unexpected grammaticality of (36). According to the MLC, in (36), the adjunct wh-phrase *where,* by occupying a higher position in the structure (=33) than *what*, is expected to block the (Probe-goal) relation between the complementizer and *what*, given that both wh-elements are characterized by an interpretable wh-feature.

In summary, both Rizzi's (2001, 2011) Relativized Minimality and Chomsky's (1995) Minimal Link Condition fail to provide an adequate account of the unexpected grammaticality of cases such as (36).

2.3.6 *Obata (2008)*

Drawing insights from Chomsky's (1995 and thereafter) probe-goal system, Pesetsky and Torrego's (2002) case system and the concept of *multiple agree* discussed in Hiraiwa (2001), Obata (2008) proposes the following algorithm to account for the absence of superiority effects in (32).

(39) a. P[α][EPP] < G1[α] < G2[α]

b. P[α][β][EPP] < G1[α] < G2[α][β]

(40) a. [$_{CP}$ Who [$_{TP}$ t_i [$_{VP}$ t_i [read what]]]]?

b. [$_{CP}$ What did [$_{TP}$ you [$_{VP}$ [read t_i] where]]]?

In (39a), the *Probe* (a Complementizer), c-commands Goal 1 (*who*) and Goal 2 (*what*) and both goals are identical in terms of their feature specification: wh-q feature. As a result, *C* attracts the closest c-commanded goal to its specifier position, and this generates (40a). But in (39b) (=(40b)), the *Probe C* matches *what* (G2) better than *where* (G1), in terms of their featural composition. The additional feature that C and *what* share is identified as an uninterpretable Case feature, which is absent from *where*.[18] Thus, *what* becomes a possible candidate for extraction because it has more matching features with C than *where* does, despite the fact that *where* is the closest c-commanded goal. According to Obata, maximizing match and maximizing locality compete with each other, effectively allowing either *where* or *what* to move. As a consequence, the order in (40b) becomes possible. This system, thus, allows the movement of either of the wh-phrases for different reasons. Obata (2008) identifies this as an instance when "the two fundamental principles of the strong minimalist thesis are competing against each other: the closest element G1 should be chosen to reduce computational complexity (minimal search) but the best matching element G2 should be chosen to maximally satisfy the interface conditions at this stage of the derivation (cf. Poole's (1996) Total Checking Principle) (p. 6). In Chapter 4, we will revisit this proposal in the context of our experimental study on wh-movement in English.

[18] This is based on Pesetsky and Torrego's (2002) proposal that *C* also has an uninterpretable Case feature, similar to arguments.

2.3.7 *Locality Constraints in Sinhala Wh-questions*

We observed earlier in the discussion that Sinhala is a *wh-in-situ* language (Gair, 1998; Gair & Sumangala, 1991, Hettiarachchi, 2015; Kishimoto, 2005) in which a wh-phrase in the unmarked case stays in situ in the overt syntax, maintaining e.g. an SOV word order (41) for an object wh-question.

(41) [$_{CP}$[$_{TP}$ siri [$_{vP}$ mokak də kiyeww-e ?]]].
Siri.$_{NOM}$ what Q read.$_{PAST-E}$
What did Siri read?

However, wh-questions in Sinhala, similar to non-wh phrases, also allow the OSV word order, as illustrated in (42) below:

(42) mokak də siri kiyeww-e ?
what Q Siri.$_{NOM}$ read.$_{PAST-E}$
What is it that Siri read?

Even though (42a) is superficially similar to overt wh-movement in English, this non-canonical word order in Sinhala is derived through a syntactic operation called *scrambling,* the driving force for which is provided by a different syntactic feature than *uwh** in C. Following Miyagawa's (2009) proposal for Japanese scrambling, Hettiarachchi (2015) argues that clause initial scrambling in Sinhala (OSV) is either topic or focus driven, as further discussed below. For instance, scrambling, unlike wh-movement in English, can apply even to non-wh elements:

(43) a. siri potə kiyewwa.
Siri.$_{NOM}$ book.$_{ACC}$ read.$_{PAST}$
Siri read the book.
b. potə siri kiyewwa.
book.$_{ACC}$ Siri.$_{NOM}$ read.$_{PAST}$
The book, Siri read.

Turning to the issue concerning displacement in wh-question instances, it has been observed[19] that wh-displacement is a also an instance of scrambling (wh-scrambling) in Sinhala (42), unlike wh-movement in English, does not exhibit superiority effects (see Kariyakarawana, 1998, p. 145):

(44) a. siri [kau də mokak də kiwwe kiyəla] kalpəna-kəruwa.
Siri.$_{\text{Nom}}$ who.$_{\text{NOM}}$ what.$_{\text{ACC}}$ say-$_{\text{PAST}}$ that wonder
'Siri wondered who said what.'

b. siri [mokak də kau də t_i kiwwe kiyəla] kalpəna kəruwa.
Siri wondered [what who said].

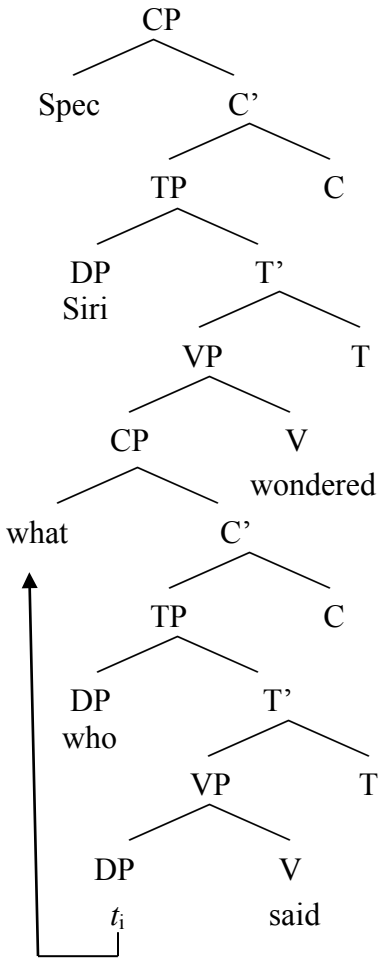
If scrambling in (44a) were driven by the same uninterpretable feature as wh-movement in English, the displacement of *mokak* (what) in (44b) would be expected to show sensitivity to superiority, contrary to fact, also considering that both wh-phrases in this example correspond to arguments, instead of a case argument/adjunct superiority interaction (cf. earlier review of Superiority violations in English). The tree structure in (45) illustrates (with English glosses) the Sinhala example in (44b).

One other source of evidence for the absence of overt wh-movement in Sinhala comes from the status of Subjacency violations in Sinhala. Similar to many other wh-in-situ languages, wh-phrases are allowed inside a variety of syntactic islands in Sinhala (Gair, 1983; Gair & Sumangala, 1991; Kariyakarawana, 1998; Kishimoto, 1997, 2005). We illustrate this with examples from Kishimoto (1997): *Relative clause island* (46), *DP island* (47) and *Adjunct island*

[19] See Takahashi (1993) for the same observation in Japanese.

(48), each one of which is grammatical in Sinhala in a non-echo question, as opposed to the corresponding overt wh-movement case in English.

(45)



(46) oya [[chitra kaa-ʈə dunnə] potə] də kiyewwe?
you Chitra who-$_{DAT}$ gave book Q read
*Who did you read the book that Chitra gave to?)

(47) Chitra [[Ranjith monəwa gatta kiənə] katəkataawə] də æhuwe?
Chitra Ranjith what bought that rumor Q heard
*What did Chitra hear the rumor that R. bought?

(48) [Chitra monəwa kanə koʈə] də Ranjith pudumə unne?
Chitra what ate when Q Ranjith surprise became

'*What was Ranjith surprised when Chitra ate?)

The absence of subjacency violations in Sinhala wh-questions is at least predicted from Huang's (1982) generalization that LF (wh-)movement, unlike overt wh-movement, is only sensitive to the Empty Category Principle (ECP)[20] (Chomsky, 1981), which specifies that a trace must be properly governed by an antecedent or a lexical head. This is also adopting the analysis discussed above that in instances in which there is overt displacement of a wh-phrase in Sinhala, it corresponds to an instance of scrambling, which has been shown not to be sensitive to Superiority violations.

Before concluding this section, we would like to make an observation about island effects (Subjacency) in scrambling in Sinhala. In languages such as Japanese, it has been observed that scrambling is not sensitive to Subjacency (see Bošković & Takahashi, 1998).[21] As first observed in Kariyakarawana (1998), the same is true in Sinhala. Notice that in the following example, the wh-phrase *mokak* 'what' has been scrambled out of a wh-island, yet evades both a Subjacency violation and a Superiority violation.

(49) [$_{CP}$ mokak dəi [$_{TP}$ siri [$_{CP}$ kaudə [$_{TP}$ t_i genawa kiyəla] kiwwe?]]]]
what.$_{ACC}$ Q Siri.$_{NOM}$ who.$_{NOM}$ bring.$_{PAST}$ that say.$_{PAST\text{-}E}$
What did Siri say who bought?

Summarizing our discussion so far, English is a wh-move language in which the overt movement of a wh-phrase to Spec-CP is triggered by an uninterpretable feature (*uwh**) in C. This movement in English is restricted by at least two locality constraints: *Superiority* and

[20] However, for counter evidence, see e.g. Nishigauchi (1986), Pesetsky (1987), Reinhart (1991) and Watanabe(1992).
[21] However, Saito (1985) observes that island constraints are not completely absent in Japanese, even if some island effects in scrambling are weaker.

Subjacency, which in Minimalist syntax are subsumed under the MLC and PIC respectively. Sinhala, by contrast, is a wh-in-situ language. So, the same uninterpretable feature (*uwh**) is absent in the complementizer in Sinhala as is evident by the absence of overt wh-movement in the language. However, Sinhala allows wh-scrambling, which is superficially similar to wh-movement in English. Nevertheless, this operation is not triggered by the same syntactic feature that drives wh-movement in English, as is evident in the absence of superiority and subjacency violations in Sinhala wh-scrambling.

2.4 The Syntax of Relative Clauses

2.4.1 English Relative Clauses

A Relative Clause (RC) is a complex construction in which a Determiner Phrase (DP) (or NP) is modified by a CP complement (see Chomsky, 1977). Some typical examples of English relative clauses are illustrated in (51) below. English is one language that allows the relativization of all points on the so-called Noun Phrase Accessibility Hierarchy (50) proposed in Keenan and Comrie (1977).

(50) *Subjects >Direct Obj > Indirect Obj > Obliques > Genitives > Object of Comparatives*

(51) a. This is the child *who drew the picture of a unicorn.* [Subject]
b. This is a poem *which Mary wrote*. [Direct Object]
c. This is the girl *to whom John gave a present*. [Indirect Object]
d. This is the brush *that Kevin drew the painting with*. [Oblique]
e. This is the manager *whose decision nobody liked*. [Genitive]
f. This is the drama *which Macbeth is more interesting than*. [Object Complement]

A noun that receives modification in an RC is called the head of the relative clause*:* e.g. *child* in (51a). It forms an agreement dependency with the relative pronoun (*who*) that it precedes; its failure to agree with the relativizer results in ungrammaticality:

(52) * This is the book *who pleased everyone.*

Cross-linguistically, there are two main structural types of relativization: *gap strategy* and *resumptive strategy* (Keenan & Comrie, 1977; see also Bhatt, 2002). As we have already observed in (51), English relative clauses are formed via the 'gap strategy': a relative clause contains a gap that could be associated with the relative pronoun. However, as observed by Chomsky (1982), the *resumptive strategy* is also not completely absent in English:

(53) the man who$_i$ John saw him$_i$.

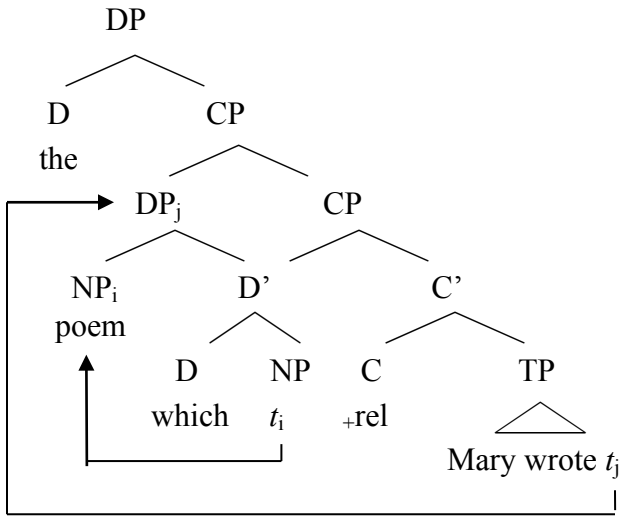
How relative clauses are syntactically derived in English (and other languages) is a significantly debated issue in generative literature (see e.g. Alexiadou, Law, Meinunger & Wilder, 2000; Bhatt, 2000 for a review of different proposals). Starting from the early GB era (see e.g., Chomsky, 1977; Schachter, 1973; Vergnaud, 1974), two main analyses[22] have been proposed to account for English relative clauses: *Raising analyses* (see e.g. Bhatt, 2002; Kayne, 1994; Schachter, 1973; Vergnaud, 1974) and *External Head/(wh-) operator movement analyses* (see e.g. Browning, 1991; Chomsky, 1977; Jackendoff, 1977; Safir, 1981).

[22] In addition to these two kinds of approaches, Matching analyses (see e.g., Chomsky, 1965; Lees, 1960, 1961) also have received some attention in the literature; they share some assumptions with both *raising* and wh-dependency *analyses*. For reasons to be explained later in this chapter, we consider only head raising and operator movement analyses.

2.4.2 Raising Analyses

According to the Raising analyses (see e.g. Bhatt, 2002; Kayne, 1994; Schachter, 1973; Vergnaud, 1974), the modified NP, e.g. *poem* in (51b), is first merged as part of a DP inside the relative clause (i.e. as the object of *wrote*). The surface word order in (51b) is created when the NP *poem* undergoes syntactic movement within its DP (i.e. *which poem*) inside the RC, after which the DP moves into the Spec-CP position, as shown in (54). The relative clause CP, meanwhile, is assumed to be a complement to the D head of the Determiner Phrase (under Kayne's, 1994 analysis). By overt syntactic movement, the NP *poem* forms a chain with its trace inside the RC. Reconstruction of the NP at LF allows it to be interpreted in its base position inside the RC. The proposed structure for English relative clauses under this approach (based on Kayne, 1994) is illustrated in (54) below:

(54)



One source of evidence often cited in favor of head raising analyses such as (54) is binding (e.g. Schachter, 1973). Notice that in the following example (55), if the NP containing the anaphor (*the picture of himself*) is not first merged inside the RC, the sentence is expected to be a violation of the Binding Principle A (56) (Chomsky, 1981), i.e. the anaphor is not bound inside

its local domain. However, assuming that the binding principle applies at LF, raising analyses would predict that the anaphor is bound in this context through reconstruction to its first merged position inside the RC.

(55) The picture of himself *that the child saw* was on the table.

(56) An anaphor must be A-bound in its governing category.
(The governing category for an element α is the minimal XP containing α, its governor and an accessible subject.)

Raising analyses of RCs in English are also supported by the movement of idiom chunks (Bhatt, 2002; Schachter, 1973; Vergnaud, 1974). First consider the following example, as discussed in Schachter (1973):

(57) a. We made headway.
b. The headway that we made was satisfactory.

If idioms are stored in the mental lexicon as syntactic/semantic units, constituent elements of an idiom are required to be in a local relation at LF, i.e. in the corresponding structure (57), the verb (*made)* and its complement (*headway*) must be in a sisterhood relation. This is observed in (57a). Given this, (57b) can be grammatical only if *headway* is first generated as the complement of the verb (*made*) inside the RC, before it is displaced to occupy the Spec-CP position. If not, the two constituent elements of the idiom fail to be in a local relation at LF. Thus, the grammaticality of (57b) provides further evidence for a head raising analyses in English RCs.

As first discussed in Bhatt (2002), additional evidence for the raising analyses in English relative clauses comes from adjectival modifiers. Bhatt (2002) observes that the following English example is ambiguous between *high* and *low* readings for the adjectival modifier.

(58) The first book that John said that Tolstoy had written
Low reading: X is the first book that Tolstoy wrote.

High reading: X is the first book about which John said that Tolstoy had written (it).

As Bhatt (2002) argues, this ambiguity in (58) arises from a chain created by the movement of the DP *(the first book)* from its base position (inside the RC) to the surface position (matrix Spec-CP). The low reading for the DP *the first book* is obtained when the lower copy inside the embedded TP2 receives an interpretation. The high reading is possible when the copy in the intermediate position (TP1) is interpreted. Thus, if the DP *the first book* is not generated inside the lower TP, this ambiguity remains unexplained.

(59) $[_{DP}\ [\ _{CP}\ [_{DP}$ The first book] that $[_{TP1}$ John said $[_{CP}\ t_i$ that $[_{TP2}$Tolstoy had written $t_i\ ]]]]$

Other evidence for Raising analyses of RCs comes from subcategorization, scopal reconstruction and variable binding (see Alexiadou et al., 2000 and Bhatt, 2002 for a review of these arguments).

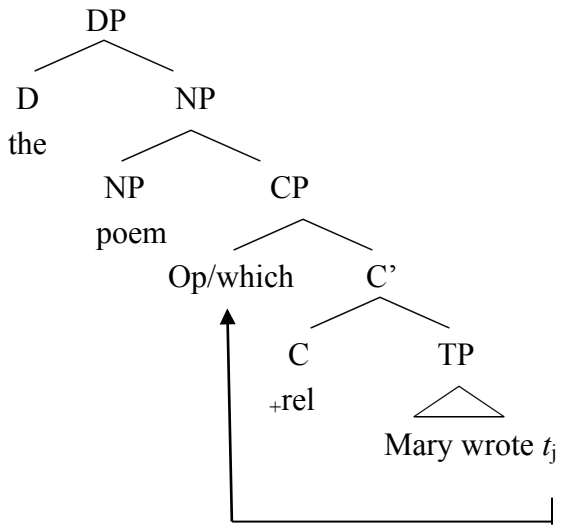
2.4.3 External Head/Operator Movement Analyses

Despite the evidence for raising analyses reviewed in the previous section, the dominant view in generative syntax has been that relative clauses in English (and many other languages) are derived through wh-movement, following Chomsky (1977). This proposal (see also Browning, 1991; Jackendoff, 1977; Safir, 1981) is primarily based on three main assumptions: (i) the NP head of a relative clause is base-generated outside the CP, (ii) the relativizer is first merged inside the relative clause and subsequently it undergoes wh-movement[23] to occupy the Spec-CP

[23] Under Minimalism, it is generally assumed (though arguably) that wh-movement in English relative clauses is not different from canonical wh-movement that was discussed in the previous section: in both instances, the movement is driven by an uninterpretable edge feature (uwh*) in C (see Chomsky, 2001). Still, wh-movement in RCs is

position, and (iii) the NP and the wh-phrase are linked through some form of co-indexation. Further, in the absence of an overt relativizer, a null operator (OP) undergoes the same kind of movement. The proposed structure for an English RC under this approach is illustrated in (60).

(60)



Evidence for wh-movement analysis of English RCs comes from at least two observations (see Alexiadou et al., 2000). Similar to canonical wh-movement, relative clauses also allow LD dependency formation, as illustrated in the following example:

(61) a. This is the story *which his father read* yesterday.
b. This is the story *which the child said his father read* yesterday.
c. This is the story *which Mary believes that the child said that his father read* yesterday.

Moreover, relative clauses, similar to canonical wh-dependencies, are subject to island constraints in English (Ross, 1967): *Complex NP constraint* (62a), *Relative clause island* (62b), *and Wh-island* (62c).

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different from canonical wh-movement (as discussed in the previous section), at least in two respects (e.g. Alexiadou et al., 2000, p. 2). Wh-dependency in RCs:

(a) is not interrogative semantics.
(b) serves to link a position inside the clause and an item outside that clause.

(62) a. *This is the story *which the child made the claim that his father read* yesterday.

b. * This is the story *that the horse kicked the man who read.*

c. * This is the book *that Mary wondered how Max read.*

To sum up, how relative clauses are derived in English (and other languages) is an unsettled issue in generative syntax. The approaches that we have reviewed at least converge on the assumption that relative clauses in English are derived through some form of syntactic movement. The disagreement is on whether it is the relativizer/operator or the NP that undergoes movement. There is compelling evidence for both kinds of approaches (see e.g. Bhatt, 2003). In both approaches, the movement is sensitive to Subjacency violations. However, in this study, following a standard view in generative syntax literature (Chomsky, 1977 and thereafter), we assume that RCs in English are derived through wh-movement. This movement, similar to canonical wh-movement, involves an agreement dependency between an uninterpretable syntactic feature (*uwh**) in C and its interpretable counterpart on the relativizer/wh-phrase.

2.4.4 Sinhala Relative Clauses

A typical relative clause in Sinhala is illustrated in (63) below. As assumed in Chandralal (2010), Henadeerage (2002) and Walker (2006), Sinhala RCs, similar to those in English, are formed using the 'gap strategy.'

(63) [siri-tə magə-di hamu-unə] miniha.
siri-$_{DAT}$ way-on met.$_{REL}$ man.$_{NOM}$
The man who Siri met on the way

There are three main properties that characterize Sinhala relative clauses. First, unlike in English, relative clauses are pre-nominal in Sinhala, i.e. the clause precedes the noun that it modifies. Second, an overt relativizer is absent in Sinhala RCs. Finally, the verb of the embedded

clause takes a non-finite form (Chandralal, 2010; Walker, 2006). In terms of the typology of relative clauses, these properties have been found to be common in many other SOV languages too (see e.g. Alexiadou et al., 2000; Comrie, 1989; Kwon, 2009; Mahajan, 2000).

Earlier we observed that English allows the relativization of any point on Keenan and Comrie's (1977) Noun Phrase Accessibility Hierarchy (NPAH). The same is observed in Sinhala (see Chandralal, 2010; Henadeerage, 2002; Walker, 2006).

(64) a. [unicorn-ge pinthure ændəpu] laməya me inne. [Subject]
unicorn-of picture.$_{ACC}$ draw.$_{REL}$ child this is
This is child who drew the picture of a unicorn.

b. [meri liyəpu] kawiya me thiyenne. [Direct Obj]
Mary.$_{NOM}$ write.$_{REL}$ poem this is
This is poem that Mary wrote.

c. [siri thægga-k dipu] laməya me inne. [Indirect Obj]
Siri.$_{NOM}$ present.$_{INDEF-ACC}$ give.$_{REL}$ child this is
This is the girl to whom Siri gave a present.

d. [kevin pinthure ændəpu] brash-ekə me thiyenne. [Oblique]
Kevin.$_{NOM}$ painting.$_{OBL}$ draw.$_{REL}$ brush-$_{DEF}$ this is
This is the brush that Kevin drew the painting with.

e. [kauruwath thirenəyə-tə akamæthi-wechchə] mænejər me inne. [Genitive]
nobody.$_{NOM}$ decision-$_{DAT}$ dislike.$_{REL}$ manager this is
This is the manager whose decision nobody liked.

f. [Macbeth-tə wada rasawath] drama-ekə me thiyenne. [Object Comparative]
Macbeth-$_{DAT}$ than interesting drama-$_{DEF}$ this is
This is the drama which Macbeth is more interesting than.

Finally, one important observation (see Chandralal, 2010) is that Sinhala, similar to Japanese (e.g. Kuno 1973; Murasugi, 2000) and Korean (e.g. Han & Kim, 2004; Kwon, 2008), allows

double relativization, which arguably constitute instances of wh-island violations within RCs in Sinhala, as in the embedded RC2 in the following example adapted from Chandralal (2010, p. 134):

(65) [$_{RC1}$[$_{RC2}$ t_i t_j igənə-gattə] paadəmə$_j$ amətəkə-wechchə] lamai$_i$

learn.$_{REL}$ lesson.$_{ACC}$ forget.$_{REL}$ children

Children who forgot the lesson that (they) learnt.

2.4.5 Analysis of Sinhala Relative Clauses

As far as we are aware, no theoretical syntactic analysis has been previously proposed for relative clauses in Sinhala. The discussion of this phenomenon in current literature is limited to providing descriptive generalizations. Given this, in this section we provide an analysis of Sinhala RCs, as background for the experimental studies reported in Chapter 6. Even though the goal of this section is not to provide a full-fledged analysis of Sinhala relative clauses, we present arguments that favor a non-movement analysis for them.

Let's first consider movement approaches to English relativization that we reviewed in section 2.4.1. Recall that the External Head/Wh-movement analysis assumes that a relative clause in English is derived when the relativizer/operator raises from its first merged position (inside the RC) to the Spec-CP position. The operator/relative pronoun, thus displaced, can be reconstructed at LF for interpretation. In contrast, under head raising analyses, it is the NP head that undergoes syntactic movement from its base position (inside the RC) to Spec-CP position. However, both analyses can accurately account for the Subjacency violation in the following English example — i.e. regardless of whether it is the head NP or the null operator that moves to occupy the spec-CP position, this movement of the head/operator corresponding to 'the story' has to cross more than one bounding node at a time.

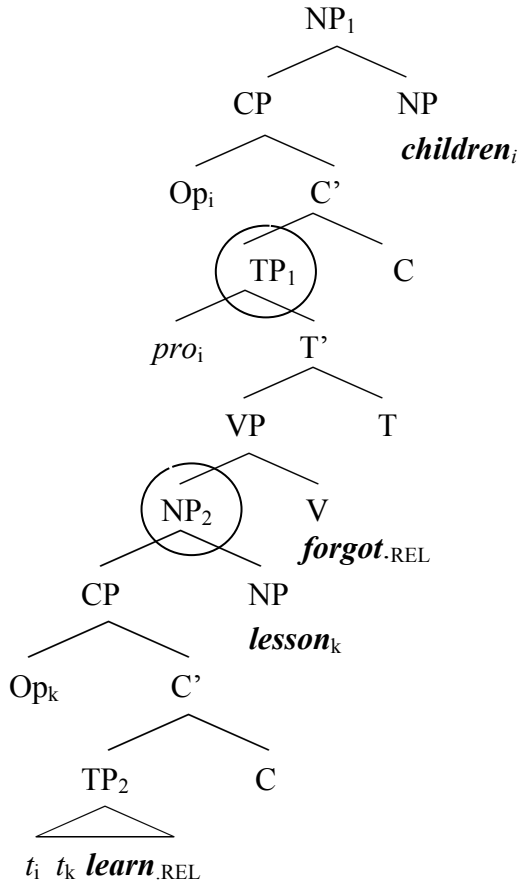
(66) * This is [$_{NP}$ the story$_j$ [$_{CP}$ that [$_{TP}$ the horse kicked [$_{NP}$ the man [$_{CP}$ who$_i$ [$_{TP}$ t_i read t_j]]]

Given what we have observed in English, one possibility to consider is whether Sinhala relative clauses, similar to those in English, can be generated by syntactic movement, namely *wh-movement* or *head raising*. Given that Sinhala does not have overt relativizers, the wh-movement approach would predict that RCs in Sinhala are derived through null operator movement to Spec-CP. In contrast, head raising analyses would predict that the head of the relative clauses is first merged inside the RC in Sinhala, before it raises to Spec-CP. If operator movement or head raising is indeed responsible for the generation of Sinhala relative clauses, they are expected to be sensitive to island constraints, an observation that we have already made for English. However, this prediction is not borne out in Sinhala. As we observed in (65), Sinhala allows instances of double relativization which would involve an island violation for the operator or the head NP that raises from inside the lower RC to a position in the higher RC — i.e. no matter whether it is the operator or the head that raised to cross more than one bounding node at a time. We illustrate this in (65), represented in (67) (a partial structure of Sinhala with English words), although we will show evidence against the RC movement analysis for Sinhala in the discussion that follows.

In Sinhala, grammatical counterparts of Subjacency violations in RCs are not limited to instances of double relativization. They are also found in regular relative clauses in the language, with different types of islands, as shown in (68) to (70):[24]

[24] However, similar to English, the Coordinate Structure Constraint cannot be violated in Sinhala RC.
(1) a. laməya-tə amathəkə-unə potə saha pænə.
child-$_{DAT}$ forget.$_{REL}$ book.$_{ACC}$ and pen.$_{ACC}$
The book and the pen that the child forgot

(67)



(68) [thatha __$_i$ kiyewwa kiyənə prakasəyə laməya karəpu] katawə$_i$
father.$_{NOM}$ read.$_{PAST}$ that claim child.$_{NOM}$ make.$_{REL}$ story
*the story *which the child made the claim that his father read*

(69) [siri __*i* kohomədə kiyewwe kiyəla geeta kalpana-karəpu] potə
Siri.NOM how read.$_{PAST}$ that Geeta wonwer.REL book

---

b. [*laməya-tə potə saha amathəkə-unə] pænə
child-$_{DAT}$ book.$_{ACC}$ and forget.$_{REL}$ pen.$_{ACC}$

*the book *that Geetha wondered how Siri read.*

(70) siri kanə koʈə] Ranjith pudumə unnə malu?
Siri.$_{NOM}$ eat when Ranjith surprise become.$_{REL}$ fish
*the fish *which Ranjith was surprised when Siri ate*.

The absence of subjacency effects that we have observed here is problematic for any movement analysis of Sinhala relative clauses.[25] Further, a head raising analysis cannot be maintained for Sinhala RCs at least for three additional reasons.

First, let's consider the argument about idiom chunks. In the English example in (71) (repeated from (57b)), the idiomatic reading is retained because the head NP (*headway*) can be reconstructed to its first-merged position so that the two constituent elements of the idiom are in a local relation at LF (Vergnaud, 1974). This reconstruction evidence suggests that the head NP has undergone syntactic movement from a position inside the RC to its surface position in the structure.

(71) The headway that we made was satisfactory.

But in some languages, such as Korean (Kwon, 2008), it has been observed that idiom chunks cannot be relativized, i.e. an idiom loses its idiomatic reading under relativization. The same observation holds in Sinhala. We illustrated this with the following Sinhala example in which the idiom is italicized. Notice that in contrast to (72a), the relativized version in (70b) can only convey a literal meaning.

(72) a. samaharə minissu *ævilena gindara-tə piduru danəwa*.
some people.$_{NOM}$ burning fire-$_{DAT}$ straw.$_{ACC}$ put.$_{PRE}$
Some people contribute to the destruction of others/things.

[25] This is assuming that Sinhala has the same bounding nodes (TP and DP) as in English.

b. *samaharə minissu ævilena gindara-tə* __$_i$ *danə* piduru$_i$
some people.$_{NOM}$ burning fire-$_{DAT}$ put.$_{REL}$ straw.$_{ACC}$
Straw that some people put into the bonfire

Thus, unlike in English, idiomatic expressions lack one form of evidence to support a head raising analysis for Sinhala RCs.

Second, anaphor binding also does not show evidence for head raising in Sinhala RCs. As we discussed earlier, in the following English example, the LF reconstruction of the head DP accounts for the satisfaction of Binding Principle A. But a similar example in Sinhala is degraded in grammaticality.[26]

(73) The picture of himself *that the child saw* was on the table.

(74) ??[laməya t_i dækəpu] thaman-ge pinthure
child.$_{NOM}$ see$_{t.REL}$ self-$_{GEN}$ picture
Self's book that the child forgot.

Finally, the test of adjectival modification (Bhatt, 2002) that we reviewed for English shows different results in Sinhala. Recall that the following sentence in English is ambiguous given that the head NP could either be interpreted in the higher clause (high reading) or the lower clause (low reading). But its Sinhala counterpart (75) has only the 'high reading', implying that a head movement analysis is problematic for Sinhala RCs.

(75) [[Tolstoy liwwa kiyəla] siri kiyəpu] paləmu potə
Tolstoy.$_{NOM}$ write.$_{PAST}$ that Siri.$_{NOM}$ say.$_{REL}$ first book
The first book about which Siri said that Tolstoy had written.

[26] This has also been observed for e.g., Japanese (Hoji, 1995) and Swedish (Platzack, 2000).

Summarizing our discussion so far, the absence of subjacency effects along with the results from idiomatic chunks, anaphor binding and adjectival modification tests disfavors a movement analysis of Sinhala relative clauses. Given this, following what has been proposed for some other SOV/wh-in-situ languages in which relative clauses bear similar properties, mainly Japanese and Korean (Fukui & Takano, 2000; Kang, 1986; Kwon, 2008; Murasugi, 1991; Sohn, 1980), we assume that relative clauses in Sinhala are not derived through syntactic movement. Therefore, the gap in a Sinhala RC is not a copy/trace left by head movement or operator movement. Rather, it is a null pronominal (*pro*) element base-generated inside the RC. This element is A-bar bound by a null operator base-generated in the Spec-CP position or the NP that heads the relative clause (78). Further, the heading NP, as assumed in wh-movement analyses for English (Chomsky, 1977), is also base-generated in its surface position. Under this proposal, a relative clause in Sinhala has a non-movement derived structure as in (78).

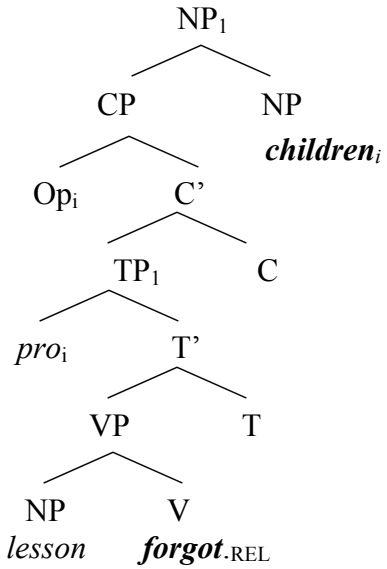
This analysis immediately accounts for the absence of island effects in Sinhala. If either the operator or the head NP does not undergo movement, island effects are not predicted. On the other hand, if the NP were generated inside a RC and subsequently underwent movement into its surface position, reconstruction effects should be observed in binding, idioms and adjectival modification in Sinhala relative clauses, contrary to fact.

(76) $[_{CP}$ Op_i $[_{TP}$ pro_i paadəmə amətəkə-wechchə] $lamai_i$
lesson$_{.ACC}$ forget$_{.REL}$ children
Children who forgot the lesson

Evidence for this analysis in other languages also comes from the observation that pro in a RC can be replaced with an overt anaphor (see e.g. Fukui & Takano 2000; Han & Kim, 2004; Kwon, 2008). The same is observed in Sinhala.

(77) [$_{CP}$ Op$_i$ [$_{TP}$ *pro*$_i$/thaman-tə paadəmə amətəkə-wechchə] lamai$_i$
self-$_{DAT}$ lesson$_{.ACC}$ forget.$_{REL}$ children.$_{NOM}$
'Children who forgot the lesson…'

(78)



If the gap inside the RC were a trace/copy left by movement, (77) would be expected to be ungrammatical in Sinhala. Also, notice that in the alternative with an overt anaphor in the subject position of the relative clause, the anaphor bears dative case — as required by the verb *amətəkə-wenəwa* 'forget' in Sinhala — whereas the head NP bears nominative case. From a theoretical point of view, the absence of the DAT case on the head noun would also be problematic if it indeed started inside the RC — i.e. it would be expected to receive the inherent dative case from the verb before it raised to occupy a higher position.[27]

Given our discussion so far, in this study, we make the following assumptions/predictions:

[27] See Chou and Hettiarachchi (2012) for a discussion of this phenomenon.

(a) Sinhala relative clauses, unlike their English counterparts, are not derived through syntactic movement. They are derived by the base-generation of a null *pro* in the gap position.

(b) Thus, the gap in a Sinhala RC is not a copy/trace left by the movement of an empty operator or NP head raising.

(c) Unlike in English, relative clauses in Sinhala do not show subjacency effects.

2.5 Syntax of Topicalization

As background for our experimental study on topicalization in Chapter 6, in this section we discuss the operation of topicalization, as instantiated in English and Sinhala.

2.5.1 Definition of 'Topic'

In this study, we adopt the following definition of topic[28] from Vermeulen (2010, p. 2):

(79) A sentence topic is a syntactic category that newly introduces a referent as to what the rest of the sentence is about.

According to this definition, in the English example in (80a), *Mary* functions as the topic of the sentence, i.e. it is a sentence about Mary. But in contrast to (80a), the example in (80b) has a new topic, the fronted NP *a book.* Given this, (80b) is a sentence about the apartment door rather than Mary[29].

(80) a. *Mary* forgot to lock the apartment door.
b. *The apartment door*, Mary forgot to lock.

[28] In this study, we use the use term *topic* to refer to *sentence topic* in contrast to *discourse topic*, a different notion not relevant for our current discussion.

[29] See Reinhart (1982, p. 3) for the discussion that the syntactic position occupied by an element is not a sufficient indicator of whether it functions as the topic of a sentence. For instance, in *Max saw Rosa yesterday,* either Max or Rosa can be the topic depending on which question is asked: *Who did Max see yesterday* (Topic: Max), *Has anybody seen Rosa yesterday* (Topic: Rosa).

As Reinhart (1981) elaborates, sentence topic can also be understood as the answer to X in the following request (but see e.g. Vermeulen, 2010, for discussion about a typology of topics that will not be relevant to the research presented here):

(81) a. Tell me about X (Grace).
b. Well, Grace is absent today.

To sum up, for our proposals in this study, topic can be understood as a phrasal constituent about which something additional is stated.

2.5.2 Syntactic Topicalization in English

Topicalization is another syntactic phenomenon in English that has received extensive discussion in the generative syntax literature (e.g. Chomsky, 1977; Grohmann, 2003; Haegeman, 2004; Lasnik & Saito, 1992; Platzack, 2004). It can be defined as an A-bar movement operation by which a phrasal element (XP) is displaced from its base-generated position to occupy a clause-initial position. By this displacement, it functions as the topic of the sentence. This is illustrated with the following example (repeated from (80)):

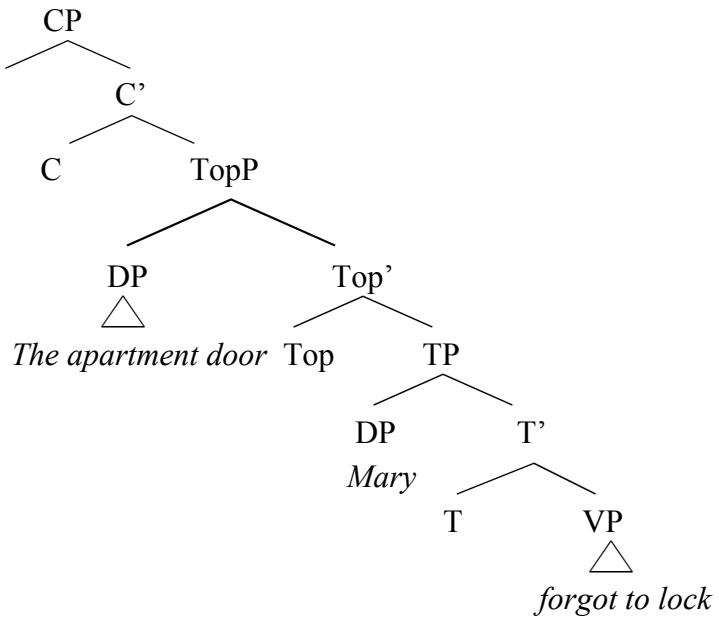
(82) *The apartment door*, Mary forgot to lock.

Following Rizzi's (1997, 2001, 2004) *Split CP Hypothesis*[30], one approach in the generative literature (see e.g. Grohmann, 2003; Haegeman, 2004; Müller, 2011; Radford, 2009) has been that a topicalized phrase in English occupies the specifier position of a *Topic Phrase,* which is

[30] According to this hypothesis, the CP structure consists of several different functional projections including *Force Phrase*, *Focus Phrase*, *Topic Phrase* and *Finiteness Phrase.*

one of the various projections in the CP[31] domain. Under this approach, the structure for a topicalized sentence in English can be illustrated as in (83)[32]:

(83)



In the same way we have observed for *wh-movement* and *relative clauses*, topicalization in English allows unbounded dependencies (84a).[33] Further, it also shows subjacency effects (e.g. Chomsky, 1977; Haegeman, 2004; Müller, 2011). We illustrate this with the following examples from Phillips (2013, p. 4) for a *Relative clause island* (84b) and an *Adjunct island* (84c).

(84) a. [$_{CP}$ Those chapters, [$_{TP}$ most students agree [$_{CP}$ that [$_{TP}$ you can safely skip $t_{i.}$]]]]

b. [* $_{CP}$ Those chapters$_i$, [$_{TP}$ most students discovered [$_{DP}$ a web site that summarizes $t_{i.}$]]]]

c. [* $_{CP}$ Those chapters, [$_{TP}$ most students know [$_{CP}$ how to pass the exam [$_{CP}$ without reading $t_{i.}$]]]]

[31] However, for an alternative view, see Lasnik and Saito (1992).
[32] In the tree we have excluded functional projections which are irrelevant for our discussion.
[33] However, English topicalization is different from Left Dislocation (e.g. *John$_i$, I like him$_i$*), which is not formed through syntactic movement (see Chomsky 1977).

Further, as observed in Müller (2011, p. 50), topicalization in English is also disallowed from an embedded clause in which an XP has already been topicalized.

(85) a. [$_{CP}$ *This book* [$_{TP}$ Mary thinks [t_i $_{CP}$ that Bill gave t_i to John.]]]

b. [$_{CP}$ **This book*$_i$ [$_{TP}$ Mary thinks [t_i $_{CP}$ that *to John*$_j$ Bill gave t_i t_j]]]

In this way, (85b) is similar to the wh-island constraint violation which prohibits wh-movement out of an embedded clause in which the Spec-CP position is occupied by a wh-word:

(86) [$_{CP}$ *How do [$_{TP}$ you wonder [$_{CP}$ whether [$_{TP}$ Mary knows the secret]]]]?

Despite this similarity, topicalization is different from wh-movement in terms of Weak Cross Over (WCO) effects (see Lasnik & Stowell, 1991), i.e. unlike wh-movement, topicalization in English does not trigger WCO violations[34]:

(87) a. *Who$_i$ does his$_i$ mother like t_i?

b. This book$_i$, I expect [its$_i$ author] to buy t_i.

In summary, *topicalization* in English is an A-bar movement operation. The topicalized element in the language typically occupies the specifier of the Topic Phrase. Further, similar to other kinds of A-bar dependencies, topicalization in English is also subject to island constraints. However, it is different from wh-movement in terms of WCO effects.

2.5.3 Topicalization in Sinhala

Sinhala uses two different strategies to denote the topic of a sentence. Under the first strategy, an XP receives the morphological topic marker *–naŋ,* a suffix that can be attached to any XP (except the VP) regardless of which syntactic position that it occupies (see Chandralal, 2010;

[34] A WCO, originally referred to as the Leftness Condition (Chomsky, 1976), is observed when the trace (tail of a chain) fails to c-command a pronoun with which it is co-indexed.

Hettiarachchi 2015; Kariyakarawana, 1998). In the following example, (88a) shows a neutral sentence while (88b) and (88c) illustrate instances of subject and object topicalization,[35] respectively.

(88) a. Sarath kawiya-k liyuwa.
Sarath poem-$_{\text{INDEF.ACC}}$ write.$_{\text{PST}}$
Sarath wrote a poem.

b. Sarath-naŋ kawiya-k liyuwa.
Sarath-$_{\text{TOP}}$ poem-$_{\text{INDEF.ACC}}$ write.$_{\text{PST}}$
As for Sarath, he wrote a poem.

c. Sarath kawiya-k naŋ liyuwa.
Sarath.$_{\text{NOM}}$ poem-$_{\text{INDEF.TOP}}$ write.$_{\text{PST}}$
As for a poem, Sarath wrote it.

As Hettiarachchi (2015) observes, in the presence of the topic marker *–naŋ,* the most natural reading for a sentence is the contrastive topic interpretation.

However, our main focus in this section is on the second strategy employed in Sinhala to denote a topic interpretation. For reasons to be discussed later, this operation, as illustrated in (89) below, is at least superficially similar to *topicalization* in English, i.e. it involves overt syntactic movement of the object from its base-generated position to a clause-initial position (see Gair, 1983; Hettiarachchi, 2014; Kariyakarawana, 1998):

(89) kawiyə$_{\text{i}}$, sarath t_{i} liyuwa.
poem-$_{\text{ACC}}$ Sarath.$_{\text{NOM}}$ write.$_{\text{PAST}}$
The poem, Sarath wrote.

[35] In this section, we use the term *topicalization* in a loose sense, to refer to the operation/s by which a topic interpretation is derived in Sinhala. However, as we will show later in the discussion, this operation/s in Sinhala has some different properties from the phenomenon referred to as *topicalization* in English.

Also, similar to its English counterpart in (80b), this sentence denotes a topic reading for the clause fronted NP (see Hettiarachchi, 2015). Evidence for this comes from the observation that unlike the canonical word order in (88a), the sentence in (89) cannot be an answer to the request in (90a), i.e. the answer is infelicitous. But it is an appropriate answer for (90b) (based on Reinhart (1991), *tell me about x*):

(90) a. Tell me about Sarath.

#kawiyak$_i$, sarath t_i liyuwa.
poem-$_{ACC}$ Sarath.$_{NOM}$ write.$_{PAST}$

b. Tell me about the poem.

kawiya$_i$, sarath t_i liyuwa.
poem-$_{ACC}$ Sarath.$_{NOM}$ write.$_{PAST}$

Compare this with the English counterpart in (91), which shows the same restriction as to what can be an appropriate answer for questions given in (92):

(91) a. Mary forgot to lock the apartment door.

b. *The apartment door*, Mary forgot to lock.

(92) a. Tell me about Mary. / # *The apartment door*, Mary forgot to lock.

b. Tell me about the apartment door. / *The apartment door*, Mary forgot to lock.

Thus, similar to the topicalized English example in (91b), the Sinhala example in (89) denotes a topic reading for the fronted object. However, the general assumption in the Sinhala syntax literature is that the OSV word in (89) is derived through a different syntactic operation than topicalization (see Section 2.5.2). As we discussed in the context of wh-movement, this operation, which involves overt movement, is known as constituent *scrambling* (Chandralal 2010; Gair 1998; Kanduboda 2011; Kariyakarawana 1998; Kishimoto 2005; Sumangala 1992), an operation the syntactic status of which has been debated in generative syntax for a few decades (see e.g. Bošković 2004; Bošković & Takahashi, 1998; Dayal, 1994; Karimi, 2005;

Mahajan, 1990; Miyagawa, 2003, 2009; Saito, 1985). The major debate concerns whether this kind of object scrambling[36] involves A-movement or A-bar movement. Following Dayal (1994) for Hindi, Karimi (2005) for Persian and Saito (1985) for Japanese, Hettiarachchi (2015) argues that Sinhala object scrambling in (90), similar to topicalization in English, is characterized by A-bar properties. Evidence for this argument comes from *binding*, the potential for *reconstruction* and *parasitic gaps*. Here we provide the details of the argument from binding.

Based on the fact that a scrambled object in Hindi can serve as an antecedent for a reflexive in the subject position, Mahajan (1990) argues that a scrambled object in Hindi (local scrambling) undergoes A-movement. But the application of the same test in Sinhala yields a different result.

(93) a. *thaman-ge$_i$ malli sunil-wə$_i$ taume-di dækka.
self-$_{GEN}$ brother.$_{NOM}$ Sunil-$_{ACC}$ town-in see.$_{PST}$
*Self's$_i$ brother saw Sunil$_i$ in town.

b. *sunil-wə$_i$ thaman-ge$_{ij}$ malli t_j taumedi dækka.
Sunil-$_{ACC}$ self-$_{GEN}$ brother.$_{NOM}$ town-in see.$_{PST}$

The ungrammaticality of (93a) shows that Sinhala, similar to English, does not allow an anaphor to be a part of the subject of a finite clause, arguably because in that position it is not bound by a c-commanding antecedent in its binding domain. In addition, if scrambling in Sinhala were A-movement, (93b) would be expected to be grammatical: the scrambled object, which now occurs in a position c-commanding the anaphor, should A-bind it in its governing category. The

[36] For ease of exposition, in the rest of the discussion, we will use the term scrambling to refer to the operation that derives the (OSV) word order in Sinhala. However, 'scrambling' is an ambiguous term that refers to a wider variety of syntactic operations (see Bošković 2004).

ungrammaticality of the scrambled sentence in (93b) suggests that the scrambled element is in an A-bar position, a position from which an element cannot A-bind an anaphor. Further evidence for this hypothesis comes from (94) below, which illustrates that a sentence in Sinhala can be grammatical despite the (A-bar) scrambling of a phrase with an anaphor to a sentence initial position (94b).

(94) a. demawpiyo$_i$ thaman-ge$_i$ lamai-tə adarei.
parents.$_{NOM}$ self-$_{GEN}$ children-$_{DAT}$ love.$_{PRE}$
'Parents$_i$ love self's$_i$ children'

b. [thaman-ge$_i$ lamai-tə]$_j$ demawpiyo$_i$ t_i adarei.

If Condition A were applied in narrow syntax after overt movement occurs, (94b) would be expected to be a violation of Binding Principle A, because the anaphor in that position is not bound by any antecedent. We assume that the binding requirement in (94b) is fulfilled at LF through reconstruction. Reconstruction, as discussed by Chomsky (1992), Huang (1993) Mahajan (1990) and many others, is a property associated with A-bar movement. Thus, both the ungrammaticality of (93b) and the grammaticality of (94b) indicate that scrambling in each of the above cases involves A-bar movement. Dayal (1994) makes the same argument for Hindi.

Also, Sinhala object scrambling can license parasitic gaps, another property associated with A-bar but not A-movement.[37]

[37] A parasitic gap, as first discussed by Engdahl (1983, p. 1), refers to a null element (a trace) inside an adjunct whose presence has to be licensed by the existence of another null element in the sentence (a-b). According to Chomsky (1982) and Mahajan (1990), a parasitic gap can only be bound by an antecedent in an A-bar position (cf. c-d).

a. Which article did you file…… without reading…….?
b. This is the kind of food you must cook….. before you eat…..
c. *John was killed t by a tree falling on e.

(95) parənə karekəi sara [t_i hadanne nætuwa] t_i wikunuwa.
old car.ACC Sara.NOM repairing without sell.PST
The old car, Sara sold without repairing.

Based on this, it is reasonable to assume that the scrambling operation that generates the OSV word order in Sinhala, similar to topicalization in English, is characterized by A-bar movement. Further, following Hettiarachchi (2015), we assume that the fronted object in Sinhala, similar to its English counterpart, receives a topic interpretation by its displacement to the specifier position of the Topic Phrase.

(96) [$_{TopP}$ kawiyak$_i$, [$_{TP}$ sarath [$_{VP}$ t_i liyuwa]].
poem-ACC Sarath.NOM write.PAST
A poem, Sarath wrote.

However, this scrambling operation in Sinhala is different from topicalization in terms of island constraints. Object Scrambling, unlike English topicalization, is allowed from a variety of syntactic islands in Sinhala. We illustrate in the following examples with the *Complex DP Constraint*, *Adjunct Island*, and *Topic Island* (Müller, 2011). In each case, notice that the island violation yields an ungrammatical sentence in English, but not in Sinhala.

(97) [$_{TopP}$ karekak [$_{TP}$ mamə [$_{DP}$ [CP sita rajutə t_i dunna kiyənə] katawə] dannəwa.]]
car.INDEF I.NOM Sita.NOM Raju-DAT gift.PAST that story know.PRE
*A car, I know the story that Sita gifted t_i to Raju.

(98) [$_{TopP}$ chitrapatiya [$_{CP}$ sunil t_i balanə-kota, [$_{TP}$ eya-tə parənə katawa-k matak una.
movie.ACC Sunil.NOM watch-when he-DAT old story-INDEF remember.PAST
*A movie, Sunil remembered an old story when he watched t_i.

---

d. *Mary seemed t to disapprove of John's talking to e.
(Engdahl 1983, p. 5)

(99) a. [$_{TopP}$ me karekə [$_{TP}$ mamə [$_{CP}$ [$_{TP}$ taththa malli-tə t_i dunna kiyəla] dannəwa]]
This car I.$_{NOM}$ father.$_{NOM}$ brother-$_{DAT}$ gift.$_{PAST}$ that know
This car, I know that father gifted t_i to brother.

b. $_{TopP}$ me karekə$_i$ [$_{TP}$ mamə [$_{TopP}$ malli-tə taththa t_i dunna kiyəla] dannəwa]]
This car I.$_{NOM}$ brother-$_{DAT}$ father.$_{NOM}$ gift.$_{PAST}$ that know
*This car, I know that to brother$_j$ father gifted t_i t_j.

In addition, in the same way as we observed for English topicalization, object scrambling in Sinhala also does not trigger WCO violations:[38]

(100) [$_{TopP}$ arə gedərə$_i$ [$_{TP}$ kusal [$_{CP}$ eke$_i$ aithikaraya t_i vikunai kiyəla] balaporoththu una.]]
That house.$_{ACC}$ Kusal.$_{NOM}$ its owner sell.$_{FUT}$ that hope
That house, Kusal hopes that its owner will sell t_i.

To conclude this section, the scrambling operation that generates a topic interpretation for a fronted object in Sinhala resembles English *topicalization* in many respects, i.e. both involve A-bar movement to Spec-Top and both operations seem to have the same semantic effect. But the two operations are also crucially different in terms of their sensitivity to subjacency/island constraints. How and why scrambling is different from other A-bar dependencies[39] is an unsettled issue in generative syntax. For our purposes in this study, we assume scrambling to be a different syntactic operation from topicalization (especially given the difference regarding sensitivity to subjacency) though it yields similar semantic effects.

To sum up, this chapter has provided a detailed review of the three syntactic phenomena that will be relevant for the experimental research in this dissertation, as involving possible A-bar

[38] The absence of WCO effects is cross-linguistically a common property associated with scrambling (see Karimi, 2005 and Dayal, 1994).
[39] Alternatively, see Miyagawa (2009) and Mahajan (1990) for arguments based on e.g. Japanese and Hindi that scrambling is A-movement.

dependencies: wh-movement, relative clauses and topicalization/scrambling. In Chapters 4 and 6, we will discuss the implications of their properties for experimental research in L2 acquisition, both regarding L2 grammatical competence and online processing.

Chapter 3

Generative Approaches to L2 Acquisition

3.1 Introduction

A question that has been extensively debated in generative SLA during the last few decades concerns the role of Universal Grammar (UG) in adult L2 acquisition. Many competing hypotheses have been proposed in this regard, which are generally classified as *No Access*, *Full Access* or *Partial Access* approaches (see White, 2003 for a review).

Among No Access approaches, the most well-known is Bley-Vroman's (1988, 1990, 2009) Fundamental Difference Hypothesis (FDH). Bley-Vroman (1988, 1990, 2009) assumes that child L1 acquisition and adult L2 acquisition are incomparable given that they are fundamentally different processes. They differ both in terms of the developmental sequence and the ultimate attainment. Under this view, even though L1 acquisition is constrained by Universal Grammar, as far as L2 acquisition is concerned, "the native language, rather than UG itself, shapes the initial hypothesis space." Further, he maintains that in L2 acquisition, one's native language is "the chief source of initial expectations about the likely character of the target language" (Bley-Vroman, 2009, p. 180). Due to this, parameter re-setting or native-like representations for the target L2 are predicted to be impossible in interlanguage grammars. In summary, under Bley-Vroman's view, L2 acquisition is not guided by the "domain-specific cognitive system of UG" but the "domain-general central system to which language is strange" (Bley-Vroman, 2009, p.

180). Thus, the Fundamental Difference Hypothesis maintains a strong view that no direct access to UG is available in adult L2 acquisition[1].

However, there is increasing support in generative SLA (see e.g. Campos-Dintrans, Pires & Rothman, 2014; Epstein et al., 1996; Herschensohn, 2009; Schwartz & Sprouse, 1996; White, 2003, 2007) for the view that that UG is indeed available in adult L2 acquisition. Within this perspective, the disagreement rather is whether interlanguage grammars are fully or partially constrained by UG. As far as the goals of this dissertation are concerned, this is the more relevant distinction. So, in this chapter, we provide a review of these two approaches, namely *Full Access* and *Partial Access* to UG in adult L2 acquisition. The goal is to provide the necessary background for the experimental study on syntactic competence presented in Chapter 4. In the context of each approach, we also review some experimental studies on the L2 acquisition of wh-questions and related phenomena.

This chapter is organized as follows. Section 2 provides a review of *Full Access* approaches. Section 3 presents *Partial Access* approaches, mainly the Interpretability Hypothesis. In Section 5, we review different approaches to 'variability' or divergence in interlanguage systems. Section 6 provides a summary of our discussion.

3.2 Full Access Approaches

Full Access approaches (e.g. Epstein et al., 1996; Schwartz & Sprouse, 1996; White, 1989, 2003), as the name itself implies, are based on the core assumption that L2 learners, similar to children acquiring their L1, have full and direct access[2] to the complete inventory of features

[1] For critical evaluations of this proposal, see e.g. Epstein et al. (1996), Herschensohn (2009), Schwartz and Sprouse (1996) and White (2003).
[2] Full Access Approaches are also alternatively known as *Direct Access Approaches.* See White (2003) for details. However, as will explain later, not all Full Access approaches assume direct access during early stages of

(along with basic syntactic operations and principles) made available by UG without any restrictions imposed by a critical period. Also, they assume that native-like cognitive representations are indeed possible in L2 grammars despite a *Poverty of the Stimulus* (Chomsky, 1980) problem imposed by the input: "L2 learners acquire complex and subtle properties of language that could not have been induced from the L2 input" (White, 2003, p. 22). However, as is well-known, proposals supporting Full Access to UG can also differ in terms of what forms the initial state of L2 acquisition. Below we discuss two main proposals in this regard.

Epstein, Flynn and Martohardjono (1996, 1998) assume that adult L2 acquisition is not different from native language acquisition in terms of what constitutes the initial state of the acquisition task. The initial state for both L1 and L2 is UG itself. Their argument goes as follows. Assuming that (i) UG is innately available for the task of native language acquisition, and (ii) child language acquisition involves setting parameter values to account for the Primary Linguistic Data (PLD) from the native language, the construction of a mental grammar for one's L1 does not change the basic form of UG. Under a hypothesis that UG itself transforms into a language-specific grammar (e.g. Bley-Vroman, 1990), at least simultaneous bilingual child language acquisition remains unexplained. For instance, a child who is simultaneously exposed to Japanese and English has to acquire the head directionality of a VP: English is a head initial language (SVO) while Japanese is a head final language (SOV). If the acquisition of one language changes the initial form of the UG, the acquisition of the head directionality in the second language is predicted to be problematic. Based on this and other empirical evidence, Epstein et al. conclude:

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interlanguage development.

> Parameter setting does not entail changing the basic form of UG but instead consists of incorporating into each stage of the grammar the particular UG option that accords with the primary language data […]
> To maintain an explicit empirical hypothesis, we seem to need a model where the form of UG is not altered by parameter setting but where uninstantiated settings instead remain available, at least for child language acquisition.
>
> (Epstein et al., 1996, p. 679)

As they further argue, full access to UG in L2 acquisition does not necessarily guarantee native-like competence in the target language given that the failure to acquire such native-like competence in a second language could be affected by a variety of different factors: "the full-access hypothesis does not deny the existence of differences between LI and L2 acquisition, nor is it incompatible with the existence of linguistic development through time" (Epstein et al., 1996, p. 680).

Another Full Access approach widely discussed in generative literature is Schwartz and Sprouse's (1994, 1996) Full Transfer Full Access (FTFA) Hypothesis. The main assumption behind this hypothesis is that the initial state of L2 acquisition is the grammatical system from a learner's native language: except for "[the phonetic matrices of lexical/morphological items], all the principles and parameter values as instantiated in the L1 grammar immediately carry over as the initial state of a new grammatical system on first exposure to input from the target language (TL)" (Schwartz & Sprouse, 1996, p. 41). This implies that L2ers, during their initial state of second language acquisition, analyzes the L2 input using their L1 grammatical system. But in the event of their failure to assign a representation to account for the target language input, the interlanguage system gets restructured, i.e. L2ers acquire new parametric values. This restructuring is possible because L2ers, similar to children acquiring L1, have full access to UG. Thus, Schwartz and Sprouse (1994, 1996) hypothesize:

> The starting points of L1 and L2 acquisition differ, and the endpoints of L1 and L2 acquisition are likely to differ; however, there is no attendant conclusion that the cognitive processes underlying L1 and L2 acquisition differ. Indeed, we maintain just the

> opposite: that in L2 acquisition, processes underlying development (as realized by the restructured Interlanguages) are precisely those mechanisms that constrain L1 acquisition.
>
> (Schwartz & Sprouse, 1996, p. 41)

These two Full Access approaches seem to differ in how they handle L1 transfer in L2 acquisition[3]. Still, in our view, the FTFA Hypothesis is also compatible with the assumption made in Epstein et al. (1996) that the basic form of UG never changes its original form with L1 parameter setting. If it did, full access to UG during the subsequent L2 development (as assumed by Schwartz & Sprouse) would not be possible.

There are other full access-based proposals which address the issue of developmental sequence in a different manner. For example, Vainikka and Young-Scholten (1994, 1996), propose that functional categories are absent during the initial stages of L2 acquisition, implying that their parametric values are not transferred into interlanguage grammars from the L1 grammatical system. But L2ers continue to have full access to those properties in UG which gradually emerge in an order that they specify as VP, and TP and then CP. For this reason, this hypothesis is also known as the Minimal Trees Hypothesis[4].

As already stated in the introduction (Chapter. 1), our focus in this dissertation is on L2ers who have achieved a steady state in their interlanguage grammars. Given this, we are not in a position to evaluate different predictions made by these Full Access approaches concerning the initial stages of the interlanguage development. Therefore, in the rest of the discussion, we use the term 'Full Access Approaches' to refer to a family of hypotheses brought together by the following core assumptions:

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[3] See White (2003) for a detailed comparison of these two approaches.
[4] For critical reviews of this hypothesis and alternative views, see Epstein et al. (1996, 1998), Schwartz (1998) and White (2003).

a. Similar to native language grammars, interlanguage representations are fully constrained by properties/principles of UG.

b. Parameter resetting or feature reconfiguration is possible in adult L2 grammars.

b. Access to UG in one's subsequent language acquisition (following their native language acquisition) is not subject to critical period constraints.

c. Native-like mental representations are indeed possible in L2 grammars even though access to UG by default does not necessarily guarantee or imply native-like competence. At the same time, one's failure to acquire native-like competence in a second language also does not imply that UG is not accessible in adult L2 acquisition.

Next, we review empirical evidence from wh-questions and related phenomena which have been argued to support full access to UG in adult L2 acquisition. As far as we are aware, there are no generative studies on Sinhala native speakers acquiring L2 English, at least on the wh-phenomenon. Hence, our focus in this background review is on L2 acquisition of wh-properties by native speakers of other languages.

3.2.1 Martohardjono (1993)

This study investigated the acquisition of the Subjacency constraint in English wh-questions by three groups of L2 speakers in their L2 dominant setting (average 3 years of immersion in the US). The participants differed in terms of what native language they spoke: *Indonesian* (*n = 24*), *Chinese* (*n = 19*) and *Italian* (*n = 11*).

The study was primarily motivated by typological distinctions between these L2ers' native languages. As the Table 1 shows, Indonesian (similar to Sinhala, see our Chapter 2), is a wh-in-situ language, implying that it does not have overt syntactic movement either in wh-questions or relative clauses. Given this, for L1 Indonesian/L2 English speakers, island constraints are not instantiated in their L1 syntax. Meanwhile, similar to Indonesian, Chinese is also a wh-in-situ

language. But, it is different from Indonesian given that Relative Clauses (RC) in Chinese are derived through syntactic movement (Huang, 1982). The implication of this is that Chinese L1/English L2 learners are sensitive to the application of island constraints at least in the case of relative clauses in their L1 syntax.

Language	Subjacency in Wh-questions	Subjacency in Relative clauses
Indonesian	×	×
Chinese	×	✓
Italian	✓	✓

Table 3.1:Typology of wh-movement (Martohardjono, 1993)

Unlike these two languages, in Italian, both wh-questions and relative clauses are derived by overt syntactic movement, and are constrained by Subjacency. Therefore, L1 Italian/L2 English learners have a full instantiation of the Subjacency constraint in their L1 syntax. Still, syntactic islands in Italian are parametrically different from those in English, i.e. following Rizzi (1982), Martohardjono (1993) assumes that English and Italian have different bounding nodes for Subjacency: *IP* and *NP* for English and *CP* and *NP* for Italian. Thus, even for Italian native speakers, the acquisition of L2 English involves parameter re-setting in the domain of bounding nodes for Subjacency. Considering these properties, out of these languages, Italian is the closest to English, because it is the only one of the three languages that, like English, shows evidence of Subjacency both in RCs and wh-questions.

Given this syntactic background, Martohardjono (1993) investigated whether the presence or the absence of the Subjacency constraint in the native language could be a predictor of these L2ers' sensitivity to island violations in English. The study included a variety of island violations

in English, including those which are classified as weak (e.g. Complex DP Constraint) and strong islands (e.g., Relative Clause Island) in English. While L2 groups were divided into different proficiency groups, a sample of English monolinguals formed the control group. Data was collected from two instruments: a *Grammaticality Judgment* (GT) task and an *Elicited Production* (EP) task.

(2) a. *Which car did John spread the rumor that the neighbor stole?

b. *Which phone did the man who answered see the boy?

All native speakers behaved as predicted. Not only were they extremely sensitive to island violations, their judgments of weak and strong islands were significantly different. Similar to native controls, all L2ers were also sensitive to island constraints in English irrespective of whether the Subjacency constraint is instantiated in their L1 syntax. Further, the advanced L2ers in all three groups also showed more sensitivity to strong island violations (e.g. relative clause islands and wh-islands) than weak islands (e.g., the Complex NP Constraint, CNC), which proved to be statistically significant.

L2 Group	Strong Island violations	Weak island Violations
Indonesian	87%	42%
Chinese	76%	38%
Italian	89%	61%
English	94%	79%

Table 3.2: Grammaticality judgment scores (%) for weak vs. strong islands (Martohardjono, 1993)

One important finding in Martohardjono's (1993) study is that even those L2ers (Indonesian L1/English L2 learners) whose L1 syntax does not have island violations, given the lack of overt wh-movement, can successfully overcome a genuine poverty of the stimulus problem in their L2.

As she argued, these findings pose problems for theories (e.g. the Fundamental Difference Hypothesis) which do not assume UG accessibility in L2 syntax.

The same argument can be made for Chinese L1/English L2 learners as well. Even though they have island constraints in relative clauses, for them these constraints do not extend to wh-dependencies. So, they also have to overcome a poverty of the stimulus problem in their L2, though their learning problem could be slightly different from that of Indonesian L2ers. Further, Italian L1/English L2 participants also show that parameter resetting is indeed possible in interlanguage grammars. The results show that the presence of island constraints in L1 makes the L2 learning task easier. Because next to English monolinguals, it is Italian L1-English L2 speakers who show the strongest sensitivity to Subjacency violations in English. But this alone cannot at least explain Indonesian native speakers' performance in this study. Martohardjono concludes:

> We take this result to provide evidence that UG must be operative in the L2 acquisition process and that it is so universally, regardless of the specific instantiation of UG in the LI. We see no alternative theory which would predict the pattern of relative acceptability across the constructions we tested. Therefore, it must be availability of UG theory which explains it.
>
> (Martohardjono, 1993, p. 151)

One important contribution of this study is its exploration of subtle, abstract properties of interlanguage systems in terms of L2ers' sensitivity to weak vs. strong islands in English. Rather than focusing only on the binary question of UG accessibility, the study explores to which extent interlanguage systems provide evidence of sensitivity to specific UG properties, in particular Subjacency and Superiority constraints.

3.2.2 White and Juffs (1998)

White and Juffs (1998) tested two groups of Chinese L1/English L2 speakers on their sensitivity to island violations in English wh-dependencies. Both groups were similar in terms of when they had been first exposed to English, which had predominantly been in a classroom environment during their adolescence. Also, as reported in a background survey, their first use of communicative English had been as adults. However, the two groups were different in terms of the kind of exposure to English they had received later in life. The first group (China Group, *n = 16*) had been immersed in an academic English environment at a university in China. They were either teachers of English or postgraduate students receiving training in English. They also had never lived in a native English speaking country. The second group, meanwhile, had moved to Canada as adults (Canada Group, *n = 16*) and had not used English for real life communicative purposes until their immersion in the L2 context. By the time they were tested, their average length of immersion in Canada was 4.1 years. The results of a proficiency test revealed that the two groups were not significantly different in their proficiency in the target language. White and Juffs also tested 19 English monolinguals. The goals of the study were to find out whether (i) the L2ers' interlanguage grammars are constrained by UG and (ii) the nature of their immersion experience had an effect on their level of sensitivity to island violations in English.

Two instruments were used in the study. The first one was a timed Grammaticality Task (GT) which included 30 grammatical and 30 ungrammatical LD wh-dependencies in English. The ungrammatical sentences contained different kinds of island violations. Grammaticals included well-formed LD wh-dependencies. During the experiment, participants judged (on a computer screen) whether the each sentence was grammatical or ungrammatical while their judgment time was being recorded. The second experiment, meanwhile, was a Question Formation (QF) task, in

which they created a wh-dependency to question an underlined wh-word in a declarative sentence.

(3) a. Sam believes the claim that Ann stole his car?

b. Jane spoke to her friend before she called Sam.

The results from the two experiments revealed that both groups of L2ers were sensitive to island violations in English wh-questions. For instance, in the GT task, both groups judged ungrammaticals to be significantly different from grammaticals. In the same way, in the QF task, their LD wh-extractions showed sensitivity to islands, i.e. they avoided extractions of wh-phrases out of syntactic islands. Overall, the China group performed slightly better than the Canada group. But the difference was non-significant. In terms of the reading time (RT) in the GT task, there was no significant difference between the two Chinese groups. But they were significantly slower than native controls. One interesting finding in this study was the percentage of wh-in-situ questions that each group produced in the QF task. Despite Chinese being a wh-in-situ language, Chinese participants produced only 7% of wh-in-situ questions when those questions for English monolinguals included 27% of their responses, as a strategy that native speakers used to avoid island violations. Based on these results, White and Juffs (1998) concluded that these L2ers have successfully acquired the Subjacency constraint in their L2 grammar, implying that their interlanguage grammars are constrained by UG:

> In conclusion, we suggest that adult learners can access island constraints and that this is so even in the case of adults who do not live in a country where the L2 is spoken, that is, where exposure to L2 input is presumably considerably less than in the case of participants living in Canada.
>
> (White & Juffs, 1998, p. 127)

Depending on the kind of syntactic analysis one assumes, it can also be argued that Chinese native speakers have performed well in this study because they are sensitive to the Subjacency

constraint in Relative Clauses (RC) in their L1. Recall that this is the assumption that Martohardjono (1993), following Huang (1982), makes in her study. But this should not necessarily undermine the contribution that White and Juffs' study makes towards our understanding of interlanguage systems of those L2ers who receive relatively less L2 input in their L1 setting. At least according to Felix and Weigl (1991) and Hawkins and Chen (1997), UG would not be activated in those L2ers whose main source of L2 input is classroom instruction. Under their view, such L2ers fail to make generalizations beyond what they are explicitly instructed on in classrooms, and that provide evidence of UG properties that apply in their L2 but would not be instantiated in their L1. White and Juffs, in contrast, argue that the interlanguage systems of L2ers are equally constrained by UG, as implied by their ability to reset parameters concerning wh-movement.

3.2.3 Other Studies on Wh-dependencies

Many other studies of wh-dependencies conducted in different L2 contexts have also revealed that parameter resetting is indeed possible in L2 grammars. For instance, Miyamoto and Iijima (2003) in a GT task with L2 English learners in Japan (*n = 165*) found evidence for the successful acquisition of the *uwh** feature in the target grammar by their intermediate learners, though elementary learners were found to consider wh-movement to be an optional operation, a property associated with object scrambling in Japanese. Similar findings are also reported in Yusa (1999) and Ojima (2005) for Japanese L2 learners of English. Meanwhile, Umeda (2008) studied the L2 acquisition of Japanese wh-questions by English (*n = 32*) and Chinese native speakers (*n = 52*). She found converging evidence from three experiments — a GT task, a translation task and a question-answer pair judgment task — to show that her advanced L2ers have successfully reset the parameter to match the target L2 grammar. Studies investigating other

syntactic phenomena such as Binding, verb raising and grammatical gender also argue that interlanguage representations are fully constrained by UG (see e.g. Campos-Dintrans et al., 2014; Epstein et al., 1998; Flynn, 1987; Gess & Herschensohn, 2001; Rothman, 2005; White et al., 2001).[5]

In summary, in this section, we have reviewed some Full Access approaches to UG in interlanguage grammars. We have also provided evidence from some empirical studies which supports this position in generative SLA. We will revisit some of these findings in the context of our experimental results discussed in Chapter 4.

3.3 Representational Deficit Accounts

Unlike Full Access approaches, Partial Access approaches assume that adult L2ers' access to UG is restricted, especially in the domain of functional categories. Given that they assume a deficit in narrow syntax for adult L2ers, partial access approaches are commonly known as Representational Deficit (RD) accounts.

The claim that functional categories are problematic in adult L2 acquisition is a hypothesis which has had different incarnations over the last few decades. Some of those versions include the *Local Impairment Hypothesis* (Beck, 1997, 1998), the *Failed Functional Feature Hypothesis* (Hawkins & Chan, 1997) and the *Feature Interpretability Hypothesis* (e.g., Hawkins & Hattori, 2006; Tsimpli, 2003; Tsimpli & Dimitrakopoulou, 2007). There are at least two assumptions shared by these hypotheses:

a. When parameter values are determined for one's native language, any parameter re-setting in L2 acquisition is impossible (in the relevant case in which L1 and L2

[5] See White (2003) for a review of some of these studies.

features or values are different). For this reason, these hypotheses are often clustered as *No Parameter Re-setting Hypotheses* (see White, 2003).

b. As far as the functional domain is concerned, access to UG is subject to a critical period. Given this, despite superficial similarities, native-like representations of the L2 syntax are impossible in interlanguage grammars. For this reason, these approaches are also known as *Impaired Representation Hypotheses* (Prévost & White, 2000).

The specific version of the no parameter setting hypotheses that we are concerned with in this study is the Feature Interpretability Hypothesis.

3.4 Feature Interpretability Hypothesis

The Feature Interpretability Hypothesis (henceforth FIH or the *Interpretability Hypothesis)*, as formulated in Hawkins and Hattori (2006), Smith and Tsimpli (1995), Tsimpli (2003), Tsimpli and Dimitrakopoulou (2007) and Tsimpli and Mastropavlou (2007), is a theory of learnability in adult L2 acquisition that has received a substantial amount of attention in generative SLA. This hypothesis is mainly based on the interpretable/uninterpretable feature asymmetry that we discussed in Chapter 2. As we elaborated there, interpretable features are those features that play a role in syntactic computation and carry semantic information interpretable at the Conceptual Intentional (CI) interface after spell-out. Uninterpretable features, meanwhile, are purely syntactic and interface independent in the sense that they are not legible to the CI interface. The proponents of the Interpretability Hypothesis assume that the L2 acquisition of uninterpretable syntactic features is subject to an early critical period: "In this theory, the domain of the functional lexicon in the Language Faculty (FL) ceases to be accessible once first language acquisition is complete" (Tsimpli & Dimitrakopoulou, 2004, p. 217). Thus, after the so-called critical period during which a child constructs a mental lexicon by acquiring feature values/specifications for their native language (so-called complete L1 acquisition), an L2 learner

has access to only those uninterpretable syntactic features which are instantiated in their L1. Under this FIH approach, acquiring native-like competence in any new uninterpretable syntactic features (those features absent in the learner's L1) is 'impossible' after the proposed critical period. So, apparent native-like performance by L2ers in the target language may not necessarily imply that they have developed native-like underlying representations in those domains: "by hypothesis, there is a permanent 'loss of capacity to acquire' in this domain" (Hawkins and Hattori, 2006, p. 273). The possible consequence of this is that in the functional domain of language, L2ers tend to rely on their L1 grammars: "while UG constrains L2 development as well as mature L2 grammars, in the domain of parametric options, L1 properties directly or indirectly affect L2 representations even at the advanced state of development" (Tsimpli & Dimitrakopoulou, 2007, p. 216).

However, in contrast to uninterpretable syntactic features, interpretable features can be fully acquired regardless of whether L2 acquisition takes place before or after the proposed critical period. Thus, the Interpretability Hypothesis assumes partial accessibility of UG in post-childhood L2 acquisition.

Tsimpli and Dimitrakopoulou (2004) propose a specific reason why uninterpretable but not interpretable syntactic features are problematic for adult L2ers. At birth a child has access to the complete inventory of syntactic features made available by Universal Grammar (UG), the genetic endowment for human language. But after the critical period, one loses access to the complete inventory of uninterpretable features except those already selected for their L1 syntax. Unlike uninterpretable features, access to interpretable features is intact. Hawkins and Hattori (2006), while drawing insight from Eubank and Gregg (1999), propose that this dichotomy in the

accessibility to different features in UG can be understood in terms of their "functional usefulness" in L1/L2 syntactic computation):

> All the options for uninterpretable features need to be available to the child initially because the child cannot know in advance whether the linguistic input to be encountered will show evidence of pro-drop or not, involve wh-movement or not, will have gender concord between Ns and Ds and As, or not, and so on. But it may be functionally economical if, after a given period during which the required features are selected, unselected features cease to be available.
>
> (Hawkins & Hattori, 2006, p. 272)

The FIH aims to address at least three issues in generative SLA, including (i) the role of Universal Grammar in L2 syntax, (ii) the role played by maturational effects or a critical period in L2 acquisition, and (iii) the locus of the divergence in syntactic competence by native speakers and L2ers. It assumes that the commonly observed divergence in performance between native speakers and L2ers results from a representational deficit in narrow syntax — i.e. after a critical period the interlanguage systems of L2 syntax become impoverished in terms of uninterpretable syntactic features.

Next we review some studies which have been argued to provide empirical support for the Interpretability Hypothesis. Given the focus of this dissertation, we limit our discussion to those studies which explore wh-acquisition and related phenomena.

3.4.1 Hawkins and Hattori (2006)

Hawkins and Hattori (2006) investigated the L2 acquisition of the uninterpretable feature that drives wh-movement in English, as represented in interlanguage grammars of Japanese L1/English L2 speakers (JSE) immersed in a native English-speaking country. As they discussed, English and Japanese are typologically distinct in the way they form wh-interrogatives. In English wh-questions, the Complementizer (C) has an uninterpretable syntactic feature

(following Adger 2003, they name this feature as uwh*[6]) which triggers the overt movement of a wh-phrase from its first-merged position to Spec-CP. The same feature is absent in C in Japanese (wh-in-situ) as evidenced by the fact that wh-phrases do not undergo overt wh-movement in Japanese. The implication is that this uninterpretable feature has not been selected for these L2ers' native language syntax, and it "has disappeared from the UG inventory following a critical period that ended at some point before these speakers encountered the relevant English input" (Hawkins and Hattori, 2006, p. 273). Given this, they predicted that not only would Japanese native speakers show difficulty in the acquisition of English wh-questions, but also they would not be sensitive to some locality constraints, in particular *Superiority* and *Subjacency* constraints associated with the uninterpretable feature that triggers overt wh-movement.

In testing this hypothesis, they conducted a Truth Value Judgment Task (following Crain and Thornton, 1998), which contained a story, a question and three answers. One sample item from their study is given below:

(4) a. Sophie was angry. Her holiday had been ruined because the hotel she had booked through a travel agency was full, and she had to sleep in a tent. Sophie's brother was a friend of Norman who owned the travel agency. He spoke to Norman on Thursday and told him that Sophie would be phoning his manager, Mrs. Smith, the following day to ask for her money back.

b. Who did Sophie's brother warn Sophie would phone when?

c. Answer 1: He warned Norman that Sophie would phone on Friday.
Answer 2: He warned that Sophie would phone Mrs. Smith on Friday.
Answer 3: He warned Norman on Thursday that Sophie would phone.

[6] Other versions of this feature, as we discussed in Chapter 2, include *edge feature* and *EPP*.

They predicted that participants who are sensitive to Superiority violations in English would choose only answer 1 in this context — i.e., it forces them to interpret *who* in the matrix clause and *when* in the embedded clause without a Superiority violation for the fronted wh-phrase. In turn, these subjects would not choose answers 2 or 3, because they would require them to interpret *who* in a structural position that would be less close (in terms of c-command) to the matrix Spec-CP position than the site where the interpretation of *when* needed to take place in each one of the two answers. However, if participants were not sensitive to the Superiority constraint in English, they would accept answers 2 or 3.

In addition to Superiority violations (3 items), H&H tested items in which the embedded reading was either blocked by Subjacency (5a) violation (3 items) or both Superiority and a Subjacency (5b) violation (1 item):

(5) a. When$_j$ did Sophie's brother warn [who$_i$ Sophie would phone t_i t_j]
b. Who$_i$ did the weather office warn [when$_j$ the hurricane might strike t_i t_j]?

The test was administered to 19 Japanese L1/English L2 speakers. These participants' length of immersion in the L2 context ranged from 9 months to 18 years. A control group of 11 native speakers was also included. Both native controls and L2ers were chosen based on the results of a syntax test. This test was intended to determine whether participants would allow the LD interpretation for a fronted wh-word when the embedded reading was not blocked by a violation. However, 16 L2ers and 7 native speakers were excluded from the study based on the results of this test. Table 3 provides a summary of their results for the three experimental conditions.

In their analysis, Hawkins and Hattori found that native speakers' (NSE) embedded interpretation in each experimental condition was significantly different from their performance in the no violation condition. But this was not the same for Japanese Native Speaker (JSE)

participants. They showed a tendency to accept an embedded reading even when it was blocked by one or more of the locality constraints, as shown in Table 3.

	Embedded Scope		Matrix Scope	
	JSE	NSE	JSE	NSE
No Violation	0.78	0.75	0.92	0.91
Superiority	0.75	0.33	0.88	0.85
Subjacency	0.58	0.21	0.93	1.00
Combined	0.58	0.00	0.95	0.95

Table 3.3: Results of Hawkins and Hattori (2006)

Given this, Hawkins and Hattori took these results to imply that these Japanese L1/English L2 participants have failed to acquire the relevant uninterpretable feature in English wh-questions, implying that their interlanguage grammars are impaired in this domain:

> The performance of the JSE in interpreting multiple wh-questions appropriately, but failing to be constrained by the Attract Closest Principle, would follow if their grammars are UG constrained, but lack the [uwh*] feature, which is absent in Japanese. This implies that the nature of ultimate attainment in a second language is partly, but not wholly, L1-determined.
>
> (Hawkins & Hattori, 2006, p. 295)

However, in our view, these results do not support such a strong conclusion on either theoretical or methodological grounds. First, consider their Superiority violation analysis for the example in (4b). As generally assumed, this would be an instance of a Superiority violation if *who,* being interpreted inside the embedded clause, needs to extracted from a position that is lower than *when* (in terms of Superiority) in the clause (4b). But these kinds of Superiority violations resulting from argument over adjunct extraction have been found to be acceptable to many native speakers of English (see e.g. Bošković, 1997; Lasnik & Saito, 1992). As we

discussed in Chapter 2, either the argument or the adjunct could be extracted in the following English sentence without a Superiority violation.

(6) a. [$_{CP}$ Where did [$_{TP}$ you [$_{VP}$ read what t_i]]]?
b. [$_{CP}$ What did [$_{TP}$ you read t_i where]]?

Even though the *Superiority Condition*, as formulated in Chomsky (1973), would predict only (6a) to be grammatical, Obata (2008) proposes that that the extraction of the argument (*what*) over adjunct (*where*) in (6b) is equally grammatical in English because the argument matches the C head better than the adjunct (where) in terms of the number of features that they share: *what* has both case and wh-features while *when* only has a wh-feature. If so, any reliable test on Superiority should also include violations resulting from argument over argument extraction, which have been found to be clearly unacceptable to native speakers of English. We will further elaborate on this issue in Chapter 4.

In addition, in their study, H&H do not report testing their L2ers's overall proficiency in the target language. Even though they mention that these L2ers have been immersed in the L2 context over many years, that itself may not necessarily imply that they are 'high proficiency speakers of English' (see Johnson & Newport, 1991 for some discussion on this issue). Furthermore, the syntax test that they conducted cannot also be considered a reliable test of L2 proficiency given that 7 out of 19 native controls also failed it. So, in the absence of an independent measurement of the L2ers's language proficiency, one can raise questions concerning the conclusion by H&H that these L2ers have failed to acquire the relevant uninterpretable feature in English. One possibility is that they were not sufficiently advanced L2 learners, contrary to what Hawkins and Hattori assumed.

Finally, the test they used in the study is complex in various independent respects that could have affected the success of the L2 learners in the task. Notice that their sample test item (4) has

four different characters. If the syntax test included items of the same format, the complexity of the task could be one explanation why many native speakers as well performed poorly in it. In view of these problems, H&H's results do not favor a strong conclusion that the relevant uninterpretable feature is absent in these L2ers. We return to further discussion regarding H&H's study in Chapter 4.

3.4.2 Hawkins and Chan (1997)

Hawkins and Chan (1997) is another study that has often been cited in the literature as providing support for the Interpretability Hypothesis. Hawkins and Chan tested the acquisition of the uninterpretable uwh*[7] in English relative clauses by Chinese native speakers acquiring L2 English in their L1 dominant setting, namely Hong Kong. The syntactic analysis assumed for Chinese relative clauses in this study is partially different from the one adopted in Martohardjono (1993). Recall that Martohardjono assumed that RCs in Chinese are derived through operator movement, following Huang (1982). But Hawkins and Chan adapted a non-movement analysis of relative clauses proposed in Xu (1986) and Xu and Langendoen (1985). Under this approach, RCs in Chinese are derived by the base-generation of a null topic in Spec-CP which A-bar binds a *pro* inside the RC. This *pro* can be overt at least in the object position (Hawkins & Chan, 1997, p. 195):

(7) [CP Top_i [IP wo xihuan pro_i/ta_i] de] neige $nuhai_i$
null topic I like pro/her C the girl
The girl who I like

[7] In this study, following Rizzi (1990) they named this feature as [+/- wh] in C which is formally equivalent to uwh* (edge feature) that we discussed in the context of Hawkins and Hattori (2006).

Under this analysis, RCs in Chinese are different from those in English which are derived by null or overt operator movement. In English, this operator movement is driven by the uwh* feature in C. They assumed that there are at least three properties associated with the *uwh**feature in English RCs: (i) English RCs disallow resumptive pronouns in the gap position (8a), (ii) movement obeys the Subjacency condition (8b), and (iii) the doubly-filled CP Filter cannot be violated (8c) in English. But these properties are irrelevant in Chinese given that RCs in Chinese do not involve syntactic movement.

(8) a *The man who(m) she admires him is an artist.
b. *This is the flat which my mother told me when she will rent.
c. *The classmate who(m) that I hate is very selfish.

Given this typological difference between English and Chinese, Hawkins and Chan assumed that Chinese L1/English L2 learners have to acquire a new uninterpretable syntactic feature which is not directly instantiated in the Complementizer in RCs in their L1. They also predicted that native-like competence would be impossible in this domain given that UG is only partially available in post-childhood L2 acquisition.

The instrument used was a Grammaticality Judgment (GT) task with 56 grammatical and ungrammatical sentences with English relative clauses (8 for ungrammatical examples). They tested three groups of Chinese native speakers (age range, 12-21) who, at the time the study was conducted, were studying English in a classroom environment either at a school or a university in Hong Kong. Subjects were assigned to three proficiency groups based on the results of the Oxford English Placement Test. The study also included two control groups. The first group consisted of native speakers of English (*n = 32*). The second group included French native speakers (three groups of similar proficiency to match the experimental groups) acquiring L2 English. They predicted that the French group would perform differently from the Chinese group

in the task because RCs in French, but not in Chinese, have syntactic properties similar to those in English.

Their results revealed that in all conditions the three French groups outperformed the Chinese participants. Except for the beginner group in some instances, French native speakers were also not significantly different from native speakers. The following table gives the summary of the results for the three Chinese experimental groups and native controls.

Condition	Native	Beginner L2	Intermediate L2	Adv. L2
Grammatical	96	56	67	79
Subjacency	85	71	61	38
Resumptives	98	38	55	90
Doubly-filled Comp-Filter	99	55	68	83

Table 3.4. Grammaticality Judgment Scores (%) for Hawkins and Chan (1997)

According to these results, the advanced L2 group shows evidence of the acquisition of the new uninterpretable feature in their L2 English. This is seen at least in their higher sensitivity to ungrammaticality in resumptives and Doubly-filled Comp-Filter violations in English. But Hawkins and Chan argue that even in the case of advanced L2ers, "their mental representations only appear superficially like operator–trace constructions" in English (p. 217). Their argument goes as follows. As far as the advanced L2 group is concerned, they reject violations resulting from overt resumptive in English. Hawkins and Chan argue that this is because these L2ers have learned (or have been taught) that overt resumptives are unacceptable in English relatives, although they do not explain how it is possible for learners to obtain knowledge regarding grammatical constraints that would require exposure to negative data. They argue that learning these properties does not require any parameter resetting in features. But at the same time, these

L2ers show less sensitivity to Subjacency violations. Hawkins and Chan take this to imply that the L2ers do not assign an operator movement analysis to English relative clauses — i.e., in their mental grammar, the gap in the RC is not a trace of a displaced wh-operator but a resumptive *pro*. Because of this, island constraints in English RCs are irrelevant for the Chinese L2 learners, under H&C's approach. As further evidence for this argument, Hawkins and Chan indicate the higher rejection of Subjacency violations by the elementary L2 group. According to H&C, subjects reject Subjacency violations because they prefer an overt resumptive pronoun inside the RC and not because they are sensitive island constraints. Based on this evidence, Hawkins and Chan conclude that:

> If, where functional features in an L2 are not accessible, adult learners construct alternative, but nevertheless UG-constrained, syntactic representations, results which show that they accept apparent violations of universal constraints cannot be taken at face value. Their acceptance may be precisely because they have different underlying syntactic representations.
>
> (Hawkins & Chan, 1997, p. 221)

This study substantially contributes to our understanding of the nature of L2 acquisition/learning in a classroom environment. It is still debatable whether the kind of language input that L2ers receive in a classroom setting can trigger successful UG-based acquisition (see White, 1998). However, contra Hawkins and Chan's findings, White and Juffs (1998), as we reviewed earlier, report that some L2ers can successfully acquire new feature values in the target language even in their L1 dominant environment. Even in the case of the L2 learners in Hawkins and Chan (1997), the evidence does not seem sufficient to conclude that they cannot reset a parameter to match the target language provided they receive more exposure to the target L2 input. We will revisit some of these implications in our discussion in Chapter 4.

3.4.3 Tsimpli and Dimitrakopoulou (2007)

In terms of the syntactic phenomenon, methodology and the target L2 population in focus, this study is very similar to Hawkins and Chan's (1997) study that we reviewed in 3.4.2. Tsimpli and Dimitrakopoulou (2007, henceforth T&D) investigated the L2 acquisition of English wh-questions by Greek L1/English L2 learners in Greece. The study, in particular, explored the nature of interlanguage representations of those L2ers in terms of the resumptive strategy acceptable in their L1 but not in L2 English.

As they assumed, wh-question formation in Greek is different from English in many respects. First, unlike English, Greek allows an optional resumptive pronoun in the gap position that is co-indexed with a displaced wh-element (9a). But this resumptive strategy is ungrammatical when the extracted wh-element is 'what' (9b). This, as they argue, results from a difference between 'what' and other wh-phases in Greek — i.e. 'what,' unlike other wh-phases, is unspecified for *phi* or case features. Thus, they account for the ungrammaticality in (9b) in terms of an agreement failure between the resumptive clitic and 'what,' which implies that the resumptive strategy in Greek is associated with a cluster of uninterpretable features. An additional result is that Greek native speakers allow a resumptive pronoun to be co-indexed with a wh-phrase in subject position but not in the object position, when the extracted wh-element is 'what.'

(9) a. Pjon ipes oti (ton) prosevalan xoris logho?
whom said$_{2SG}$ that (him) insulted$_{3PL}$ without reason
Who did you say that they insulted (*him) without a reason?

b. Ti nomizis oti tha (*to) dhiavasun?
what think$_{2SG}$ that will (it) read$_{3PL}$
What do you think that they will read?

Tsimpli and Dimitrakopoulou (2007) tested whether this asymmetry in Greek is observed in the interlanguage grammars of Greek native speakers acquiring L2 English, implying a difficulty in revising their L1 resumptive strategy. The test they used was a GT task. The study included two groups of English learners in Greece — Advanced Group (*n = 27*), and Intermediate Group (*n = 21*) — and a control group of English native speakers. They tested both grammatical and ungrammatical object ((10)/subject (11) extractions in English:

(10) a. Which student / Who do you think that Jane likes *ec* /*him?
b. Which book / What do you remember that Peter read *ec* /* it carefully?

(11) a. Which politician / Who have you suggested *ec* /*he /*that-he should not resign?
b. Which party / What does John think ec /*it /*that-it was very boring?

Their results (% accuracy rate) for ungrammatical sentences (Table 5) reveal that even advanced Greek/English L2ers have a tendency to accept English wh-questions with resumptives. The results also showed L2 groups are not sensitive to *that*-trace effects in English (11b). But they showed a difference in their performance between subject and object extractions which proved to be significant for the advanced group. Based on these results, Tsimpli and Dimitrakopoulou (2007) concluded that even advanced L2ers in their study analyzed English wh-questions using the resumptive strategy from their L1. According to T&D, advanced L2 speakers match native speakers in their test performance in some instances. But they argue that this is not because they have reconfigured the feature specification of the Complementizer to match the target language properties; instead they are still using the resumptive strategy from their L1, which superficially matches the L2 input at least in some instances.

We agree that these results show that Greek L1/English L2ers have not acquired the relevant uninterpretable feature in English wh-questions. But this does not necessarily mean that they have lost the capacity to acquire this feature in English. Hence, it remains to be seen whether

more proficient L2ers would also analyze English wh-interrogatives using the resumptive strategy transferred from their L1.

Group	Subject Extraction	Object Extraction
Inter. L2	63.9 (69/108)	59.5 (69/116)
Adv. L2	68.4 (104/152)	78.6 (122/154)
Native	96.7 (148/153)	96.7 (148/153)

Table 3.5: GT Scores (%) in Tsimpli and Dimitrakopoulou (2007)[8]

3.5 Divergence in L2 Competence

Representational Deficit (RD) accounts offer a straightforward explanation of L2ers's failure to achieve native-like competence in a target language. Under those accounts, the divergence in L2 grammar results from a deficit in narrow syntax (competence), i.e. L2ers' target language mental representations are impaired in the domain of functional categories. In contrast, Full Access-based proposals view this divergence to be a matter arising from difficulties in mapping abstract features of the syntactic system to target language morphology (e.g. Epstein et al., 1996, Haznedar & Schwartz, 1997; Lardiere, 1998a, 1998b, 2000; Prévost & White, 1999, 2000). One recent hypothesis that has explored this phenomenon in detail is Lardiere's *Feature (Re)assembly Hypothesis* (Lardiere, 1998, 2000, 2007, 2009).

Lardiere conducted a longitudinal case study with Patty, a Chinese immigrant fully immersed in English in the US. One of her main arguments was that most of Patty's problems in her steady state of interlanguage grammar had to do with mapping her underlying abstract syntactic knowledge to the kind of morphology that such knowledge is associated with in English. For example, Patty's use of the past tense morpheme in real time speech was very low. As Lardiere

[8] This table shows their judgments of ungrammaticals only.

(1998) argues, this does not necessarily mean that the functional head T is absent in her interlanguage, because her NOM case marking on English pronouns is native-like. Under a theory that the functional head (T) bears both case and agreement features, the absence of a T projection in Patty's interlanguage grammar would be expected to impair her case marking as well. Thus, based on the examination of a variety of grammatical properties in Patty's interlanguage system, Lardiere concludes that Patty's use of morphology heavily under-represents her abstract knowledge of L2 syntax. In her view, in L2 acquisition, the "morph(phono)logical development, i.e., productive affixation in a post-Spell-Out morphology component, proceeds independently of the featural knowledge typically associated with those affixes" (Lardiere, 1998, p. 365). Hence, the divergence in L2ers, at least of those who have reached a steady state in their L2, may not result from a lack of competence but a 'mapping problem': "the problem lies in figuring out how (and whether) to spell out (morphologically) the categories they already present syntactically" (Lardiere, 2000, p. 121).

In her later work (see e.g. Lardiere, 2008), she also refines her parameter re-setting approach in L2 acquisition in terms of what she names *feature re-assembly*. She argues that an approach to *parameter resetting* alone cannot account for the variability[9] or divergence in L2 acquisition. Also, for Lardiere, the presence of variability in interlanguage grammars or divergence from the target grammar is not a reliable indicator that a learner has failed to reset a parameter in the target language. So, the challenging task in L2 acquisition is not necessarily parameter re-setting (as assumed under RD approaches) but figuring out how those different interpretable and

[9] Lardiere (2008, p. 2) defines variability as "variable omission, underspecification, overreliance on default forms, and/or apparent optionality vs. obligatoriness of the morphophonological expression of grammatical properties."

uninterpretable features are re-assembled in the morphological system of the target language, when they are assembled in a different way in the learners' L1:

> … how such features are idiosyncratically assembled and realized in each language, whether inflectionally or lexically, or even overtly realized or not, obviously plays a role in determining crosslinguistic variation and can pose a substantial and complex learning problem for second language learners.
>
> (Lardiere, 2008, p. 4)

Thus, acquiring a feature in the target language, whether it is interpretable or uninterpretable, requires the acquisition of *morphological competence* as well. Morphological competence includes learning to match a certain feature with relevant morphemes such as a prefixes, suffixes, infixes etc. in the target language. One example Lardiere (2008) discusses in this regard includes Patty's acquisition of the [+/- definite] feature in her L2 English. Chinese is assumed to be a language which lacks a definite article. But this does not mean that the [+/- definite] feature is absent in Chinese — i.e. in Chinese, this distinction may be denoted through other mechanisms such as plurality, possessives and demonstratives. Given this, the learning task for a Chinese native speaker acquiring L2 English involves disentangling "the relevant features from the way they are assembled in the L1, and re-assembling them as required by the L2" (Lardiere, 2008, p. 14).

Along these lines, Campos-Dintrans, Pires and Rothman (2014) argue that the kind of uninterpretable feature (uwh*) that Hawkins and Hattori (2006) argues to be problematic for Japanese native speakers of English is not completely absent in Japanese syntax. But a similar uninterpretable syntactic feature (EPP) is argued to be present in T in Japanese (e.g. Kishimoto, 2001) which is responsible for A-movement in the language: "This indicates that Japanese does not lack an EPP feature in its grammar to trigger overt movement, but simply instantiates it in a different functional head (T) than the one that would trigger overt wh-movement" (Campos-

Dintrans et al., 2014, p. 46). Under this view, the kind of representational deficit involved in the acquisition of English wh-questions for JSE is a Local one (the relevant feature is present on a different functional head in the L1, but not in C) rather than a Global one (the relevant feature is not present on any functional head in the L1 syntactic system). We further discuss this distinction in Chapter 4.

3.6 Summary

To sum up, in this chapter, we have provided a review of two approaches to UG accessibility in L2 acquisition, namely *Full Access Approaches* and *Representational Deficit* (RD) *Accounts*. As we discussed, *Full Access approaches* (e.g. Epstein et al., 1996; Schwartz & Sprouse, 1996; White, 1989, 2003) assume that L2 learners have direct access to the complete inventory of features (along with syntactic operations and principles) made available by UG without any restrictions imposed by a critical period. Also, they assume that native-like cognitive representations are indeed possible in L2 syntax despite a Poverty of the Stimulus problem. By contrast, RD accounts differ from Full Access approaches in assuming that interlanguage systems are only partially constrained by UG. Under this perspective, some native-like representations are impossible in L2 acquisition because L2ers, after their native language acquisition, have access to only a subset of uninterpretable features, as instantiated in their L1. Finally, we discussed how each approach handles commonly observed 'variability' or 'divergence' in L2 acquisition, in particular, Lardiere's (1998) *Feature Reassembly* hypothesis which proposes that L2er's surface use of morphology can heavily under-represent their underlying abstract knowledge of syntax. In Chapter 4, we will revisit these hypotheses and empirical findings in the context of our experimental study on the acquisition wh-questions by Sinhala native speakers acquiring L2 English.

Chapter 4

L2 Acquisition of English Wh-questions

4.1 Learning Tasks, Predictions and Research Questions

Given our discussion in Chapter 2, Sinhala native speakers acquiring L2 English must acquire a new uninterpretable syntactic feature (*uwh**) that is not instantiated in wh-questions in their L1 syntax. If the Feature Interpretability Hypothesis (FIH) (e.g. Hawkins & Hattori, 2006; Tsimpli 2003; Tsimpli & Dimitrakopoulou, 2007) is on the right track, the acquisition of English wh-questions should pose a learnability problem for at least those Sinhala L1/English L2 speakers who undertake the L2 learning task arguably after the complete acquisition of functional feature specifications in their L1 syntax. For them, L2 acquisition involves an instance of *Parameter Re-setting* or a reconfiguration of feature specifications in the domain of the L2 functional lexicon, as elaborated below. In this section, we briefly outline specific learning tasks for the native Sinhala speakers acquiring L2 English wh-questions, along with predictions from different hypotheses and research questions to be investigated in this study.

4.1.1 Learning Tasks

As outlined in Chapter 2, the competence of an English native speaker in the domain of wh-interrogatives is characterized by at least three properties:

(1) a. A wh-phrase first merges inside the vP and subsequently undergoes overt wh-movement to Spec-CP.

feature [uwh*] in *C* which needs valuation/deletion in narrow syntax.

c. The movement of the wh-phrase in any derivation must adhere to principles of locality such as *Superiority* and *Subjacency* (or, in Minimalist terms, to the PIC and MLC, see Chapter 2).

Also, for an English native speaker, a LD wh-question in English (involving adjuncts) can be ambiguous between a matrix and an embedded reading for the fronted wh-phrase. For example, the following wh-question could either be a question about when Siri said something or when Mary bought a new car.[1]

(2) $[_{CP}$ When did $[_{TP}$ Siri say $[_{CP}[\ _{TP}$ Mary bought a new car ?]]]]

It is also part of the native speaker competence that the embedded reading of a LD wh-question could be blocked by an intervening wh-phrase at the intermediate Spec-CP, as the result of a *Subjacency violation*, as shown in (3):

(3) $[_{CP}$ When$_k$ did $[_{TP}$ Siri say $[_{CP}$ what$_i]$ $_{TP}$ Mary $[_{vP}$ bought t_i] t_k]]]

Sinhala native speakers exposed to L2 English have to acquire all three properties outlined in (1), for which they do not have overt evidence in L1 Sinhala (as discussed in detail in Chapter 2; see also Section 4.4 below). As far as the first two properties are concerned, recall that a wh-phrase first merged inside a vP does not undergo overt wh-movement in Sinhala. Given this, the first task of these L2ers is to learn/acquire that, in the case of English overt wh-movement, wh-

[1] This example is modeled on de Villiers, Roeper and Vainikka (1990).

phrases are pronounced at a different structural position from where they are interpreted at LF.[2] This also means that in incremental processing, these L2ers have to learn to form an unbounded dependency between an antecedent (wh-phrase at Spec-CP) and its trace/copy inside the vP in which it is initially merged. Second, they need to learn that a LD wh-question can be ambiguous in English, as in (2), though the same ambiguity is absent in Sinhala, in which distinct sentences yield the two meanings. Notice that the following Sinhala counterpart for English example in (2) is not ambiguous:[3] In Sinhala each interpretation (matrix or embedded) is associated with a different word order in overt syntax.

(4) laməya kawəda də [eya-tə thuwaləuna kiyəla] kiww-e?
boy.NOM when Q he-DAT get-hurt.PAST that] say-E
When did the boy say he got hurt?

(5) laməya [eyatə kawəda də thuwaləun-e kiyəla] kiwwa.
boy.NOM he. DAT when Q get hurt-E. PAST that] say.A
The boy said when he got hurt.

Finally, L2 speakers who have Sinhala as their L1 are not sensitive to the application of the two locality constraints, *Superiority* and *Subjacency* in Sinhala wh-interrogatives: an in-situ wh-phrase can be inside an island in Sinhala and overt wh-scrambling is not sensitive to Subjacency and Superiority violations.

4.1.2 Predictions

Let's first assume that Sinhala native speakers in our study have had sufficient exposure to English L2 input in order to construct a mental grammar for English as their target L2. Given

[2] Unlike those instances in which wh-in-situ is allowed in English (see analysis in Pires & Taylor, 2007, and references therein).
[3] For the same observation in Chinese, see White (2007).

that there are different hypotheses or theories on the role of UG in adult L2 acquisition, several predictions are possible concerning their interlanguage development in the domain of English wh-questions. Full Access approaches (e.g. Epstein et al., 1996; Schwartz & Sprouse, 1994, 1996; Vainikka & Young-Scholten, 1994; White, 2003) in general would predict that these L2ers can successfully acquire the relevant uninterpretable feature [*uwh**] that triggers overt wh-movement in English and the application of related constraints, given that they have direct access to the complete inventory of both interpretable and uninterpretable syntactic features made available by UG. One plausible prediction in line with the Full Access Full Transfer Hypothesis (Schwartz & Sprouse, 1994, 1996) is that Sinhala native speakers at least during their initial stages of interlanguage development could analyze wh-movement in the target language as an instance of scrambling, for which they have overt evidence in their L1 syntax. However, even if they do so, such divergence from the target grammar during early stages of interlanguage development is expected to be a temporary phenomenon, at least for learners that reach advanced proficiency in English.[4] With adequate exposure to the target language input, the L2ers can successfully reset parameters in functional categories, thereby fully converging on the target L2 grammar. As a consequence, successful L2 acquisition in this context is predicted to be able to yield native-like sensitivity to locality constraints associated with wh-movement, so that English L2 learners (Sinhala L1) also distinguish English wh-movement from scrambling, a syntactic operation driven by a different syntactic feature in these learners' L1, as discussed in Chapter 2.

[4] This is assuming that no fossilization happens in this domain during the interlanguage development (see e.g. Lardiere, 2007 for discussion).

The second prediction which is in line with Representational Deficit (RD) accounts (Hawkins & Hattori, 2006; Tsimpli, 2003; Tsimpli & Dimitrakopoulou, 2004; Tsimpli & Mastropavlou, 2007) is that Sinhala L1/English L2 speakers would continue to apply overt wh-scrambling to form wh-dependencies in the target grammar, provided that they began the L2 acquisition process following their L1. Under RD accounts, the acquisition of the *uwh** feature in L2 syntax must not be possible for late L2 learners, as they do not have access to the UG inventory of uninterpretable syntactic features after parameter setting in their L1 (Tsimpli, 2003). If the FIH is on the right track, this could be evident in the absence of native-like sensitivity to locality constraints (*Superiority* and *Subjacency*), which are associated with the uninterpretable *uwh** feature that triggers overt movement in English wh-interrogatives. Also, according to this view, L2ers who have early exposure to the target language should have a substantial advantage over those learners who approach the task relatively later in life. These predictions will be re-evaluated in view of the new experimental results presented in this chapter.

In terms of the properties outlined in the previous section, recall that Sinhala is one language which is structurally very similar to Japanese.[5] Both languages (i) are characterized by obligatory wh-in-situ (lack of overt wh-movement), (ii) have wh-scrambling which superficially resembles overt wh-movement in English, (iii) (wh-)scrambling is not sensitive to Subjacency, and (iv) scrambling does not exhibit Superiority effects. Thus, if RD accounts (Hawkins & Hattori, 2006; Tsimpli, 2003; Tsimpli & Dimitrakopoulou, 2004; Tsimpli & Mastropavlou, 2007) are on the right track, the acquisition of English overt wh-movement and corresponding constraints is expected to pose a learnability problem for Sinhala L1-English L2 speakers, in the same way

[5] See also Hagstrom (1999) and Kishimoto (1997).

they have been argued in Hawkins and Hattori (2006) to be problematic for Japanese L1 speakers acquiring L2 English. This study re-evaluates these predictions with related evidence from two experiments with Sinhala/English L2ers.

4.1.3 Research Questions

The experimental study presented in this chapter investigates the following research questions:

1. Do Sinhala native speakers acquiring L2 English (following their L1 acquisition) show evidence of successful acquisition (parameter resetting) of the [uwh*] feature in wh-interrogatives?
2. To what extent are they sensitive to locality constraints such as *Subjacency* and *Superiority* in English wh-interrogatives?
3. Does the knowledge of the L2ers in this study regarding English wh-questions differ from that of the English native speakers, considering evidence from their experimental results regarding knowledge of constraints on overt wh-movement in English?

4.2 Experiment 1: Truth Value Judgment Task (TVJ)

Experiment 1 involves a *Truth Value Judgment* task (TVJ) (Crain & Thornton, 1998), a slightly modified replication[6] of the one used in Hawkins and Hattori (2006). The goal of this task is to test the sensitivity of Sinhala/English L2ers to violations of Superiority and Subjacency in English LD wh-extractions, which would constitute evidence that they have acquired the *uwh** that triggers wh-movement in English. It is assumed that the TVJ task would allow us to test participants' sensitivity to the two locality constraints on wh-questions in a more natural way,

[6] In this study, in terms of the kinds of locality violations tested, we tried to match our experiment to the one reported in Hawkins and Hattori (2006). The main modification we applied was to reduce the number of possible answers for a test item from three to two. We will explain reasons for this modification in our discussion of the study.

including possible ambiguities in different structures which would be more difficult to do by using only a grammaticality judgment task.

4.2.1 Participants

A total of 39 L2 speakers of English (L1 Sinhala) in Sri Lanka and a control group of 31 English native controls in the US participated in this study. The mean age of the L2 speakers was 28.3 (*SD=8.6*). The mean age of the English monolinguals was 22.2 (*SD=7.5*). They all received a small fee for their participation. At the time of the testing, all L2 participants were either studying or teaching in English at a university in Sri Lanka. Native English controls were recruited from a pool of undergraduates at a major research university in the US.

A note is in order here about the kind of exposure to English our L2 group has received in Sri Lanka. Our discussion also considers results from a language background survey all participants completed as a part of this study. All L2ers in this study, as we mentioned in the introduction, reported that they learned English predominantly in a classroom setting, starting from preschool. The preschool system in Sri Lanka does not have a uniform curriculum. As a result, the nature and the amount of English input one receives at a preschool depends on the kind of preschool that he/she attends, i.e. the primary medium of instruction in a Sri Lankan preschool could be either English, Sinhala[7] or a combination of both. Given this, we have less information about the individual kind of exposure to English that this group would have had during their preschool age. However, in public schools, English is introduced in grade 1 (age 6), especially after educational reforms that took place in the early 1990s. In grades 1 and 2, this is mostly limited to the

[7] The primary language in a school could also be Tamil. But the group that we studied in this study consisted only of Sinhala/English bilinguals.

introduction of the English alphabet and a few formulaic expressions in English. English is really introduced as a subject (as taught by an ESL teacher) in grade 3 (age 8). Still, this could be different in private or semi-public schools. Starting from grade 6 (age 11), students also have the opportunity to receive most of their education in English.[8] The same is true (at least in some disciplines) in universities. Based on the survey results, the percentage (%) of education that our L2 participants had received in English during different periods in their life is summarized in Figure 1.

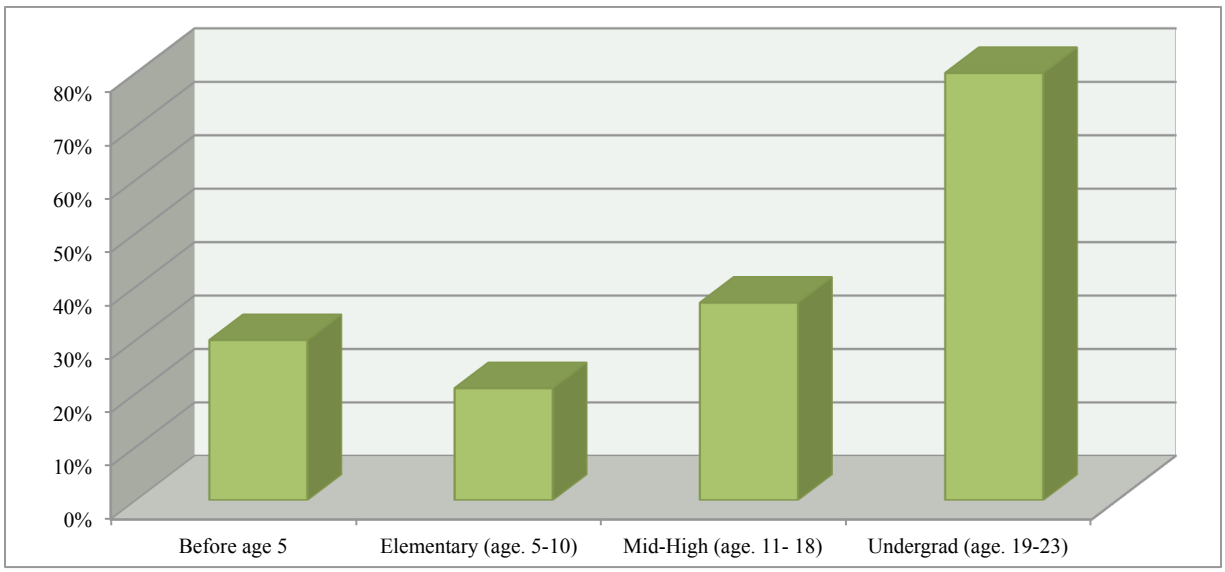


Figure 4.1: Subject exposure to English medium education from preschool to undergraduate studies

The L2 participants who took part in this study formed a group (lecturers and students) that uses English on a regular basis at least for academic purposes at a local university in Sri Lanka. They reported that (on average) 70% to 90% of their day–to-day communication at the university

[8] But such opportunities mostly exist in urban schools.

was in English. Finally, no participant had lived for more than three months in a native English speaking country before the age 20.

In addition to the two experiments (which will be described below) and the background survey, all participants also completed a language proficiency test.[9] This test (Cloze Test) consisted of 40 test items and was worth 40 points in total. Based on the results of the proficiency test (Table 1), L2 speakers were assigned to two proficiency groups. Participants who scored between 34 and 40 were included in the *Advanced Proficiency Group* (*n = 14*) while the rest were included in the *Intermediate Proficiency Group* (*n = 23*).

Group	Number	Mean Score (SD)	Score Range[10]
English Controls	31	37.42 (3.00)	28-40
Advanced L2	14	36.29 (1.73)	34-39
Intermediate L2	23	28.52 (5.26)	15-33

Table 4.1: Proficiency test (Cloze Test) scores for the three participant groups.

Also, based on their responses in the survey, L2 speakers were assigned to three different groups considering differences in their onset of exposure to English. Those speakers who had been exposed to English before age 3 made up the *Early Exposure Group* (*n = 11*). Their mean age of onset was 2.8 years. As revealed in the language background survey, these were speakers who reported having received some exposure to English at home or preschool before they

[9] This test was based on a standard English proficiency test, the *ECPE/Examination for the Certificate of Proficiency in English*, developed by the ELI, University of Michigan, Ann Arbor.
[10] In this test, 36 out of 40 native speakers (90%) scored above 34, which was also considered as the threshold that the advanced L2 speakers needed to reach.

formally learned English at schools. The second group (*n = 21*) reported having been exposed to English later, between ages 4 and 9, and their mean age of onset was 7.2. The third group consisted of participants who had received exposure to English between ages 10 and 18 (*n=5*). However, as stated earlier, all three groups had learned English predominantly in a classroom setting at school.

4.2.2 Materials and Procedure

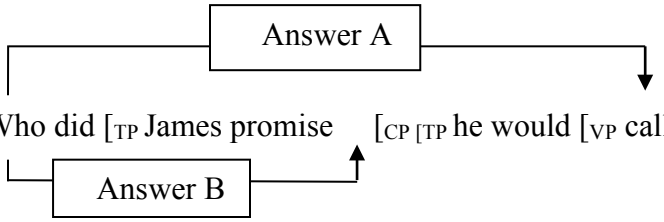
The design of the TVJ experiment took the format of a story, followed by a question and two possible answers. Both answers were pragmatically plausible given the context created by the story. But some of the answers were grammatically impossible because the interpretation they corresponded to would require violations of *Superiority*, *Subjacency* or both in the test question. This is illustrated in (6) below.

(6)

Story	James is making plans to go hike the Great Wall of China during the summer. Last Tuesday, James promised to call Lois the following day with the details of the trip, so that Lois can join him too.
Test Question	*Who did James promise he would call when?*
Answers	a: James promised that on Wednesday he would call Lois. b: James promised Lois that he would call on Wednesday.

In this task, participants were asked to choose the most acceptable answer (they had the option to choose one or both answers) to the question that was being asked. Since both answers were always pragmatically possible given the context created by the story, the difference in acceptance or non-acceptance of each answer to the test questions relied mainly on whether

subjects allowed the matrix wh-phrase in the test question (*who*) to be interpreted either in the matrix or embedded clause. For answer (a) in the above example to be acceptable, both *who* and *when* in the Test Question have to be interpreted as having scope in the embedded clause. At least according to the standard view in generative syntax (following Chomsky, 1973), this violates the *Superiority condition*: *who* would have to be generated lower than *when* in the syntactic structure that corresponds to the embedded clause interpretation of *who* in (6a) (see Chapter 2 for previous discussion). But in answer (b), *who* has scope in the matrix clause (while *when* is expected to have scope in the embedded clause). This interpretation of answer (b) does not yield any syntactic violations in the Test Question.[11] Both scopes of *who* are illustrated in (7).



Following Hawkins and Hattori (2006), we predict that participants who have acquired the [*uwh**] will show sensitivity to both Superiority and Subjacency violations, choosing answers that do not require such violations in the interpretation of the test question.

This task included the following conditions, each with four test stories and corresponding questions:

Condition 1: The matrix wh-word is predicted to be interpretable either in the embedded or matrix clause: No violation of *Superiority* or *Subjacency*.

[11] In addition to these two answers, the test items used in Hawkins and Hattori's (2006) study included a third answer that required both wh-phrases to be interpreted in the matrix clause. In our replication (following White, 2007), we avoided this option given that it is not directly relevant to the two locality constraints that we are testing in this study. Further, the elimination of the third answer reduced the complexity of the task significantly, which could have been a confounding factor affecting the performance of the non-native speakers in H&H's study.

Example:

Jina is just back from one week of vacation in France. This morning at the office, she told Rob that she visited the Eiffel Tower on Friday and the Louvre museum on Saturday.

Question: **When did Jina say she visited what?**

(a) Jina said that she visited the Eiffel Tower on Friday and the Louvre museum on Saturday.

(b) Jina said this morning that she had visited the Eiffel Tower and the Louvre museum.

Condition 2: The matrix wh-word is predicted to be interpreted only in the matrix clause (answer *a* in example below). Its interpretation in the embedded clause (answer *b*) is predicted to result in a *Superiority violation*.

Example:

Francesca is catching up with her best friend Donna at a coffee shop. Francesca tells Donna then that she plans to marry her fiancée Jordan in Chicago in April. Donna promises to come to Francesca's house in March to help plan the wedding.

Question: **Who did Donna promise she would help when?**

a) Donna promised Francesca that she would help in March with the plans for the wedding.

b) Donna promised that in March she would help Francesca plan the wedding.

Condition 3: The matrix wh-word is predicted to be interpreted in the matrix clause (answer *b* below). Its embedded reading (answer *a*) is blocked by an intervening wh-word that has overtly moved to the embedded Spec, CP, which yields a Subjacency violation.

Example:

Last Saturday, a journalist was murdered at the Corner Street in town. Sunday evening, the police arrested a drug dealer in connection with the murder. It was only on Monday that the police briefed the media on the arrest.

Question: **When did the media know who the police arrested?**

a) The media knew that on Sunday the police arrested a drug dealer.

b) The media knew on Monday that the police arrested a drug dealer.

Condition 4: The matrix wh-word can be interpreted only in the matrix clause (answer *b* in example below). Its embedded clause interpretation (answer *a*) is predicted to be blocked by both a *Superiority* and a *Subjacency violation*.

Example:

A group of tourists went on a safari tour to see wild elephants in the Yala National Park, Sri Lanka. At the park entrance, officials informed the tourists that they could be attacked by elephants on the river-bank if they got out of their vehicles.

Question: **Who did the officers warn where wild elephants could attack?**

a) The officers warned that wild elephants could attack tourists on the river-bank.

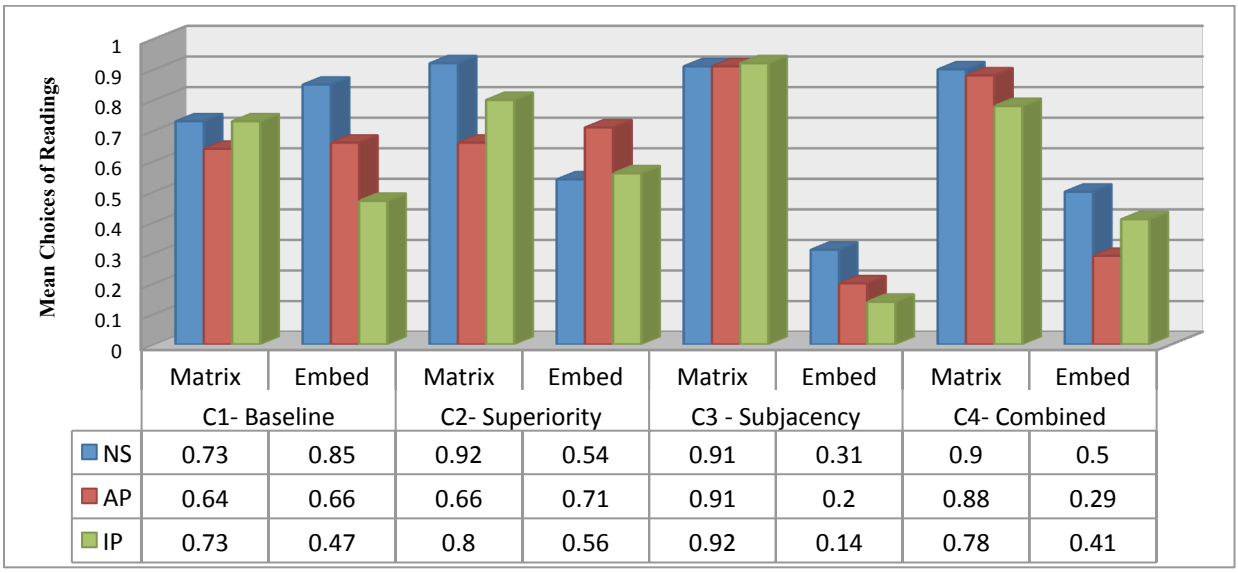
b) The officers warned the tourists that wild elephants could attack on the river-bank.

Items in C1 were used as a baseline to evaluate whether the L2 participants are sensitive to the scopal ambiguity in English wh-questions. Recall that such ambiguity is something for which these L2ers do not have overt evidence in their L1, i.e. in Sinhala wh-questions, each scopal interpretation is associated with a different word order. Provided that they are sensitive to this scopal ambiguity in English, the other three conditions are intended to reveal whether they are sensitive to the two locality constraints that block the embedded reading. These test items were presented in a random order with eight fillers that matched their structure but did not involve the application of the movement constraints.

4.2.3 Results

Participants' mean choices of matrix/embedded readings for the fronted wh-word in each condition, given their answers for each test item, are summarized in Figure 1. As stated earlier,

Condition 1 included complex wh-questions in which either the matrix or embedded reading was predicted to be possible without any violations of *Superiority* or *Subjacency*. These items allowed us to determine whether L2 participants, similar to native speaker controls, are sensitive to the scopal ambiguity in LD English wh-interrogatives. Our results show that English monolinguals in these cases had a preference, though marginally, for the embedded scope reading (*Mean* = 0.85, *SD* = 0.27) over the matrix one (*Mean* = 0.73, *SD* = 0.34). Advanced L2ers, in contrast, showed almost no difference in their choices between matrix (*Mean* = 0.64, *SD* = 0.34) and embedded readings (*Mean* = 0.66, *SD* = 0.32) while the intermediate L2 group displayed a strong preference for the matrix interpretation (*Mean* = 0.73, *SD* = 0.30) over the embedded (*Mean* = 0.47, *SD* = 0.36) one.



	Matrix	Embed	Matrix	Embed	Matrix	Embed	Matrix	Embed
	C1- Baseline		C2- Superiority		C3 - Subjacency		C4- Combined	
NS	0.73	0.85	0.92	0.54	0.91	0.31	0.9	0.5
AP	0.64	0.66	0.66	0.71	0.91	0.2	0.88	0.29
IP	0.73	0.47	0.8	0.56	0.92	0.14	0.78	0.41

Figure 4.2: Mean matrix and embedded (Embed) interpretations of the higher wh-phrase for all three participant groups in the TVJ task: NS (Native), AP (L2 Advanced Proficiency) and IP (L2 Intermediate Proficiency.

Despite these differences, all three participant groups showed that (i) they were sensitive to the scopal ambiguity in LD wh-movement, and (ii) they could assign both matrix and embedded readings for the fronted wh-word when there is no violation involved. Thus, their performance in

this condition provided us with a baseline to evaluate participants' scopal assignment in the other three experimental conditions.

We submitted participants' mean choices of embedded/matrix readings to a repeated measures ANOVA, with *proficiency* as between-subject factor and *condition* (1 to 4) and *interpretation site* (matrix vs. embedded clause) as within-subject factors. Both by-participant and by-item analyses showed a significant three-way interaction of *interpretation site*, *condition* and *proficiency* ($F1$ (6, 12) = 3.91, $p < .001$, $F2$ (6, 24) = 3.43, $p < .01$) and significant effects of *interpretation site* ($F1$ (1, 65) = 14.37, $p < .001$, $F2$ (1, 12) = 33.82, $p < .001$), *condition* ($F1$ (3, 63) = 15.90, $p < .001$, $F2$ (3, 12) = 8.08, $p < .001$) and *proficiency* ($F1$ (2, 65) = 8.78, $p < .001$, $F2$ (2, 11) = 10.80, $p < .003$). Given that proficiency interacted with the other two factors in question, we conducted separate repeated measures ANOVAs for each participant group. The interaction between *interpretation site* and *condition* was significant for native controls ($F1$ (3, 28) = 21.22, $p < .001$, $F2$ (3, 12) = 42.34, $p < .001$) and for advanced L2ers ($F1$ (3, 11) = 12.36, $p < .001$, $F2$ (3, 12) = 6.85, $p < .006$). For intermediate L2ers, this became significant only in the by-participant analysis, $F1$ (3, 20) = 13.61, $p < .001$, $F2$ (3, 12) = 2.92, $p > .07$. Overall, these results imply that both L2 groups, similar to our control group, were sensitive to different scopal possibilities offered by the four conditions.

However, we were more interested in the question whether L2ers would accept an embedded reading in those conditions that involve a Superiority violation (C2), subjacency violation (C3) or both (C4), differently from the baseline condition (C1). To answer this question, we conducted several post-hoc tests (paired t-tests and ANOVA when necessary) comparing participants' mean embedded interpretations in the baseline condition with their own embedded interpretations in each experimental condition.

Recall that items in the Superiority condition (C2), unlike those in the baseline condition, offered a different possibility in terms of their scopal interpretation for the fronted wh-word: the embedded reading for the matrix wh-word was predicted to be blocked by a Superiority violation, given standard theoretical accounts (see Chapter 2). When compared to the baseline condition (*Mean* = 0.85, *SD* = 0.27) native speakers' embedded reading in this instance (*Mean* = 0.54, *SD* = 0.33) proved to be significantly different, $t(30) = 4.42$, $p < .001$. But this was not observed for the advanced L2 group, as their mean embedded interpretation in this condition (*Mean* = 0.71, *SD* = 0.31) was not significantly different from their own performance in condition 1 (*Mean* = 0.66, *SD* = 0.32), t (13) = -0.50, $p > .62$). The latter was also true for the intermediate group: there was no significant difference between their own embedded interpretation in the baseline condition and the superiority condition, t (22) = -0.85, $p > .40$. According to these comparisons, only native speakers seemed to be sensitive to the superiority violations that we tested in the TVJ experiment (we return later to further discussion of the results of this condition). However, advanced L2ers were not significantly different ($p >.34$) from the native speaker controls in terms of the number of times that they assigned an embedded reading in C2.

Items in C3 were similar to those in C2 except that the embedded reading for the matrix wh-word in these items was predicted to be blocked by a Subjacency violation. In this condition, both L2ers and English monolinguals showed a clear preference for the matrix reading of the higher wh-word. Native controls behaved as predicted, as their performance in C3 significantly differed from their own embedded readings in the baseline condition C1, t (30) = 7.65, $p < .001$. The same was true for advanced L2ers, t (13) = 5.95, $p <.001$ and intermediate L2ers, t (22) = 4.11, $p < .001$. Furthermore, as far as the performance in this condition is concerned, there was

no significant difference between native controls and advanced L2ers ($p > .49$) even though intermediate L2ers were slightly different from native speakers ($p < .05$).

Condition 4, meanwhile, involved items in which the embedded reading for the higher wh-word was predicted to be excluded by both *Superiority* and *Subjacency* violations. As we predicted, for the control group, the embedded reading in this instance was significantly different from their own performance in the baseline condition, t (30) = 4.81, $p < .001$. The same pattern was observed for advanced L2ers, t (13) = 4.17, $p < .001$, but not for the intermediate group, t (22) = 0.45, $p > .65$. Thus, only advanced L2ers and native speakers showed strong sensitivity to violations that blocked the embedded reading in this condition.

As discussed above, even though all L2 participants in this study had learned English predominantly in a classroom setting, they differed in terms of when they had been first exposed to L2 English. Given this, additional comparisons were made between L2ers who had had Early Exposure (EE) to English (before age 3, *n = 11*), those who had Intermediate Exposure (IE) (age between 4-9, *n = 21*) and participants with Late Exposure to English (LE) (age between 10-15, *n = 5*). The goal of this test was to determine whether the age of first exposure offered an advantage regarding the acquisition of uninterpretable syntactic features, as would be predicted by the *Interpretability Hypothesis*.

Mean choices of answers for these three groups are given Figure 2. A mixed-model ANOVA on L2 participants' mean choices of embedded/matrix interpretations with the *age of first exposure* as between subject factor and *interpretation site* (matrix vs. embedded) and *condition* as within subject variables revealed no main effect of *age of exposure*, $F1$ (0, 26) = 3.91, $p > .75$ or significant interaction of *age of exposure*, *condition* and *interpretation site*, $F1$ (6, 64) = 0.97,

$p > .44$. This implies that the performance of the three groups did not differ depending on their age of first exposure to English.

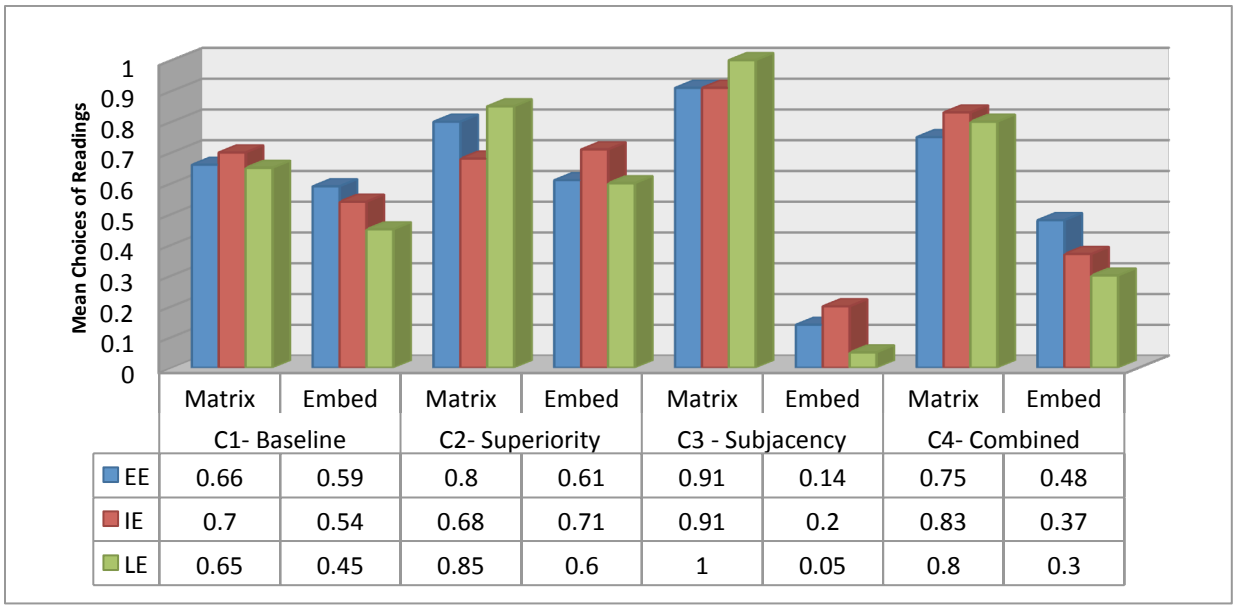


Figure 4.3: This figure presents the mean matrix and embedded (Embed) readings for the three participant groups who differed in terms of their first exposure to English: EE (Early Exposure), IE (Intermediate Exposure) and LE (Late Exposure)

4.2.4 Results Summary and Interim Discussion

Our results on the TVJ task clearly show that these L2 participants have successfully acquired the principle of Subjacency as evident in their assignment of embedded scope readings in C3. Recall that for both advanced and intermediate L2ers, the embedded reading in C3 significantly differed from their own assignment of embedded readings in the no violation (Baseline) condition (C1), in that in C3 both groups mostly avoided the embedded reading, differently from in C1: Adv L2 (t (13) = 5.95, p <.001), Inter L2 (t (22) = 4.11, p < .001). This is consistent with what was found for the native controls across these two conditions, t (30) = 7.65, p < .001. Thus, as far as Subjacency is considered, both L2 groups show evidence of the acquisition of overt wh-

movement in English wh-questions, implying that they have acquired the uninterpretable feature (*uwh**) that drives this overt movement.

Still, if Sinhala/English L2ers have indeed acquired the *uwh** in the target L2 grammar, one would expect them to show an equal level of sensitivity to Superiority violations in C2. However, neither the advanced L2 group nor the intermediate L2 group showed a strong level of sensitivity to Superiority violations in this condition, for neither of the L2 groups was the embedded scope reading in this condition significantly different from what was observed for them in the baseline condition, i.e. unlike the case of native controls. Therefore, at least in the Superiority condition, our results seem to be similar to what Hawkins and Hattori (2006) found for Japanese native speakers (JSE) acquiring L2 English: unlike what H&H observed regarding native controls, Superiority did not significantly block the embedded reading for JSE. Given these results, one could reasonably argue that Sinhala/English L2ers, similar to Japanese/English L2ers in H&H (2006), would have failed to acquire native-like competence regarding Superiority constraints on wh-movement in English, taking this to be evidence that they have not acquired the English overt wh-movement, as H&H's arguments would predict. However, in our view, this evidence alone is not sufficient to motivate such a strong conclusion, given the observations below.

Notice that even native controls in our study have shown a different level of sensitivity to Superiority violations (C2) (*Mean* = 0.54, *SD* = .33) than Subjacency violations (C3), (*Mean* = 0.31, *SD* = .23). If English monolinguals were equally sensitive to Subjacency and Superiority constraints in wh-questions, we would not expect to see a substantial difference in their performance in the embedded readings across C2 and C3. But in our analysis, this difference proved to be significant, t (30) = 3.96, $p < .001$. This implies that even native controls in this

study were less sensitive to Superiority violations (*Mean* = 0.54) than Subjacency violations (*Mean* = 0.31). We assume that this disparity between the two constraints resulted from the fact that test items on Superiority that H&H used in their study (and that we replicated in this experiment) only involved argument over adjunct wh-extractions, which have been argued to be acceptable to at least some native speakers of English (see e.g. Bošković, 1997; Lasnik & Saito, 1992; Obata, 2008). Recall that we discussed in Chapter 2 that either the argument or the adjunct could be extracted in the following English sentences. However, the Superiority violation predicted to apply in (8b) would be acceptable at least to some native speakers.

(8) a. [$_{CP}$ Where did [$_{TP}$ you read what]]?

b. [$_{CP}$ What did [$_{TP}$ you read where]]?

Given this, as we argued in Chapter 2, the use of test items such as the following would not necessarily reveal whether L2ers are indeed insensitive to the Superiority constraint in English.

(9) Who did Sophie's brother warn <who$_1$> [Sophie would telephone <*who$_2$> when]?

Answer 1: He warned Norman that Sophie would phone on Friday.

Answer 2: He warned that Sophie would phone Mrs. Smith on Friday.

In contrast, a clearer Superiority violation is observed when an argument in a lower position in the structure is extracted over an argument occupied at a higher position.

(10) *What does Siri believe [who [said <*what>]]?

Due to this possible difference in grammaticality, a more fine-grained investigation of sensitivity to Superiority should include a sample of both kinds of violations, as illustrated in (9) and (10), respectively. If L2ers, similar to native speakers, show a difference in their judgments across these two kinds of Superiority violations, that would be strong evidence for their

sensitivity to Superiority violations in L2 syntax. We took this into consideration in designing the stimuli for our second experiment.

4.3 Experiment 2: Grammaticality Judgment Task (GT)

This experiment consisted of a scalar *Grammaticality Judgment* task in which participants used a five-point scale (1: *Strongly Agree*, 2: *Agree*, 3: *Neither Agree nor Disagree*, 4: *Disagree*, 5: *Strongly Disagree*) to evaluate the un/grammaticality of forty-six English sentences presented to them in a random order. Similar to the TVJ task in *Experiment 1*, the main goal of this experiment was to test the sensitivity of L2ers to Superiority and Subjacency violations associated with wh-interrogatives in English, implying that they have acquired the uninterpretable syntactic feature *uwh** that triggers wh-movement in English. In addition, this task also tested whether our participants are sensitive to the grammaticality distinction across the two kinds of superiority violations in English wh-questions (8a & b).

4.3.1 Participants

All L2ers and native controls who took part in Experiment 1 participated in this Experiment too.

4.3.2 Materials and Procedure

This experiment included eight test items each on Superiority and Subjacency violations and five items on combined Superiority and Subjacency violations in English wh-questions. The test also included five grammatical counterparts (control items) to each test condition and 10 fillers (*n = 46*). The Superiority condition included violations resulting from Argument over Argument (AoA) extraction (11) (3 items) or Argument over Adjunct (AoAJ) extractions (12) (5 items). Examples from each condition are listed below, with their predicted grammaticality judgments

(test items, predicted to be ungrammatical or marginal – */? – and control items, predicted to be grammatical, considering the syntactic theory review in Chapter 2). The filler items were also divided between grammatical and ungrammatical items.

Condition 1: Superiority Condition

(11) ?Who did Sara believe Troy would call when?

(12) *What will Sue say who bought?

(13) Who did the secretary say left when?

Condition 2: Subjacency Condition

(14) *What did Bill hear the rumor that Jay won?

(15) *What does Grace like the author who wrote?

(16) Who made the claim that the Queen of England wrote a book?

Condition 3: Combined Superiority and Subjacency violations

(17) *Who did you say when Frank visited?

(18) Who did Jane visit when she went to London?

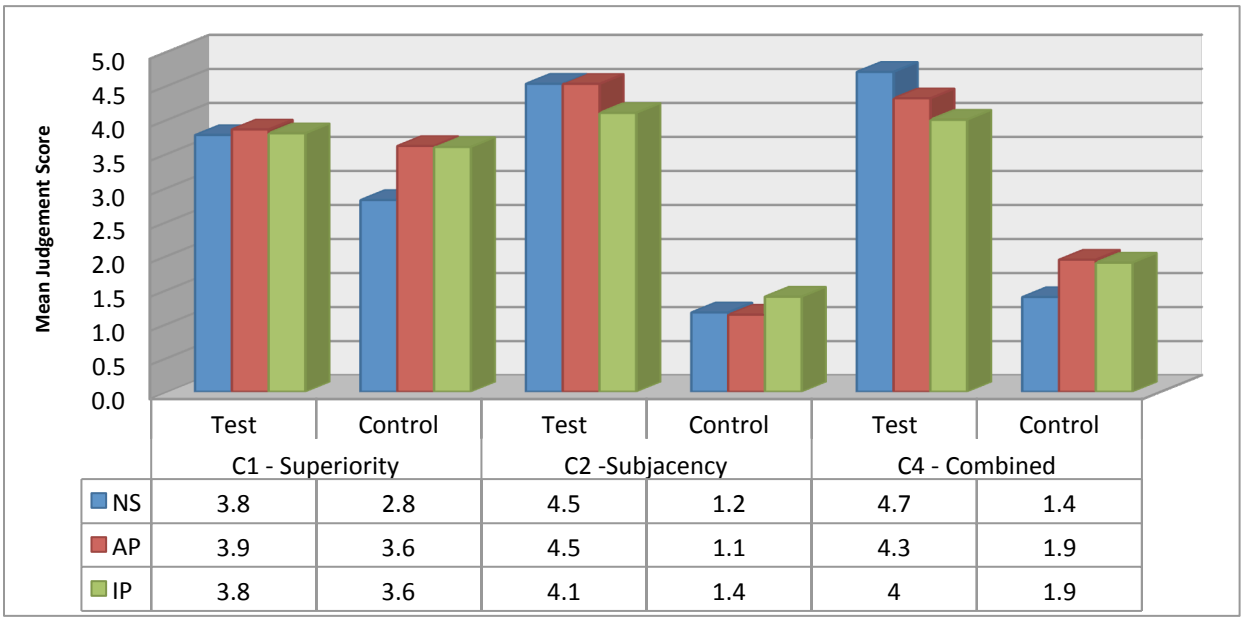
The test items in all three conditions were created using long distance wh-extraction that was either blocked by a Superiority violation (C1), a Subjacency violation (C2) or both Superiority and Subjacency violations (C3). This test was presented to them as a paper-pencil test. Participants were instructed to read each sentence carefully and indicate to what extent they thought the sentence was grammatically acceptable in English.

4.3.3 Results

In preparation for the statistical analysis, we computed mean scores for each participant as he/she judged the grammaticality of wh-questions for the three conditions. In order to do this, participants' judgments on the five-point scale (strongly agree = 1 to strongly disagree = 5) were

simply averaged. The Figure 3 shows the mean choices of the answers for the three participant groups.

When both kinds of Superiority violations are considered together, in C1, both native controls (*Mean* = 3.8, *SD* = 0.96) and L2ers (Adv/L2: *Mean* = 3.9, *SD* = 1.0, Inter/L2: *Mean* = 3.8, *SD* = 0.67) showed very similar rates of rejection of ungrammatical sentences resulting from Superiority violations. English monolingual controls (NS *mean* = 2.8, *SD* = 1.0) and L2ers (Adv/L2: *Mean* = 3.6, *SD* = 1.2, Inter/L2: *Mean* = 3.6, *SD* = 0.80) were slightly different only in that English monolinguals showed a lower rate of acceptance of arguably grammatical counterparts to Superiority violations.



	Test	Control	Test	Control	Test	Control
	C1 - Superiority		C2 -Subjacency		C4 - Combined	
NS	3.8	2.8	4.5	1.2	4.7	1.4
AP	3.9	3.6	4.5	1.1	4.3	1.9
IP	3.8	3.6	4.1	1.4	4	1.9

Figure 4.4: Mean grammaticality judgment scores for all three participant groups, NS (Native English), AP (L2 Advanced Proficiency) and IP (L2 Intermediate Proficiency), in ungrammatical test sentences vs. grammatical control sentences.

In the test of Subjacency (C2), both English monolinguals and L2ers performed very similarly in both the test and control conditions. In rejecting the test sentences with Subjacency violations, English monolinguals are in the higher end of the five-point acceptability scale (*Mean*

= 4.5, *SD* = 0.49). The same is observed for advanced L2ers (*Mean* = 4.5, *SD* = 0.46) and intermediate L2ers (*Mean* = 4.1, *SD* = 0.72). So, in this experiment, all groups showed a consistent pattern of rejection of Subjacency violations. A very similar pattern is observed in C3 (Subjacency + Superiority violations) for both L2ers and native controls. Finally, notice that for all three groups, the mean difference between test vs. control items in C1 is not as substantial as what is observed in the other two conditions, when the two types of Superiority conditions are considered together.

Given the pattern that we have observed in descriptive statistics, we submitted these mean judgment scores to a repeated measures ANOVA with *proficiency* (3 levels: *Native, Adv. L2 and Inter. L2)* as between-subject factor and *condition* (3 levels: *Superiority*, *Subjacency*, *combined*) and *grammaticality* (2 levels: *test vs. control*) as within-subject factors. Both by-participant and by-item analyses showed significant effects of *grammaticality* ($F1$ (2,64) = 231.08, $p < .001$, $F2$ (1, 4) = 386.86, $p < .001$), *condition* ($F1$ (2,29) = 10.14, $p < .001$, $F2$ (2,3) = 9.93, $p < .04$), interactions of *proficiency* and *grammaticality* ($F1$ (2,65) = 15.27, $p < .001$, $F2$ (2,3) = 209.79, $p < .001$), *condition* and *grammaticality* ($F1$ (2,64) = 231.08, $p < .001$, $F2$ (2,3) = 665.76, $p < .001$), and a three-way significant interaction between *condition*, *grammaticality* and *proficiency* ($F1$ (4, 12) = 5.47, $p < .001$, $F2$ (4,16) = 8.13, $p < .001$). However, *proficiency* alone ($F1$ (2, 65) = 0.72, $p > .48$, $F2$ (2, 3) = 4.1, $p > .13$) was not significant either in the participant or the item analyses. We take these results to imply that our participants in general judged grammatical conditions (test) differently from ungrammatical conditions (control) though at least one group showed a different level of sensitivity to the grammaticality distinction (test vs. control) in one or many conditions. In order to further explore the nature of this interaction involving proficiency,

we conducted 3 (proficiency levels) x 2 (grammaticality: test vs. control) repeated measures ANOVAs for each condition separately.

As far as C1 (Superiority violations) is concerned, the interaction between *proficiency* and *grammaticality* proved to be significant ($F1$ (2, 65) = 10.21, $p < .001$, $F2$ (2, 3) = 19.80, $p < .01$). Proficiency had a main effect only in the item analysis ($F1$ (2, 65) = 1.75, $p > .18$, $F2$ (2, 3) = 8.95, $p < .05$), while grammaticality was only significant in the participant analysis, $F1$ (2, 65) = 26.50, $p < .001$, $F2$ (1, 4) = 1.76, $p > .25$. Subsequent post-hoc (paired t-test) comparisons revealed that in C1, the grammaticality distinction (test vs. control) was significant for the native controls, t (30) = 6.87, $p < .001$, but not for the advanced L2 group, t (13) = 1.49, $p > .15$, or the intermediate L2 group, t (21) = 1.33, $p > .19$.

Meanwhile, C2 (Subjacency) also revealed an interaction of *proficiency* and *grammaticality*, $F1$ (2, 65) = 5, 30, $p < .001$, $F2$ (2, 8) = 14.56, $p < .002$. Further, the effect of *grammaticality* proved to be significant, $F1$ (1, 65) = 1063, 31, $p < .001$, $F2$ (1, 4) = 210.82, $p < .001$. However, in this condition both L2 groups, similar to native controls, showed strong sensitivity to the grammaticality distinction, as each group judged test items to be significantly different from control items (Adv/L2: t (13) = 23.17, $p < .001$; Inter/L2: t (21) = 13.36, $p < .001$; Native: t (30) = 27.88, $p < .001$).

Also, in C3 (combined Superiority and Subjacency), we found the same interaction between *proficiency* and *grammaticality*, $F1$ (2, 65) = 13.95, $p < .001$, $F2$ (2, 3) = 28.88, $p < .01$. Despite this, for each group the difference between grammatical and ungrammatical items was significant, Native: t (30) = 21.29, $p < .001$, Adv/L2: t (13) = 9.74, $p < .001$, Inter/L2: t (21) = 12.61, $p < .001$.

Further analyses considering both C2 and C3 showed that the interaction between *proficiency* and *grammaticality* was significant in both C2 and C3 because the intermediate group performed slightly differently from the other two groups in their judgment of both test and control items. Despite this difference, the intermediate group was also sensitive to the grammaticality distinction in both C2 and C3.

Summarizing our results so far, native controls, as predicted, show sensitivity to the grammaticality distinction in all three conditions. Meanwhile, L2ers are sensitive to this distinction only in C2 (Subjacency) and C3 (combined Subjacency and Superiority).

Our subsequent analyses also revealed that in ruling out ungrammatical sentences resulting from different kinds of violations, both English monolinguals and the advanced L2 group performed differently across conditions. This is evident from the fact that, in test items, *condition* had a significant effect on native controls ($F1$ (2, 29) = 16.02, $p < .001$, $F2$ (2, 3) = 199.75, $p < .001$) and the advanced L2 group ($F1$ (2, 12) = 7.46, $p < .001$, $F2$ (2, 3) = 168.43, $p < .001$). Post-hoc (Bonferroni) pairwise comparisons revealed that native controls judged Superiority violations (NS *Mean* = 3.8, *SD* = .96) significantly differently from Subjacency violations (NS *Mean* = 4.5, *SD* = .49), t (30) = -4.65, $p < .001$. The same was true for the advanced L2ers between Superiority (*Mean* = 3.9, *SD* = 1.0) and Subjacency violations (*Mean* = 4.5, *SD* = .46), t (13) = -4.65, $p < .001$. This implies that in contrast to Subjacency violations, both groups were less sensitive to violations resulting from Superiority. This is further confirmed by the observation that in C1 (Superiority), even native speakers exhibit a deviation from expected mean scores (Control: 1 (strongly agree), Test: 5 (strongly disagree)) for both grammatical control items (NS *Mean* = 2.8, *SD* = 1.0) and ungrammatical test items (NS *Mean* = 3.8, *SD* = .96). This is line with an observation that we also made in the TVJ task (Experiment 1)

concerning Superiority: when both kinds of Superiority violations (argument over argument; argument over adjunct) are considered together, participants' mean judgments show a less clear pattern of rejection.

Given this pattern in participants' behavior in C1 (Superiority), an additional analysis was conducted on *Superiority* (C1) to determine whether different kinds of Superiority violations had different or similar effects on participants' judgments. As the first step, we divided all items on Superiority violations into two categories, violations resulting from the movement of (i) argument over argument (11) wh-movement (AoA) and (ii) argument over adjunct (12) wh-movement (AoAJ). The mean judgment scores for this test are given in Figure 4.

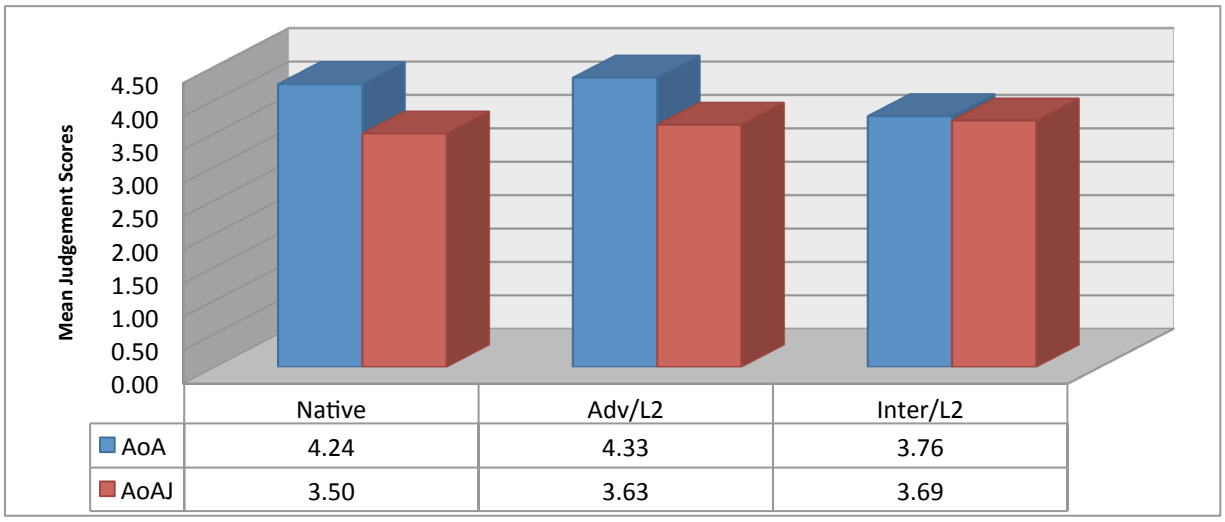


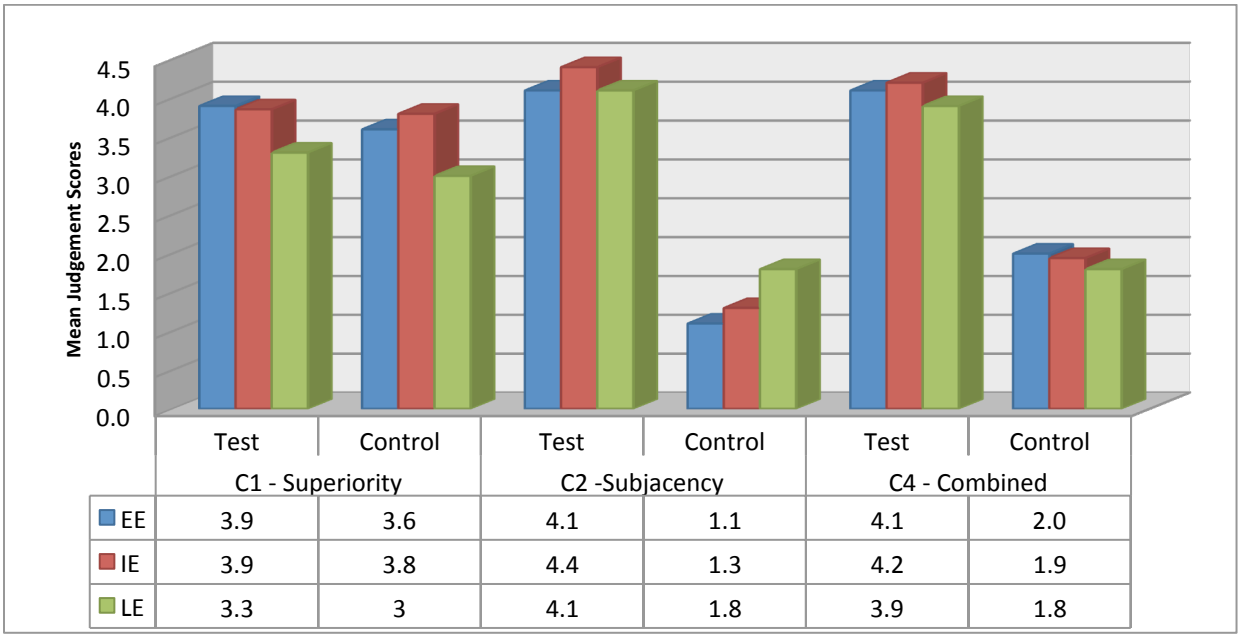
Figure 4.5: Participants' mean judgment scores on the two kinds of superiority violations, AoA (Argument over Argument extraction) and AoAJ (Argument over Adjunct extraction).

A repeated measures ANOVA on these mean grammaticality judgment scores with proficiency (*3 levels: Native, Adv/L2 and Inter/L2*) as between-subject factor and violation type (AoA vs. AoAJ) as within-subject factor revealed a significant effect of violation type, $F(2, 64) = 16.95$, $p < .001$ and a two-way interaction between *violation type* and *proficiency*, $F(2, 64) = 3.59$, $p < .03$. Subsequent analyses with each group revealed a significant interaction effect of

violation type for native controls, $F(1, 30) = 22.89$, $p < .001$ and the advanced L2 group, $F(1, 13) = 5.67$, $p < .03$. Pairwise comparisons for both of these groups confirmed that judgments on AoA superiority violations were significantly different from AoAj violations: (Native: t (30) = 4.78, $p < .001$, Adv/L2: t (13) = 2.38, $p < .03$). However, for the intermediate group, violation type had no significant effect, F (1, 21) = 0.10, $p > .75$, implying that they were not different in their sensitivity to the two kinds of Superiority violations in question. In summary, both native controls and advanced L2ers showed different levels of sensitivity to the two kinds of Superiority violations in English, and more strongly rejected test items with Superiority violations involving argument over argument wh-extraction.

Finally, recall that in the TVJ task we found that the age of first exposure had no significant effect on L2ers' sensitivity to the two constraints on wh-movement that we are interested in this study. In this experiment, additional comparisons were also made between L2ers who had Early Exposure (EE) to English (before age 3, *n = 11*), those Intermediate Exposure (IE) (age between 4-9, *n = 21*) and participants with Late Exposure (LE) to English (age between 10-15, *n = 5*). Mean grammaticality judgments for these three groups are summarized in Figure 5.

A repeated measures ANOVA conducted on these mean judgments with *age of first exposure* as between-subject factor and *condition* and *grammaticality* as within-subject factors revealed no significant effect of interaction between *grammaticality* and *age of exposure* ($F1$ (2, 34) = 1.83, $p > .54$) or between *condition, grammaticality* and *age of first exposure* ($F1$ (4,66) = 0.61, $p > .13$). Thus, these results indicate that the age of first exposure had no distinctive effect on L2 participants' sensitivity to the violations that we tested in this study.



	Test	Control	Test	Control	Test	Control
	C1 - Superiority		C2 -Subjacency		C4 - Combined	
EE	3.9	3.6	4.1	1.1	4.1	2.0
IE	3.9	3.8	4.4	1.3	4.2	1.9
LE	3.3	3	4.1	1.8	3.9	1.8

Figure 4.6: Mean grammaticality scores for the three L2 groups: EE (Early Exposure), IE (Intermediate Exposure) and LE (Late Exposure) to English.

4.4 General Discussion

This study aimed at re-evaluating a prediction made by Representational Deficit (RD) Accounts, in particular, the *Interpretability Hypothesis* (e.g. Hawkins & Hattori, 2006; Tsimpli, 2003; Tsimpli & Dimitrakopoulou, 2004) concerning the role of uninterpretable syntactic features in adult L2 grammars. According to this hypothesis, after a critical period (the acquisition of feature specifications for one's L1), L2ers do not have access to the complete inventory of uninterpretable syntactic features made available by UG. In post-childhood L2 acquisition, the role of UG is restricted to interpretable syntactic features and basic syntactic operations such as *Agree*, *Merge* and *Move.* As a result, native-like competence in any new uninterpretable syntactic features in the L2 that are not instantiated in the learners' L1 syntactic system is predicted by RD accounts to be impossible in post-childhood L2 acquisition: "by hypothesis, there is a permanent 'loss of capacity to acquire' in this domain" (Hawkins &

Hattori, 2006, p. 273). Further, apparent native-like performance by L2ers in this domain may not necessarily imply that they have developed native-like underlying representations. Under the Interpretability Hypothesis, L2ers may appear to match native speakers in performance, but they may still be using their L1 syntactic system (which is distinct from the L2 at least regarding the specification of uninterpretable features) to analyze the target language system.

Partially following aspects of the experimental design (which our Experiment 1 partially modeled) from Hawkins and Hattori's (2006) study with Japanese Speakers of English (JSE), this study investigated the acquisition of the *uwh** feature and relevant constraints in English wh-questions by Sinhala Native Speakers acquiring L2 English in Sri Lanka. If the predictions made by the RD account in H&H (2006) were satisfied, the acquisition of the uninterpretable feature (*uwh**) that drives movement in English wh-questions would be expected to be substantially difficult or inaccessible for Sinhala Native Speakers acquiring L2 English, in the same way it was argued to be problematic for Japanese/English L2ers in H&H (2006). This is due to the typological distinction regarding wh-questions between Sinhala and English, on the one hand, and the corresponding similarity between Sinhala and Japanese, on the other hand, as discussed in Chapter 2. The RD account prediction would be that, for both L2 groups (L1 Sinhala, L1 Japanese), the acquisition of wh-questions in English involves the acquisition of a new uninterpretable feature that is absent in wh-questions in their respective L1 grammars.

However, contrary to the predictions made by the RD/*Interpretability Hypothesis*, converging evidence from the two experiments in this study clearly shows that at least our advanced L2ers have successfully acquired overt wh-movement in English, implying that they acquired the uninterpretable feature (*uwh**) that is argued to trigger this overt movement in English. This is supported by the strong sensitivity of the L2 learners to locality constraints (Subjacency and

Superiority) associated with overt wh-movement in the target L2 English grammar. Let's consider evidence from subjacency violations. According to our discussion in Chapter 2, subjacency is a constraint that does not apply to wh-questions in Sinhala, i.e., in Sinhala, wh-phrases are allowed in a variety of syntactic islands (e.g. Gair, 1990). Hence, similar to the Indonesian L1/English L2 group studied by Martohardjono (1993), one can argue that in acquiring the Subjacency constraint in L2 English, Sinhala native speakers are faced with a genuine poverty of the stimulus problem (considering that they would not have access to the uninterpretable *uwh** feature in their L1, and the L2 input does not provide (negative) evidence about the application of the Subjacency and Superiority constraints). Results of our two experiments show that these L2ers have been able to successfully overcome this problem in acquiring overt wh-movement in English that is sensitive the application of Subjacency violations, implying that they have acquired the new uninterpretable feature specification (uwh*) that drives overt wh-movement. For example, in Experiment 1, for both L2 groups, the Subjacency constraint (condition 2) clearly blocked an embedded reading for the displaced wh-phrase. In addition, their performance in this condition matched what was observed for the native controls. Further, in Experiment 2, both L2 groups, like English native speakers, showed a significant difference between grammatical (test) items and ungrammatical (control) items in the Subjacency condition.

But if the L2 speakers in this study have indeed acquired the Subjacency constraint in the target L2, we would also expect them to be sensitive to an additional difference between so-called weak and strong islands in English, a distinction that has been argued to exist in native English grammars. Recall that this is one form of evidence that Martohardjono (1993) used to argue that her three L2 groups — Indonesian, Chinese and Italian native speakers — have

successfully acquired the Subjacency constraint in English. We tested this prediction regarding L1 Sinhala speakers by subdividing our test items on Subjacency into weak and strong island categories. In our subcatergorization (following Martohardjono, 1993), relative clauses (19) and adjuncts (*n* = *6*) were identified as 'strong' islands. All items on the complex NP constraint (*n* = *2*) were included in the 'weak' island category (20).

(19) What will John visit the town where his sister bought?

(20) Who did scientists make the claim that they recently saw on Mars?

The results of this comparison are given in Figure 7.

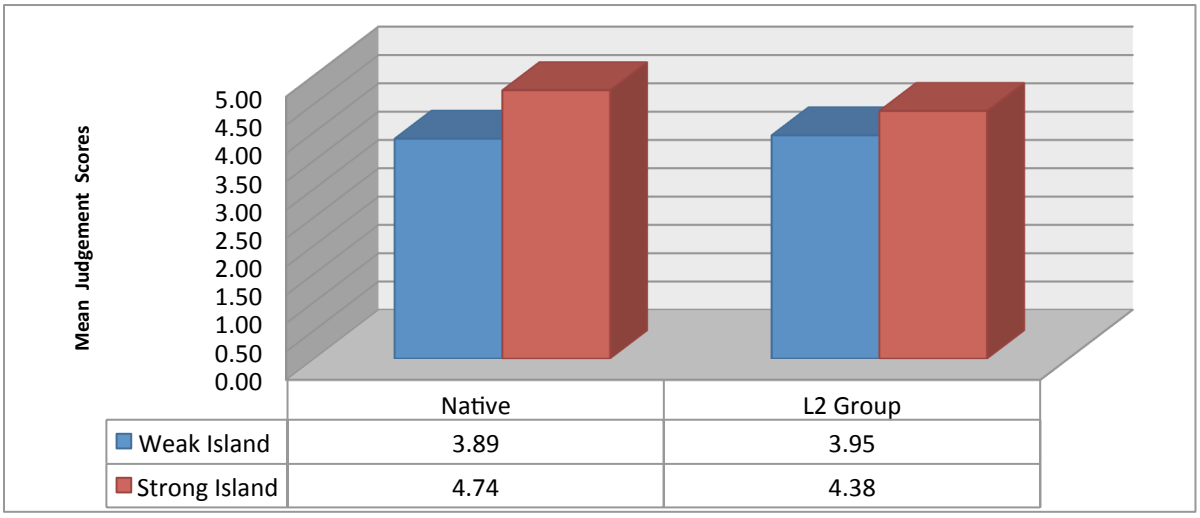


Figure 4.7: Mean average scores on participants' judgments of 'weak' vs. 'strong' islands

The analysis of this data with a paired t-test revealed the difference between weak and strong islands to be significant for both native control (t (30) = -5.93, $p < .001$) and L2 experimental groups (t (37) = -3.23, $p < .003$). Thus, this provides further evidence for these L2ers's sensitivity to the Subjacency constraint in their interlanguage/L2 grammars. Given that Subjacency is a constraint associated with overt wh-movement, which is triggered by the uninterpretable feature [uwh*] in English wh-questions, our results indicate that these L2ers (at

least the advanced L2 group) have been able to reconfigure the relevant uninterpretable feature specification in their grammars in response to the target language input.

To the extent that parameter settings are rooted on the feature specification of different syntactic categories, further evidence for such parameter resetting, involving the acquisition of the uwh* feature in the L2 grammar, comes from the L2ers' sensitivity to Superiority violations. In addition, results from our *Grammaticality Task/Experiment 2* revealed that advanced L2ers are clearly sensitive to the argument/adjunct distinction in Superiority violations in English.

Notice that even intermediate L2ers in this study show some evidence of successful acquisition of the relevant uninterpretable syntactic feature in English wh-questions, although they show weaker sensitivity to Superiority violations, unlike advanced L2ers and native controls. In both experiments, they at least show a strong level of sensitivity to Subjacency violations. This could be evidence that their interlanguage grammar is still under development (see e.g. Ellis, 1985; Long, 1990; Selinker, 1996 for discussion of this phenomenon). However, as rightly pointed out by Epstein et al. (1996), this does not necessarily imply that their grammar fails to be UG constrained: "Although L2 learners may lag behind native speakers with regard to accuracy rates, their judgments of wh-structures may still derive from their knowledge of UG principles and conform to a pattern predicted by UG" (p. 688). Also recall Lardiere's (2008) argument that the 'variability' or 'divergence' from the target norm is not necessarily a reliable indication that L2ers have failed to reset a parameter in their interlanguage grammars. Hence, more converging evidence is required before further conclusions can made regarding the intermediate L2er's knowledge state in their target L2 English syntax.

One argument that has commonly been made in favor of Representational Deficit (RD) accounts is that L2ers, even those who seem to match native speakers in performance, do not

truly have native-like underlying mental representations, i.e. L2ers' mental grammar for the target language is impaired in the functional domain due their restricted access to UG. Hence, in accounting for the target input, they would use alternative strategies borrowed from their L1 grammatical system. For instance, Hawkins and Chan (1997), in their study of Chinese L1/English L2 speakers in Hong Kong, argue that even the advanced L2ers in their study analyzed English relative clauses as non-movement structures derived through a 'resumptive strategy' borrowed from their L1. Tsimpli and Dimitrakopoulou (2007) made a similar argument to account for the non-target like performance of the Greek L1/English L2 learners that they studied in Greece. Meanwhile, Hawkins and Hattori (2006), following Miyamoto and Iijima (2003), argued that their Japanese L1/English L2 speakers have replaced English wh-movement with scrambling, an operation found only in their L1 grammar. Borrowing Bley-Vroman's (2009) term, let's call these 'patching strategies.'

Given these common findings with L2ers in different contexts (e.g. Hawkins & Chan, 1997; Hawkins & Hattori 2006; Tsimpli & Dimitrakopoulou, 2007), one could consider whether Sinhala/English L2ers in this study are also employing a 'patching strategy' to analyze wh-dependencies in English. For the sake of argument, let's assume that these L2ers have not reconfigured the relevant feature specification in their interlanguage grammars. One possibility, as suggested by H&H for Japanese natives, is that they are analyzing English wh-movement as scrambling, an operation available in their L1. Given the superficial similarity between the two kinds of operations, as discussed in Chapter 2, this would indeed be a possibility. However, if the L1 Sinhala/L2 English learners studied here had transferred scrambling from their L1 syntax to analyze the L2 input (as at least as predicted by Schwartz & Sprouse, 1996 for early stages of L2 development), we would not expect them to be sensitive to Superiority violations in English. The

reason, as we discussed in Chapter 2, is that Sinhala wh-scrambling, unlike wh-movement in English, is not subject to Superiority violations. The insensitivity to Superiority violations is a main argument used by H&H to support the proposal that Japanese native speakers have not acquired the relevant feature in English. However, contra this prediction, we found in the current study that our advanced L2ers could even distinguish between the two kinds of Superiority violations in English, in the additional analysis carried out as part of Experiment 2.

The assumption that these L2ers analyze wh-movement as a scrambling operation is even more problematic regarding the Subjacency constraint. As we discussed in Chapter 2, scrambling, unlike wh-movement, does not show island effects in Sinhala. However, even intermediate English L2ers show strong sensitivity to island constraints. Given this, there is evidence from this study against the view that L2ers, especially at the advanced level, would be using a 'patching strategy' in their acquisition of the uninterpretable feature specification of English wh-questions that is different from their L1 Sinhala. Further, the Subjacency and Superiority constraints are very unlikely to have been explicitly taught in ESL classrooms too. In addition, they cannot be inferred only from the input, which would require exposure to negative data (ungrammatical structures). Hence, they must be part of their acquired unconscious knowledge of the L2 syntax.

All in all, our advanced L2ers' ability to avoid a scrambling treatment of wh-movement in their English L2 is strong evidence to believe that they have indeed acquired the uninterpretable feature uwh* that drives wh-movement in English. By acquiring this new uninterpretable feature, they have overcome a clear poverty of the stimulus problem in their L2/L1 input, implying that their L2 grammars are constrained by UG: "the identification of genuine poverty of the stimulus problems in adult L2A would represent the strongest possible demonstration that adult L2

acquisition is indeed constrained by innate mechanisms" (Sprouse, 1996, p. 772). These results are also consistent with what White and Juffs (1998) found concerning the wh-acquisition by Chinese L1/English L2 speakers in China. These findings, in line with White and Juffs' (1998) conclusions, seem to suggest that UG can be activated even in those L2ers whose initial exposure to a target language is in a classroom setting (see also Campos-Dintrans et al., 2014; Epstein et al., 1996; Schwartz & Sprouse, 1996, and refs. therein).

Furthermore, in this study we found that the age of onset in L2 instruction/exposure does not seem to have an impact on L2ers' ability to acquire the uninterpretable uwh* feature in question (within the range of L2 exposure reported by the L2 learners in this study). Recall that in both experiments, there was no significant difference in the performance between L2ers who had received early exposure (before age 3), intermediate exposure (from age 4 to 9) and late exposure (from age 10 to 18) to English. As revealed in the background survey, those participants who had received early exposure to English had grown up as bilinguals with simultaneous exposure to English and Sinhala. Given that the *Interpretability Hypothesis* predicts an early critical period for uninterpretable syntactic features, these L2ers would be expected to have a substantial advantage over those L2ers who received intermediate or late exposure to English. However, this was not supported by the results of the present study. Even though the similar performance by these three L2 groups seems to challenge the notion of an early critical period for uninterpretable features, additional converging evidence as well as more information on the nature of the input that the different groups received would be necessary before further conclusions can be made regarding (late) age of exposure. These results, at least in the absence of additional evidence, seem to be consistent with a common finding in SLA that unlike L2ers in naturalistic

environments, instructed learners do not show an advantage of early exposure (Herschensohn, 2013, p. 325; Muñoz, 2006).

In sum, these results indicate native-like underlying mental representations are indeed possible in uninterpretable syntactic features in L2 syntax, a challenge to RD accounts. Our results with Sinhala/English L2ers are also consistent with some recent studies that report the successful acquisition of new functional features in various L2 contexts (e.g., Campos-Dintrans, Pires & Rothman, 2014; Foucart & Frenck-Mestre, 2012; Gess & Herschensohn, 2001). Finally, these results can reasonably be interpreted as additional evidence for Full Access to UG principles and constraints in adult L2 syntax (e.g. Epstein et al., 1996; Hettiarachchi & Pires, 2015; Schwartz & Sprouse, 1996; White, 2003).

4.4.1 Alternative Analysis

As we reviewed in chapter 3, Campos-Dintrans et al. (2014) argue that the uninterpretable syntactic feature H&H (2006) found to be problematic for JSE in their study is not completely absent in Japanese syntax. Since Japanese is a wh-in-situ language, the movement-forcing feature (*uwh**) that drives wh-movement in English is clearly absent in the same syntactic domain in Japanese. However, the uwh* adopted by H&H has also been treated as equivalent to the EPP-feature in C (Chomsky, 2000). Under this view, a similar uninterpretable syntactic feature has actually been argued to be present in T in Japanese (e.g. Kishimoto, 2001; Miyagawa, 2009) which is responsible for A-movement in the language: "This indicates that Japanese does not lack an EPP feature in its grammar to trigger overt movement, but simply instantiates it in a different functional head (T) than the one that would trigger overt wh-movement" (Campos-Dintrans et al., 2014, p. 46). As elaborated below, under this view, the kind of representational deficit involved in the acquisition of English wh-questions for JSE is a 'Local' deficit (i.e. the

relevant feature is present on a different functional head in the L1, but not in C) rather than a 'Global' one (i.e. the relevant feature is not present on any functional head in the L1 syntactic system).

This argument can further be qualified by the observation that Subjacency is also not completely absent in Japanese grammar. For example, the following example from Saito (1985, p. 307) shows that Japanese scrambling is sensitive to at least some island constraints:

(21) * Mary-o_i [John-ga [$_{NP}$ [e_i e_j sagasite iru] hito-o_j] mikaketa rassi]
Mary-$_{ACC}$ John-$_{NOM}$ looking-for person-$_{ACC}$ saw seem
Intended: It seems that John saw a person who was looking for Mary.

Given this, one can argue that the relevant uninterpretable feature (uwh*) as well as some constraints associated with it can be locally present at least in a different syntactic domain in Japanese.

Considering different syntactic analyses that have been proposed in literature, a similar argument can also be made for Sinhala as well. Even though an edge feature (*uwh**) is absent in Sinhala wh-questions, at least according to Gair (1983), T in Sinhala has an EPP feature that drives A-movement in Sinhala[12]. Also, similar to Japanese (Saito, 1985), island violations may not be completely absent in L1 Sinhala (see Kariyakarawana, 1998; Kishimoto, 2005). Recall that we discussed in chapter 2 that the coordinate structure constraint cannot be violated in Sinhala. Also, Kariyakarawana (1998, p. 174) observes that focus movement in Sinhala is also sensitive to island constraints.

[12] However, see Chou and Hettiarachchi (2012) for a counter argument.

(22) *oyaa [t_i horəkankərəpu baduvagayak] hoyenne [gunee də]$_i$
you stolen thing-$_{PL}$ looking for-$_E$ Gune $_Q$
'lit. It is Gune that you are looking for things he stole?

Based on these properties in L1 Sinhala, one could argue that Sinhala native speakers in our study show native-like competence in the *uwh** feature and relevant constraints because what they have to overcome in their L2 acquisition is a local representational deficit rather than a global one. But then a relevant question would be why Japanese/English L2ers (JSE) in Hawkins and Hattori's (2006) study would also have failed to overcome a similarly local representational deficit within their L1 by acquiring native-like competence in L2 English wh-questions. That is, under this approach, given JSE's long-term immersion in the target L2 context in H&H's study, one should expect them to show native-like competence to constraints on English wh-questions that would be at least equivalent to the Sinhala/English L2ers that we studied in Sri Lanka. Even though conclusive evidence is absent, we would like to suggest two possibilities to account for Japanese/English L2ers' failure to exhibit native-like competence in Hawkins and Hattori's (2006) study.

First, as also admitted by H&H (2006), even Japanese L2ers in their study showed some evidence of the acquisition of the relevant uninterpretable syntactic feature in English wh-questions: "[…] they are less likely to accept what are traditionally called 'Subjacency' violations than 'Superiority' violations." (p. 294). Also recall that their test of Superiority violations was problematic for the reasons that we discussed in the context of our Experiment 1. Furthermore, their sample included only 19 L2 participants and 11 English monolinguals. Considering all these, a reliable or more-fine grained test of Superiority, possibly with a larger

sample of proficient Japanese/English bilinguals, might yield different results than what H&H found in their study.

Second, H&H (2006) do not report any information about their L2er's target language proficiency, which would be relevant to further evaluate their results. H&H's failure to provide an independent measurement of L2er's target language proficiency makes their overall argument concerning the acquisition of the uninterpretable syntactic features a weaker one. However, they conducted a syntax test the goal of which was to determine whether their participants would allow the LD wh-interpretation for a higher wh-phrase when no locality violation was present. Based on the results of this test, they excluded 16 L2ers and 7 English monolinguals. This means that 36% of their original set of native speakers (7 out of 19) also failed this test, which itself raises questions regarding the reliability of their syntax test. One possibility is that the complexity of the task that they used in their study had an impact on participants' performance. This would be especially relevant if the overall proficiency of the JSE in their study was significantly lower than that of native speakers' of English, which they did not clearly specify.

To sum up, even if what Sinhala native speakers have to overcome in acquiring English wh-questions is a local representational deficit, the challenge of their acquisition task should not be underestimated. The same argument holds for Japanese native speakers as well. As Lardiere (2008) assumes regarding her Feature Reassembly Hypothesis, such learning also involves reassembling bits and pieces of various properties/constraints, which are found in some other domains in their grammar to correctly account for the target input. Such feature reassembling also requires access to UG, given that all the constraints associated with a certain feature (Superiority, or even Subjacency in our study) may not be overtly instantiated in L2ers's native

language (global deficit), or at least may not be instantiated in the same grammatical domain as in their L1 (local deficit).

Chapter 5

L2 Sentence Processing

5.1 Introduction

This chapter provides a review of theoretical literature on L1 and L2 sentence processing. The goal is to provide the necessary background for the two experimental studies presented in Chapter 6 of this dissertation. The chapter contains two main sections. In Section 2, we briefly discuss a relevant selection of theories of L1 sentence processing, especially in the context of filler–gap dependency formation and the role of island constraints in native language processing. Section 3, meanwhile, reviews theories of L2 sentence processing, in particular the Shallow Structure Hypothesis (SSH) as formulated in Clahsen and Felser (2006a, 2006b). In that section, we also review some selected studies on L2 sentence processing which provide evidence or counter evidence to the SSH.

5.2 Native Language Processing

5.2.1 Theories of L1 Sentence Processing

Sentence comprehension can generally be defined as a process by which a reader or listener imposes a syntactic analysis on incoming input that is parsed as a string of lexical items and assigns it a suitable interpretation during processing (Pickering, 1999). Such comprehension, as is generally assumed (following Marslen-Wilson, 1973) in current psycholinguistics literature, is an incremental process, i.e. the processor, on identifying a new word, immediately incorporates it into the structure that he/she is building. The consensus view in the field is that incremental

processing demands the parser to integrate information from a variety of sources, including phonology, morphology, syntax, semantics, pragmatics, discourse, and prosodic cues (see e.g. Boland, 1997; Clahsen & Felser, 2006; Gibson & Pearlmutter, 1998; Pickering, 1999). However, there is less agreement among psycholinguists in terms of the time-course with which different sources of information are employed during actual processing. The debate mostly concerns whether initial processing decisions are made on the basis of syntactic information alone (e.g. Frazier, 1978; Frazier & Rayner, 1982) or other sources of information are also simultaneously taken into consideration in making an initial decision (e.g. Boland, 1997; Boland, Tanenhaus, Garnsey & Carlson, 1995; MacDonald, Just & Carpenter, 1992; Trueswell & Tanenhaus, 1994; Trueswell 1996).

The first approach (Frazier, 1978 and thereafter), known by various names such as '*syntax first models,'* '*restricted accounts,*' '*modular view*' or '*two-stage models'* in the literature, is based on the assumption that initial decisions that the parser makes purely depend on syntactic information: lexical category information (e.g. noun, verb, determiner etc.) and corresponding syntactic structural information. The use of other sources of information such as semantics and pragmatics is delayed until the incoming element receives a structural analysis. Among 'syntax first models,'[1] the most well-known is Frazier's (1987) Garden Path model (GP). The GP model assumes that in initial processing, the parser is guided by two structure-building principles (Frazier & Rayner, 1982, p. 180):

> **Late Closure**: When possible, attach incoming lexical items into the clause or phrase currently being processed (i.e., the lowest possible non-terminal node dominating the last item analyzed).

[1] For a comprehensive review of these proposals, see Pickering (1999).

Minimal Attachment: Attach incoming material into the phrase-marker being constructed using the fewest nodes consistent with the well-formedness rules of the language.

These two principles have been argued to account for why the parser is led down the garden path in processing locally ambiguous sentences such as the following (Frazier & Rayner, 1982, p. 180):

(1) a. [[Since Jay always jogs a mile] this seems like a short distance to him].
b [Since Jay always jogs] a mile seems like a short distance to him].

(2) a. The city council [argued [$_{NP}$ the mayor's position]] forcefully.
b. The city council [argued [$_{CP}$[$_{TP}$[$_{NP}$ the mayor's position] was incorrect]]]].

The principle of Late Closure requires that a new incoming lexical item be incorporated into the phrase structure that is currently being processed. Thus, in (1), the parser would reasonably interpret the NP 'a mile' as the object of the transitive verb 'jogs' so that it becomes part of the VP phrase that it is currently being processed. To the extent that this decision also proves to be the correct one, as in (1a), less difficulty (as implied by shorter reading time) is predicted to arise during the processing of the rest of sentence than in (1b). But if the same analysis is applied in (1b), it is predicted to show a garden path effect at the point the verb 'seem' is parsed, because in this sentence, 'a mile' has to be the subject of 'seems like a short distance', unlike in (1a). Hence, the parser at this point has to impose a reanalysis in (1b), before it can proceed to the next lexical item. Evidence for this re-analysis comes from longer reading times at different points in the parsing of (1b), compared to (1a).

The principle of Minimal Attachment (MA) requires that the parser builds the simplest possible phrase structure to account for the incoming element by ruling out all unnecessary nodes. In (2a), this would require the parser to interpret 'the mayor's position' as the NP direct object of the verb 'argued' so that the structure would involve the fewest possible nodes. But in

(2b), this decision becomes problematic and results in a garden path effect, because 'the mayor's position' requires a more complex structure (a full CP needs to be built) before it can be correctly integrated into the full phrase structure. Such garden path effects have been argued to provide evidence for 'syntax first' use in incremental processing (see Frazier & Rayner, 1982).[2]

In contrast to this position, unrestricted accounts, also known as 'interactive models' or 'constraint-based models,[3]' hypothesize that initial processing is also guided by other sources of information, which may include semantics, pragmatics, prosody, statistical information as determined by prior experience and any other information that is potentially relevant (e.g., Boland, 1997; MacDonald, Just & Carpenter, 1992; Marslen-Wilson, 1973, 1975; Trueswell & Tanenhaus, 1994; Trueswell 1996): "by not respecting processing modularity, the parser is able to take into account whatever information is likely to determine which analysis should be favored" (Pickering, 1999, p.138). Supporting this hypothesis, experimental work using different research paradigms has shown how initial processing decisions can be influenced by the discourse context (e.g. Altmann & Steedman, 1988), plausibility (e.g. Boland, Tanenhaus & Garnsey, 1990; Boland, Tanenhaus, Garnsey & Carlson, 1995; Tanenhaus, Carlson & Trueswell, 1989; Traxler & Pickering 1996; Traxler, 2005), sub-categorization information (Ford, Bresnan & Kaplan, 1982), verb control information (Boland, Tanenhaus & Garnsey, 1990) and so on. Our discussion on filler gap-dependencies will take into account the main findings of some of these studies.

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[2] Frazier and colleagues also take these effects to imply that "the human sentence parsing mechanism copes with the temporary ambiguities of natural language by initially pursuing just a single analysis of a sentence" (p. 178).
[3] See e.g. Boland (1997) for a review of these proposals.

In summary, the time course with which the processor utilizes information from different sources such as syntax, semantics and the discourse context is still an unresolved issue in native language processing research. Despite this, proponents of both approaches agree that successful online language comprehension requires the parser to integrate information from a variety of sources.

5.2.2 Processing Filler Gap Dependencies

In Chapter 2, we reviewed the theoretical approach that wh-question formation in English involves overt syntactic movement. According to the standard view in generative grammar (Chomsky, 1977 and thereafter), the derivation of a wh-question with overt wh-movement in English involves two steps: (i) the initial merge of the wh-phrase in its theta position and (ii) its subsequent successive cyclic movement to occupy its surface position (Spec-CP). The displaced wh-phrase is assumed to leave a trace or copy at its base position. As a consequence, one hypothesis is that in real time sentence processing, the parser has to associate the displaced wh-phrase (Filler) with its first merged position (Gap) so that it can receive a theta interpretation (provided that the wh-phrase is an argument). This process is known as "Filler-Gap (FG) Dependency Formation" (e.g. Boland, 1997; Fodor, 1978; Philips, 2006; Traxler & Pickering, 1996). In addition to wh-movement (3), filler-gap dependency formation is also observed in operations such as topicalization (4) and scrambling (5). In our examples, the filler is the *italicized word* while the gap is indicated by __.

(3) *What* did Mary buy __ yesterday?

(4) *The apartment door*, Mary forgot to lock__.

(5) *kawiyak*$_{i}$, sarath __ liyuwa. (Sinhala)
poem-$_{ACC}$ Sarath.$_{NOM}$ write.$_{PAST}$
A poem, Sarath wrote.

As it has been extensively discussed in the literature, in incremental processing, the filler–gap dependency formation can involve one or many instances of local ambiguity. For instance, in our example in (6) (from Traxler and Pickering, 1996), the real gap position for the displaced wh-phrase is after the verb *love*. But the filler can also be provisionally interpreted right after the verb '*believe*' is encountered (the provisional gap position). This is because *believe*, being transitive in nature, can optionally take an object complement. When a sentence involves provisional interpretations for the filler, the processor can be led down the garden path and has to perform a reanalysis on arriving at the real gap position.

(6) *Which man* do you believe __ Mary loves __ a lot?

One question that has been debated in the processing literature is when exactly the processor forms a filler-gap dependency during incremental processing. The question concerns whether the association is formed right on the potential gap position (Immediate Association), identified as the position of the first (subcategorizer) verb, or on arriving at the real gap position (Standard Gap filling). The approach known as *Standard Gap Filling* (Fodor, 1978; Wanner & Maratsos, 1978; Jackendoff & Culicover, 1971) or *gap-as-last resort* assumes that the dependency formation happens only at the real gap location. According to this view, the processor does not posit a gap on reaching the verb but will wait to confirm that the argument position of the verb/preposition is not filled. In contrast, *Immediate Association* accounts (e.g. Clifton & Frazier, 1989; Crocker, 1995; Gibson & Hickok, 1993; Phillips, 2006; Pickering & Berry, 1991; Sag & Fodor, 1994) propose that the processor forms a dependency as soon as it encounters the first potential gap (after encountering the verb *believe* in (6) without waiting to confirm whether the gap is already filled or not. For this reason, this approach is known as the '*First Resort Strategy*': the processor associates the filler with the first potential gap. Under this view, several sources of

information such as the sub-categorization and theta properties of verbs and other predicates can guide the dependency formation. One well-known hypothesis that adopts this view in the processing literature is Clifton & Frazier's (1989) Active Filler Hypothesis:

> Active-Filler Hypothesis: When a filler of category XP has been identified in a non-argument position, such as COMP, rank the option of assigning its corresponding gap to the sentence over the option of identifying a lexical phrase of category XP.

According to this hypothesis, in processing a displaced element such as a wh-filler (XP), the processor chooses to posit a gap as soon as possible, over the option of waiting to confirm the availability of a vacant gap position. The prediction of this approach is that in a context where a potential gap turns out to be already filled by an XP, which often immediately follows the source of the gap, as in (6), the processor is likely to face difficulty as often implied by an elevated reading time on the already filled XP (Filled Gap Effect: e.g. Crain & Fodor, 1985). The motivation for the Active Filler Hypothesis also comes from research showing that shorter dependencies are economical in terms of working memory (see e.g. Gibson's 1998, 2000 Dependency Locality Theory). Given that a filler has to be retained in working memory until a matching gap is located in the structure being processed, the linear distance between the filler and the gap contributes to the 'integration cost':

> Integration cost of a syntactic head: The cost of syntactically integrating a newly input syntactic head h_2 to a syntactic head h_1 in the current structure is proportional to the sum the number of new referents in the discourse (e.g., nouns and verbs whose referents have not yet been mentioned) that have been processed since h1 was last activated.
>
> (Gibson & Warren, 2004, p. 59)

Many experimental studies using different research paradigms have reported evidence for the first-resort strategy in filler-gap dependency formation. For instance, Boland et al. (1995) conducted a Stop Making Sense task with a group of English monolinguals to investigate the role of verb argument structure information in making filler-gap associations. They tested sentences

(Experiment 1) such as those in (7a & b) which differ in terms of the number of potential gap positions each one contains: simple transitive (a) vs. object control (b).

(7) a. Which client/prize did the salesman visit __ while in the city?

b. Which child/movie did your brother remind __ to watch __ the show?

Their results revealed a plausibility effect on the main verb in simple transitive sentences but not in object control constructions (7b). This, as they argued, implies that initial decision making in processing is also guided by the argument structure of a verb, i.e. when a verb is found (e.g. remind), the parser considers whether the wh-phrase can be interpreted as one of its argument. Further, the longer reading time on the main verb in the implausible condition provides evidence for the use of the First Resort Strategy in forming filler-gap dependencies. If the participants did not form the association on first encountering the main verb, the effect of implausibility is not expected at that position.

Also, in an eye tracking study with English monolinguals, Traxler and Pickering (1996) found similar evidence for the use of the First Resort Strategy in filler-gap associations. They tested sentences (8) in which the verb (e.g. *shot*), the first potential gap site, and the real gap position are far apart. Contra the predictions of the Standard Gap filling approach, participants in this study posited a gap on encountering the verb *shot* as implied by longer reading time on the implausible verb (plausible, *196 ms*, implausible, *217 ms*) (8b).

(8) a. That's the pistol with which the heartless killer shot __ the hapless man __ yesterday afternoon.

b. That's the garage with which the heartless killer shot __ the hapless man __ yesterday afternoon.

Similar results, which provide evidence for the First Resort Strategy in filler-gap associations, have been reported in various studies in L1 sentence processing (e.g. Felser et al., 2003; Phillips et al., 2005; Sussman & Sedivy, 2003).

Thus, it is reasonable to conclude that in forming filler-gap dependencies, native speakers of a language are engaged in an '*active gap search,'* by which they attempt to posit a gap at the earliest potential gap position in a sentence. Also, in this processing (the First Resort Strategy), they do not necessarily wait to confirm whether the gap position is already filled or not. As a result, this effect is often reflected on or around a lexical item that gives rise to a potential gap.

5.2.3 Island Constraints in Native Processing

In Chapter 2, we discussed that LD (A-bar) dependencies in English are subject to the principle of Subjacency (Chomsky, 1973), which requires that any element being displaced to occupy a clause-initial position (e.g. a moved wh-phrase), cannot cross more than one bounding node at a time without incurring a Subjacency violation. As a result, the extraction of any XP is prohibited from inside to outside of a syntactic island (Ross, 1967).

As reviewed in Phillips (2006), starting from the early 1980s, many experimental studies have investigated whether island constraints play an active role in real time language comprehension (e.g. Bourdages, 1992; Clifton & Frazier, 1989; Freedman & Forster, 1985; Neville et al., 1991; Traxler & Pickering, 1996; Stowe, 1986). Conclusions that those studies have arrived at, however, are sometimes contradictory. For instance, studies such as Foster (1985), Clifton & Frazier (1989), and Kurtzman & Crawford (1991) report that English native speakers that they tested posited gaps even inside syntactic islands, something which is not predicted if they were sensitive to island constraints in processing. However, many other studies have found that native speakers immediately make use of the island constraint to guide their

filler-gap dependency formation (Bourdages, 1992; Pickering et al., 1994; Stowe, 1986; Traxler & Pickering, 1996; Yoshida et al., 2004). Philips (2006) also argues that those early studies which report the absence of island constraints in online processing are problematic for two reasons. First they treat all different kinds of island violations as one category, which is problematic given that native speakers in offline judgment tasks show different levels of sensitivity to weak vs. strong islands. Second, some experimental methods such as sentence-matching (e.g. Freedman & Forster, 1985) employed in early studies to investigate this phenomenon do not yield reliable results.

Thus, despite some contradictory evidence, the more prominent view in current processing literature appears to be that native speakers actively employ island constraints to guide their filler-gap dependency formation in processing: "The prevailing opinion in psycholinguistics has been that the evidence supports the position that island constraints are immediately effective in parsing, and that contrary findings may be due to flaws in experimentation" (Philips, 2006, p. 800).

One study that provides clear experimental evidence for native speakers' island sensitivity in filler-gap dependencies is Traxler and Pickering (1996). In this study, they conducted an eye tracking experiment with thirty-two English monolinguals. The goal was to find out whether English natives would associate a filler with a gap embedded inside a relative clause island. The set of stimuli that they tested included sentences such as those in ((9).

(9) a. Plausible Non-Island
*We like **the book** that the author **wrote** __ unceasingly and with great dedication about __ while waiting for a contract.*

b. Implausible Non-Island
*We like **the city** that the author **wrote** __ unceasingly and with great dedication about __ while waiting for a contract.*

c. Plausible Island
We like the book that the author [who wrote unceasingly and with great dedication] saw __ while waiting for a contract.

d. Implausible Island
We like the city that the author [who wrote unceasingly and with great dedication] saw __ while waiting for a contract.

Assuming that participants use the First Resort Strategy in forming filler-gap dependencies, Traxler and Pickering (T&P, 1996) made the following predictions. Sentences in (9a) and (9b) have two gap positions, a provisional gap after the main verb *write* and the real gap position following the preposition *about*. So, if participants initially associated the filler (the book) with the provisional gap, non-island sentences (9a) and (9b) would show a plausibility distinction around the verb *wrote*, i.e. *the city* does not match the selectional restrictions of the main verb. The same conditions hold in non-island sentences except that in (9c) and (9d), the provisional gap after *wrote* is now within a (relative clause) island. Given this, if participants are sensitive to the island constraint, the provisional gap would not serve as a potential gap site for the filler in these sentences, implying that (9c) and (9d) should not show a plausibility distinction.

The table 1 provides a summary of T&P's mean readings times (RT) results. In non-island conditions, Traxler and Pickering found an effect of plausibility (a longer reading time in the implausible condition) which proved to be significant in their analysis. They interpreted this as evidence for participants' attempt to form a filler-gap dependency at the provisional gap position. But plausibility was not found to be significant in the two island conditions, implying that they

did not consider *wrote* as a potential gap position when it was inserted inside an island. Based on these results Traxler and Pickering concluded that native speakers in their study actively used the island constraint to guide their filler-gap dependency formation: "We conclude, therefore, that no semantic processing takes place on the misanalysis if that misanalysis requires ignoring the strong island constraint information implicated in this study."

Condition	**Provisional Gap (*wrote*)**	**Real Gap (about/saw)**
Non-island, plausible	222	238
Non-island, implausible	255	223
Island, plausible	233	243
Island, implausible	223	239

Table 5.1: Mean Reading Times from Traxler and Pickering (1996, p. 467)

Studies exploring different syntactic phenomena such as binding and ambiguity resolution have also revealed that mature native speakers are sensitive to syntactic constraints in their real-time language processing (see Felser & Clahsen, 2006 for a review of this literature).

Summarizing our discussion so far, in this section we have provided a brief overview of theories of L1 sentence processing relevant for the experiments to be presented in Chapter 6, including hypotheses concerning filler-gap dependencies and island constraints in real time language processing. Next, we will discuss some of relevant literature on L2 sentence processing.

5.3 Second Language Sentence Processing

In contrast to L1 processing, how second language speakers/learners process language in real time is a question that has received little attention in recent psycholinguistic literature (see e.g.

Juffs, 2015; Phillips, 2006; Witzel, J., Witzel, N & Nicol, 2012). The focus in most of these studies has been on exploring similarities and differences between native and L2 sentence processing. In this section, our focus is on a recent hypothesis which assumes qualitative differences between L1 and L2 sentence processing.

Representational Deficit (RD) accounts, as reviewed in Chapter 3 of this dissertation, assume that the divergence in ultimate attainment (defined in Chapter 1) in syntax between native speakers (NSs) and L2ers results from a representational deficit in narrow syntax (e.g. Hawkins & Hattori, 2006; Tsimpli 2003; Tsimpli & Dimitrakopoulou, 2004; Tsimpli & Mastropavlou, 2007). Despite some counter evidence from different studies (see e.g. Campos-Dintrans, Pires & Rothman, 2014; Gess & Herschensohn, 2001; Martohardjono, 1993; Rothman, 2005; White & Juffs, 1998), including the results described in the previous chapter, *No Parameter Resetting* approaches such as the RD accounts remain prominent in the second language acquisition literature.

In parallel, other studies in SLA, including Clahsen and Felser (2006), Felser et al. (2009), and Felser and Cunnings (2012) hypothesize that there is a divergence in performance between NSs and L2ers, but it may not result from difficulties in acquiring subtle grammatical properties, i.e. syntactic competence, but from different mechanisms the two groups deploy in real time language processing or comprehension. In their view, L2 language processing differs from mature native speaker processing in at least three fundamental ways: (i) the integration of information from different sources, (ii) lack of automaticity in processing, and (iii) the influence of L1 on L2 processing (Clahsen & Felser, 2006, p. 4).

First, as has been extensively argued in the language processing literature (see e.g. Gibson & Warren, 2005), real-time language comprehension by adult native speakers is characterized by an

integration of information from a variety of sources, including syntax, (lexical) semantics, discourse and prosody. This pattern of processing is something that native speakers acquire early in life, implying that children use similar processing mechanisms in real-time language comprehension even though it may be argued that during early stages of their development children arguably rely more on structural information over lexical-semantics and contextual clues (Felser, Marinis & Clahsen, 2003 &; Traxler, 2002). This behavior of children is often attributed to their relatively limited cognitive capacities. However, L2 speakers, as argued by Clahsen and Felser (2006), are different from both adult native speakers and children in the way they process their target language, i.e. in real-time comprehension second language speakers rely mostly on non-structural information such as lexical-semantics and contextual cues while ignoring structural-based parsing principles. Based on a review of several studies on L2 processing, Clahsen and Felser (2006) conclude that "syntactic representations adult L2 learners compute during comprehension are shallower and less detailed than those of native speakers" (p. 5). This means "L2 learners essentially compute predicate–argument structure representations of the input that capture thematic roles and other aspects of lexical–semantic structure, but which lack hierarchical detail and more abstract elements of syntactic structure" (p. 32). In the case of L2ers, shallow processing, as they argue, is mostly observed in the processing of complex structures such as A-bar dependencies. This proposal is generally known as the *Shallow Structure Hypothesis (SSH)* in the SLA literature.

The proponents of the SSH, however, do not claim that shallow structure processing is absent in native language comprehension. Indeed many studies have provided empirical evidence to argue that shallow structure building exists in L1 processing too (e.g. Ferreira et al., 2002; Fodor, 1995; Sanford & Sturt, 2002). But the difference between adult native speakers and L2ers is that

"L2ers are largely restricted to this option in L2 processing, computing representations for language comprehension that lack syntactic detail, and attempting more direct form-function mappings instead" (Clahsen & Felser, 2006a, p. 34). This overreliance of the L2ers on lexical-semantic information over structural representations is taken to result in a 'lack of automaticity' in their processing (Segalowitz, 2003), the second property that is argued by proponents of the SSH to make L2 processing distinct from mature native speaker processing. Finally, arguable though, syntactic properties of L2 speakers' native language can influence the way they process the target language (Juffs, 2005). We will further elaborate on this issue later in this discussion.

At least during its initial stages, the evidence for the SSH mostly came from studies exploring L2ers' processing of ambiguous relative clauses in English and other languages (e.g. Dussias, 2003; Felser, Roberts, Gross & Marinis, 2003; Papadopoulou & Clahsen, 2003). For example, the following sentence (Felser et al., 2006, p. 453) is ambiguous in English given that the RC can either modify the NP1 (the servant) or NP2 (the actress):

(10) Someone shot the servant of the actress who was on the balcony.

Many studies have revealed that English native speakers have a preference for the NP2 modification of the RC in when the two NPs are linked by the preposition *of* (complex genitive NP) (see Felser, Roberts & Marinis, 2006 for a review these studies). But in some other languages such as Spanish, Greek and French, speakers have been found to show a preference for the NP1 attachment in similar examples, implying that RC attachment preferences are subject to cross-linguistic variation. Thus, RC attachment preferences have been used to test the issue of L1 transfer in L2 processing as well as the employment of structure-based parsing strategies (Minimal Attachment, Late Closure) by L2ers. A common finding in these studies (as reviewed by Clahsen & Felser, 2006a) is that on encountering ambiguity, L2ers, unlike native speakers and children acquiring their L1, do not show a consistent attachment preference for the RC. But

L2ers, in many studies, have shown a strong preference for the NP2 attachment when two NPs are linked by the thematic preposition "with."

(11) Everyone liked the actress with the servant who was always smiling.

Clahsen & Felser (2006a) account for this asymmetry in L2 performance by proposing that in dealing with ambiguity in real-time processing, L2ers fail to employ 'phrase structure-based parsing principles (such as recency or predicate proximity)' and they over-rely on non-structural cues such as lexical-semantic properties:

> Findings from the above L2 processing studies show that contrary to children, late L2 learners have no difficulty accessing and making use of lexical–semantic or pragmatic information when resolving structural ambiguities in their L2. There is no independent evidence, on the other hand, that nonnative comprehenders are guided by phrase structure based parsing principles of the kind that have been attested in L1 processing.
>
> (Clahsen & Felser, 2006a, p. 34)

Several other studies have provided empirical evidence both for and against the Shallow Structure Hypothesis. In the next section, we review some selected studies in the domain of filler-gap dependency formation, the phenomenon that we are investigating in our experimental studies in Chapter 6.

5.3.1 Marinis, Roberts, Felser, and Clahsen (2005)

In a Self-Paced Reading (SPR) experiment with English monolinguals, Gibson and Warren (2004) found empirical evidence that syntactic representations built by English monolinguals in processing LD dependencies consist of traces/copies of displaced elements. Marinis et al. (2005) replicated Gibson and Warren's experiment with four groups of L2 learners immersed (0.85 to 2.48 years) in an academic setting in the UK: Chinese (*n = 34*), Japanese (*n = 26*), German (*n = 24*) and Greek (*n = 30*) (Control Group = 24 English monolinguals). The goal of the study was to

find out whether L2 learners would use similar-structure based strategies in parsing their L2 input. They tested sentences such as those given in (12) which belong to four different conditions.

(12) a. **Extraction across a VP (+ intermediate gap)**
The nurse [who$_i$ [the doctor argued [e_i that [the rude patient had angered e_i]]] is refusing to work late.

b. **Extraction across an NP (- intermediate gap)**
The nurse [who$_i$ [[the doctor's argument about the rude patient] had angered e_i]]] is refusing to work late.

c. **Nonextraction, local subject-verb integration (VP)**
The nurse thought the doctor argued that the rude patient had angered the staff at the hospital.

d. **Nonextraction, nonlocal subject-verb integration (NP)**
The nurse thought the doctor's argument about the rude patient had angered the staff at the hospital.

The sentence in (12a) is derived through the LD wh-movement of 'who' from an embedded complement clause to occupy the Spec-CP position of the RC. In accordance with the principle of Subjacency (Chomsky, 1973), this movement is expected to leave a trace/copy at the intermediate Spec-CP position in order to satisfy Subjacency (specifically if Subjacency is treated as a constraint on representations). But no intermediate gap/trace is postulated in (12b) because the movement in this instance only crosses one bounding node to reach Spec, CP. The control condition sentences in (12c) and (12d), meanwhile, are structurally similar to those in the other two conditions except they do not involve any A-bar dependencies. The prediction was that participants who postulated intermediate traces would show reading time differences in the two critical regions in (12a): *that* (P3), the complementizer which immediately follows the intermediate trace and *angered* (P5), the subcategorizer that the filler is associated with.

Mean reading times (RTs) for the two critical regions (P3 & P5) for all participant groups are summarized in Table 2.

Condition	L1 English		L1 Chinese		L1 Japanese		L1 German		L1 Greek	
	P3	P5	P3	P5	P3	P5	P3	P5	P3	P5
Extraction VP	825	1075	1062	1630	956	1560	977	1609	838	1330
Extraction NP	833	1307	814	1813	1126	1910	935	1374	830	1394
Non-Extra. VP	729	811	836	1349	956	1420	925	959	875	1086
Non-Extra. NP	657	820	857	1503	918	1523	753	925	664	1008

Table 5.2: Mean raw reading times from Marinis et al. (2005). In the table, P3 and P5 refer to critical word positions.

For both native speakers and L2ers, the reading time at the subcategorizer (P5 *angered*) was longer in the two extraction conditions than in non-extraction conditions. This implies that all groups associated the filler with its subcategorizer at this position, which is required for its interpretation. Despite this, as Marinis et al. argued, in their study only native controls showed evidence of using the intermediate traces in their processing. The argument goes as follows. As far as the two extraction conditions are concerned, native controls' reading time in the final gap position was significantly shorter in the VP extraction condition than in the NP extraction condition. Further, this contrast was not observed between the two non-extraction conditions. According to Marinis et al.'s interpretation of the results, this means that the activation of the filler in the intermediate position in VP extraction cases reduced its integration cost at the final gap position (Gibson, 1998, 2000). Because of this, in this condition, native controls read the subcategorizer faster than in the NP extraction condition. Also, for native speakers, position P3 (the complementizer *that*) showed a longer reading time in the VP extraction condition than in VP non-extraction condition, implying that the filler was temporarily activated at this position.

Taken together, these results were argued to show in this study that native speakers, similar to the group studied by Gibson and Warren (2004), analyzed these LD dependencies in short steps, which is less taxing to memory in terms of the retrieval of the filler at the ultimate gap position (subcategorizer). But this pattern was not found for any of the L2 groups, i.e. for neither group, the interaction between *phrase type* and *extraction* proved to be significant at (P5). In both extraction conditions, they read the subcategorizer at a similar speed. The conclusion that the authors arrived at was that all L2ers, regardless of whether wh-movement is present in their native language (German and Greek) or not (wh-in-situ Chinese and Japanese), did not postulate intermediate traces in real time processing of these English wh dependences: "This suggests that the L2 learners did not postulate any intermediate syntactic gaps during processing but instead tried to link a filler directly to its lexical subcategorizer irrespective of the availability of an intermediate landing site. Gap-filling in L2 processing, then, appears to be driven by the lexicon rather than by requirements of the grammar, such as the subjacency constraint" (Marinis et al., 2005, p.70).

However, Rodriguez (2008), in a modified replication of this study with Chinese and Spanish native speakers of English, reports evidence for L2ers' sensitivity to intermediate gap real time processing. But in a later replication of Marinis et al. (2005), Pliatsikas & Marinis (2009) argued that advanced Greek L1/English L2 participants yielded results similar to what was found in the original study. Felser and Roberts (2007), in a cross-modal priming task with Greek native speakers acquiring L2 English, also report a similar finding and argue that mental representations L2ers build during real time comprehension are incomplete in terms of purely structural details.

L2ers in Marinis et al.'s (2005) study still showed evidence that they can successfully understand these sentences, i.e. in answering comprehension questions, they matched native

speakers. So, this difference, as they argued, comes from qualitative differences between L1 and L2 processing. However, as also revealed by Rodriguez's (2008) study, this strong conclusion that Marinis et al. (2005) arrive at may not necessarily be true in all contexts of L2 acquisition (see Omaki & Shultz, 2011, discussed below, for a similar argument). Given that the four groups of L2ers that they tested were chosen based on the Oxford Placement Test (Upper Intermediate and above), one would wonder whether a more proficient group immersed in the L2 context over an extended period of time would perform differently in processing their L2.

5.3.2 Cunnings, Batterham, Felser and Clahsen (2009)

This is a replication of Traxler and Pickering's (1996) eye-tracking study that we reviewed in Section 2. Recall that Traxler and Pickering (1996) found that English monolinguals are sensitive to island constraints in their real time language comprehension, i.e. they do not link a filler with a subcategorizer inside an island. The goal of this study was to examine the role of island constraints in L2 sentence comprehension. For this purpose, Cunnings et al. (2009) tested two L2 groups from two different L1 backgrounds immersed in an English speaking country: Chinese (*n = 26*, immersion: *2.1 years*) and German (*n = 24*, immersion: *3.9 years*). In terms of proficiency the L2ers ranged from 'upper intermediate' to 'advanced.' The study also included a control group of 39 English natives.

Their materials were modeled on the following from Traxler and Pickering (1996).

(13) Non-island, implausible
We like the book that the author wrote unceasingly __ and with great dedication about __ while waiting for a contract.

(14) Non-island, plausible
We like the city that the author wrote __ unceasingly and with great dedication about __ while waiting for a contract.

(15) Island, plausible

We like the book that the author who wrote__ unceasingly and with great dedication saw __ while waiting for a contract.

(16) Island, implausible

We like the book that the author who wrote__ unceasingly and with great dedication saw __ while waiting for a contract.

Following Traxler & Pickering's proposal, in non-island conditions, the verb *wrote* (critical region 1) was taken to introduce the first potential gap for the filler (the city/the book). In island counterparts, the same verb was inaccessible as a gap source given that it is embedded inside another relative clause (a relative clause island). Thus, in the island sentences the only source of a possible gap was the second verb on the linear order: *saw*, which introduced the real gap. Thus, similar to the original study, two critical regions were identified for the analysis: *wrote unceasingly* (Region 1) and about/saw (Region 2).

Their eye-tracking reading times (first pass, regression pass and rereading) in the critical region 1 (*wrote unceasingly*) showed that both native speakers and L2ers were sensitive to the island constraint: the plausibility effect in this region was only observed in non-island conditions. Further, all participant groups read this region faster in island conditions than in non-island conditions. This is regardless of whether island constraints are absent (Chinese) or present (German) in these L2ers' native languages. But Cunnings et al. (2009) argued that this evidence does not necessarily imply that these L2ers and native speakers built similar mental representations in processing these constructions. Their reason for this argument comes from their observations regarding processing of the real gap position (critical region 2: about/saw). In this region, the L2 groups showed a much longer reading time in island conditions than in non-island conditions, which proved to be a significant difference in all three kinds of reading times: the *first pass*, *regression path* and the *rereading*. But no such difference was observed for the

native controls in this region. Further, in the non-island plausible condition, L2ers did not show convincing evidence of reanalysis (longer reading time) from an initial misanalysis at the critical region. Based on these results, Cunnings et al. (2009) concluded that L2ers in their study, despite some evidence of being sensitive to islands, experienced greater processing difficulties than natives when a complex relative clause (RC) intervened between the filler and the gap. Thus, in their view, a processing based approach to islands (see e.g. Kluender, 2004) can better explain these results than a grammatical constraint model:

> At the second RC's clause boundary, the cost of maintaining the filler rises due to the parser's attempting to identify and access a discourse referent for the definite noun phrase *the author*, which at this point still lacks a thematic role and thus cannot be fully integrated into the emerging sentence representation. In addition, a semantic link must be formed between *the author* and the relative pronoun *who*, which itself is another wh-filler triggering a new gap search, besides indicating the start of the new subordinating clause. As a result of the increased processing load and the memory burden, the original gap search is likely to be abandoned or suspended at this point.
>
> (Cunnings et al., 2009, p. 90)

Further evidence for this processing-based approach to islands in L2 comprehension is proposed in Felser, Cunnings, Batterham & Clahsen (2012). However, as Phillips (2006, p. 802) argues, if island effects indeed result from a processing difficulty rather than a constraint in mental grammar, the parser should never posit a gap inside an island. But there is experimental evidence (as reported in Phillips, 2006) showing that the parser posits gaps in some islands but not others. According to Phillips, this is at least compatible with the weak/strong island distinction assumed to be part of the competence of a native speaker. Hence, a processing-based approach to islands is problematic.

5.3.3 Omaki and Schulz (2011)

In further evaluating the claims of SSH, Omaki and Schulz (2011) tested a group of 24 Spanish L1/English L2 speakers in the US on their online and offline processing of filler-gap dependencies in English relative clauses. They conducted two experiments. The first one was an untimed Grammaticality Judgment task (GT) in which L2ers and native speaker controls judged a collection of grammatical and ungrammatical relative clauses (violations of the RC island constraint) in English. The results of this experiment showed that both groups are sensitive to island violations in relative clauses. The second experiment was a Self-Paced Reading (SPR) task (a modified replication of Traxler & Pickering, 1996). The goal of this task was to investigate to what extent native speaker controls and L2ers deploy island constrains in constructing filler-gap dependencies in real time. In the SPR task, they modeled their materials on Traxler and Pickering (1996):

(17) Non-island, implausible

The city that the author wrote regularly about was named for an explorer.

(18) Non-island, plausible

The book that the author wrote regularly about was named for an explorer.

(19) Island, implausible

The city that the author who wrote regularly saw was named for an explorer.

(20) Island, plausible

The book that the author who wrote regularly saw was named for an explorer.

Following Traxler and Pickering (1996), Omaki and Schulz (2011) predicted that participants who are sensitive to the RC island constraint in processing would show plausibility effects in non-island conditions but not in island conditions.

The results of their experiment showed that both native speakers and L2 speakers took the island constraint into consideration in their active search for a gap in (19) and (20). This was implied by their longer reading times for wrote (or the following word) in non-island cases (17) and (18) relative to shorter reading times on the same words in the two island conditions (19 and (20). Based on this evidence, Omaki and Schulz (2011) concluded that L2 learners, like native speakers, can build detailed syntactic structures in real time processing. However, they assume that "SSH could be maintained in a slightly weaker form — namely, that L2 learners might construct shallow structures more often than native speakers do, perhaps in some restricted contexts." They also hypothesized that shallow structure processing may be more common in those syntactic domains which are typologically distinct between learners' L1 and L2 "plausibly because their L1 parser may interfere with parsing of the L2 input" (Omaki and Schulz, 2011, p.584). O&S, unlike many other studies testing the SSH (e.g. Marinis et al., 2005), supplemented the processing experiment with an offline grammaticality judgment task.

5.3.4 Summary

Since Clahsen and Felser (2006), many experimental studies have been conducted to evaluate the predictions of the shallow processing hypothesis. However, the findings of those studies have yielded different, often contradictory conclusions (see Juffs, 2015 for a review). While some studies have found evidence for shallow structure processing in L2, some other studies report that L2ers can indeed compute hierarchically deep syntactic representations during real time comprehension (e.g. Dong, 2014; Foucart, Sagarra & Herschensohn, 2008; Hopp, 2006; Witzel, J. Witzel, N. Witzel & Nocol, 2012; Rodriguez, 2008). Given this, further research is needed before strong conclusions can be drawn (see discussion in Omaki and Schulz). In the context of

our experimental results in Chapter 6, we will revisit some of the findings of studies that we have reviewed here and re-evaluate arguments that have been made regarding the Shallow Structure Hypothesis.

Chapter 6

L2 Sentence Processing: Filler-Gap Dependencies in L2 English

6.1 Rationale and Research Questions

As we discussed in Chapter 5, many experimental studies on L1 sentence processing have provided evidence that native speakers are sensitive to island constraints in real-time language comprehension, implying that they build highly detailed abstract hierarchical representations in real-time processing (e.g. Bourdages, 1992; Phillips, 2006; Pickering et al., 1994; Stowe, 1986; Traxler & Pickering, 1996; Yoshida et al., 2004). Even though they may also employ shallow processing strategies when and where necessary (see Ferreira et al., 2002; Fodor, 1995; Sanford & Sturt, 2002), there is convincing evidence to believe that in unbounded dependency formation native speakers do not postulate illicit gaps inside syntactic islands. As will be discussed later, if gaps are postulated inside islands, it is only when a gap can be licensed by a parasitic gap (see e.g. Phillips, 2006).

In contrast to L1 processing, the status of island constraints in real-time second language comprehension is more unclear, i.e. different experimental studies have reported contradictory findings. For instance, Cunnings et al. (2009) in their eye tracking study with Chinese and German native speakers of L2 English argue that both groups appeared to be sensitive to islands in processing English relative clauses, but compared to English monolinguals, the evidence in their case was less convincing. The main reason for their conclusion was that L2ers, unlike English monolinguals, showed a much longer reading time in island conditions than in non-

island conditions, implying that they experienced greater processing difficulties when the filler and the gap were interrupted by a relative clause island. Further, in their view, L2ers did not show any convincing evidence of recovery at the real gap position from an initial misanalysis of the filler at the provisional gap position. Based on this, Cunnings et al. (2009) concluded that L2 processing is syntactically shallow and they do not build a detailed hierarchical representation to account for the input in processing complex structures in the target language. In contrast to this, in Omaki and Schulz' (2011) SPR study, they report that the Spanish native speakers they tested actively used the island constraint to guide their filler-gap dependency formation in L2 English. No difference was observed by O&S between bilinguals and English monolinguals in this regard. Based on this evidence, they argue that L2ers, similar to native speakers, are capable of building full-fledged syntactic representations during online comprehension, a challenge to the SSH hypothesis. However, despite convincing evidence from the provisional gap position, Omaki and Schulz (2011) did not provide evidence regarding the real gap position to support their finding. Recall that it is based on the results from the real gap position that Cunnings et al. (2009) argued that L2ers, unlike native speakers, are building shallow structures to account for filler-gap dependencies. In summary, given this unclarity concerning L2er's use of island constraints in real-time language comprehension, more investigation is needed to understand the exact nature of syntactic representations that L2ers build during real-time processing of unbounded dependencies.

In their SPR study with Spanish/English bilinguals, Omaki and Schulz (2011) identify two main issues that should be investigated in future research: (i) the role of L1 syntax on L2 online processing, and (ii) the relation between L2 proficiency and parsing mechanisms used during real-time language comprehension. As far as the first issue is concerned, the findings in L2

sentence processing studies are mixed. While some studies have found evidence for L1 transfer effects in L2 syntactic processing (see e.g. Juffs, 1998), other studies, mainly testing the SSH (see e.g. Felser et al., 2003), have failed to find any reliable evidence for a possible relationship between the properties of L1 syntax and L2 processing. A recurring argument in the latter studies is that L2 processing of complex structures is inherently shallow regardless of whether learners' L1 and L2 bear similar or different properties in a given syntactic domain. However, Clahsen and Felser (2006a) also assume that L2 processing can be more challenging when the language pair in question is typologically distinct:

> Incomplete grammatical acquisition may also prevent learners from successfully establishing syntactic dependencies on-line, and it is possible that properties of a learner's L1 influence parsing. Learners from wh-in-situ backgrounds, for example, may not process sentences containing a fronted wh- constituent in a native like fashion, even if they appear to be sensitive to (e.g.) subjacency violations in off-line tasks.
>
> (Clahsen & Felser, 2006a, p. 20)

Following Clahsen and Felser (2006a), Omaki and Schulz (2011) suggest that:

> It is possible that shallow structures may be more widely observable when the learner's L2 requires grammatical structures and features that are not present in their L1, plausibly because their L1 parser may interfere with parsing of the L2 input.

If this is true, it is possible that Spanish native speakers that Omaki and Schulz tested in their study displayed native-like sensitivity to island constraints in L2 processing because Spanish and English share similar syntactic properties in the domain of wh-dependencies, i.e. in both languages, overt wh-movement takes place in narrow syntax and it is subject to constraints such as subjacency. Given this, it still remains to be seen whether native speakers of a wh-in-situ language can successfully build detailed syntactic representations to account for LD filler-gap dependencies in L2 English.

The second issue that Omaki and Schulz (2011) discuss involves how L2 speakers' overall proficiency in the target language interacts with their parsing decisions in the target L2:

> Sentence processing is a complex cognitive task that involves lexical access, structure building, semantic composition, and discourse integration. It seems reasonable to think that the parser may attempt to reduce some of the processing burden by adopting less complicated representational options. Under this view, it is predicted that shallow structures would be adopted less often as the L2 learner's overall proficiency increases.
>
> (Omaki & Schulz, 2011, p. 584)

Even though many studies have been conducted (see Juffs, 2015 for a review) with different L2 populations to test the SSH, as far as we are aware, no prior study testing filler-gap dependencies has compared two L2 groups of different proficiency levels[1] to investigate how proficiency interacts with parsing mechanism in a target language. Hence, Clahsen and Felser's (2006b, p. 568) following statement remains relevant after many years of research testing the SSH: "little is known about how L2 processing abilities develop over time." The focus in existing studies has either been on college level advanced L2ers (e.g., Cunnings et al., 2009; Dong, 2014; Felser, Sato & Bertenshaw, 2009; Rodriguez, 2008; Witzel et al., 2012) or bilinguals who have arguably reached a steady state in their target L2 (Hopp, 2006; Omaki & Schulz, 2011). In our view, testing the relation between L2 shallow processing and proficiency requires the comparison of two L2 groups of different proficiency levels, ideally from the same L2 population (i.e. same L1, similar conditions of exposure to the L2).

Therefore, building upon previous research on filler-gap dependency formation in real-time language comprehension, this study intends to address the following research questions:

[1] However, such comparisons have been made in other syntactic domains such gender processing in L2 (see e.g. Sagarra & Herschensohn, 2008).

(1) Are L2ers sensitive to island constraints in processing long distance dependencies in English, implying that they employ deeper syntactic processing strategies than shallow processing during real-time language comprehension?

(2) Do syntactic properties of their native language interfere with L2ers' processing in the target language, by preventing them from achieving native-like processing in the target L2?

(3) Do L2ers use more or less shallow processing relative to their proficiency level in the target language or is the L2 processing of complex syntax inherently shallow overall, (regardless of proficiency) as predicted by the SSH?

We investigate these questions in relation to two groups of Sinhala/English bilinguals immersed in English in the US: (i) L2ers who have achieved a steady state in the target language competence, and (ii) intermediate L2ers whose interlanguage is arguably still under development. Our focus is on filler-gap dependency formation in English relative clauses (Experiment 1) and topicalization (Experiment 2), two A-bar dependencies predicted to be challenging in L2 syntactic processing (at least following the SSH).

6.2 Alternative Hypotheses

If the Shallow Processing Hypothesis is on the right track, we would expect L2ers in the current study to have difficulties in processing these A-bar dependencies in English. That is, their failure to generate full-fledged syntactic representations to account for the target L2 input would force them to over-rely on lexical-semantic and pragmatic information. As a result, they would show greater difficulty in processing islands than non-islands (see Cunnings et al., 2009). This difficulty could be evident either in their postulation of gaps inside syntactic islands or significantly longer reading times on sentences involving syntactic islands (see Cunnings, et al. 2009). Either way, their performance is expected to be different from that of English

monolinguals in a way that cannot be rooted in their ability to consider the underlying syntactic structure in detail in their processing.

Also, if second-language processing of A-bar dependencies is inherently shallow, both advanced and intermediate L2ers in this study are expected to show a similar pattern in their processing of the target language, i.e. both groups should have difficulty in forming filler-gap dependencies in a native-like fashion. But, if shallow processing is a temporary mechanism only employed by less proficient L2ers during their early stages of L2 development (as hypothesized by Omaki & Schulz, 2011), advanced L2ers in this study are expected to process the target language in a more native-like fashion than their intermediate peers.

Further, given that Sinhala and English are typologically distinct in the domains of relative clauses and topicalization (absence of island constraints in Sinhala wh-questions and scrambling), for these bilinguals, the L1 parser could interfere with the processing of the target language thereby making L2 syntactic processing a greater challenge (see also Omaki & Schulz, 2011). This could be true regardless of whether Sinhala/English L2ers have acquired native-equivalent competence in the target grammar (see Clahsen & Felser, 2006a, p. 20).

6.3 Experiment 1

In this experiment, we use a Self-Paced Reading (SPR) task to investigate the sensitivity of L1 Sinhala/L2 English speakers to island constraints in processing filler-gap dependencies in English relative clauses. In doing so, we address the research questions outlined in (1), (2), and (3) above.

6.3.1 Participants

A total of 40 L1 Sinhala/L2 English speakers (29 males and 11 females) immersed in English in the US and a control group of 40 (15 males and 35 females) English monolinguals participated in this study. They all received a small fee for their participation. However, based on their accuracy scores for comprehension questions in the SPR task (to be explained later), four L2 speakers and one English monolingual were excluded from the analysis. Therefore, we considered the results from 36 L2ers and 39 English monolinguals in the full analysis.

In addition to the SPR task, all participants completed a language proficiency test and a background survey. The proficiency test (Cloze Test) consisted of 40 test items and was worth 40 points in total (it was the same proficiency test used in the wh-competence experiments presented in Chapter 4). Based on the results of the proficiency test, L2 speakers were assigned to two different proficiency groups. Participants who scored between 30-40 made up the *Advanced Proficiency Group* (*n = 21*). The rest were included in the *Intermediate Proficiency Group* (*n = 15*), given their lower scores. No subjects were excluded from the study based on their proficiency scores alone. Table 1 provides a summary of the results of this proficiency test for all three participant groups:

Participant Group	Mean Test Score (SD)	Range
English Monolinguals	37.7 (2.24)	31-40
Advanced L2ers	33.9 (2.63)	30-40
Intermediate L2ers	25.8 (2.46)	21-29

Table 6.1: The Proficiency test scores (out of 40) for all three participant groups

Similar to the L2 group that we described in the wh-competence study, all L2 participants in this study had learned English as a second language in a classroom setting in Sri Lanka. Their mean age of initial exposure to English was at 6.1 (*SD* = 2.6). In terms of age, they ranged from 25 to 56 years (*Mean* = 37.1). Almost all participants had moved to the US after age 20 (except for one participant who moved to the US at the age of 15). By the time they participated in the study, all these English L2 learners (except for two participants) had completed some level of education at a US university[2]. Their mean time of immersion in English in the US was 12 years and 3 months (Range: 3 to 27 years, *SD* = 7.2). Most of them are highly proficient speakers of L2 English who use it as their dominant language at their workplace and/or for academic purposes. When they were asked to rate their proficiency in English on a seven-point scale (1 = beginner knowledge, 7 = perfectly native) their mean rating was 5.1 (Range: 4 to 7). All participants were naive with regard to the purpose of the experiment.

English monolinguals were recruited from the University of Michigan (Ann Arbor) student community. Their mean age was 19.2 years. As far as English monolinguals are concerned, one prerequisite for their participation was that they reported having grown up in an English-only household during the first five years of life.

6.3.2 Materials

For this experiment, twelve sets of four sentences were selected from Omaki and Schulz[3] (2011), which are modeled on Traxler and Pickering's (1996) eye tracking study with English monolinguals. Some items were slightly modified to systematically match the word length across

[2] Fourteen of them had completed doctoral degrees. Four of them were doctoral students. Twelve of them had completed some other postgraduate level degree. Four of them had completed bachelor's degrees.
[3] In choosing these test items, preference was given to those items that sounded more natural and did not include any uncommon adverbs.

test items, a criterion that had not been enforced in O&S's design. Sample test items across all four conditions are given in (4) below:

(4) a. **Plausible Non-island**[4]
The letter /that/ *the/ woman/* ***wrote/ cautiously/*** *about __/ was/ inspected/* by the board.

b. **Implausible non-island**
The house/ that/ *the/ woman/* ***wrote/ cautiously/*** *about __/ was/ inspected/* by the board.

c. **Plausible Island**
The letter that */the/ woman/ who/* ***wrote/ cautiously/*** *saw __/ was/ inspected/* by the board.

d. **Implausible Island**
The house that /*the/ woman/ who/* ***wrote/ cautiously/*** *saw __/was/ inspected/* by the board.

The difference between the two non-island conditions (*a* and *b*) is on the head NP (*the letter*) which either matches (a) or mismatches (b) the selectional properties of the first verb (*wrote*) of the sentence in terms of being a plausible argument of that verb (e.g. write a letter vs. #write a house). In each condition, the first verb also introduces the provisional gap (as a potential gap at least). Only the real gap position is indicated in (4), by an underscore in the sample test items. Assuming that participants use the *first resort strategy* in forming filler-gap dependencies, the prediction is that in these non-island conditions they would try to form a filler-gap dependency as soon as encountering the subcategorizer, *wrote*. If so, the mismatch in plausibility would

[4] In both sample test items for the experiments in this chapter ((4) and (5)), only the regions that are in italics were considered in detail for the statistical analysis. The ones in boldface were the two critical regions (Verb and Adverb).

result in a longer reading time around the verb (*wrote*) in the implausible non-island (b) but not in the plausible non-island condition (a); in addition, this effect can either show up on the verb itself or on the following word, an adverb (as considered in Omaki & Schulz, 2011). So we treat these two words (first verb and adverb, in boldface in the test items) as the critical regions across all four conditions (4a-d) in our analysis. In any given set of test items across the four conditions, the verb was always followed by the same adverb so that the length of the adverb was not responsible for any reading time differences between the four conditions.

The two island conditions mostly match the two non-island conditions. However, in the island conditions (c and d), the first linear verb (*wrote)* of the sentence (the verb in the most embedded relative clause) is predicted to be relatively inaccessible (compared to the non-island conditions) as a source of a provisional gap for the filler NP, because it is embedded inside a relative clause island. Thus, in the island cases, the only possible gap is the real gap which is after the second verb in the linear order: *saw*. Given this, if participants are sensitive to the island constraint, the provisional gap would not serve as a potential gap site for the filler in the island test items, also implying that (4c) and (4d) should not show a plausibility distinction at the provisional gap position. For these reasons, the two critical regions for our analysis include the first linear verb (*wrote*) and the adverb (*cautiously*), in both island and non-island conditions. These two positions, the real gap position (at the subcategorizer preposition or verb) and the following word, are expected to provide important information about parsing decisions the processor makes during the filler-gap dependency formation.

In summary we make the following predictions. If participants are sensitive to island constraints in forming filler-gap dependencies, in the critical regions they are expected to read the two non-island conditions differently from the two island conditions. Alternatively, if they

are not actively taking the island constraint into consideration in processing, differences are not expected to arise between the island and the non-island conditions, especially in the critical regions.

6.3.3 Procedure and Equipment

This SPR experiment used the word-by-word non-cumulative moving window paradigm (Just, Carpenter & Woolley, 1982). It was both designed and presented using the E-Prime software. Each participant was tested in a quiet room in one of the psychology labs at the University of Michigan, Ann Arbor. Participants read all the sentences on a 19" LCD monitor as they appeared in the center of the screen.

Each session (a 20-35 minute session for the task that included these test items) began with five practice items that did not include any filler-gap dependencies. Participants were allowed to repeat these practice items until they became familiar with the task. During the entire session, a participant read six tokens from each test condition[5] (24 test items) presented in a random order with a set of fillers (n = 64 filler items). The presentation of each sentence started with a series of dashes. Participants pressed a key on the button box to read one word at a time, at their own pace. The software recorded their reading time for each word. At random intervals, they were also required to answer a comprehension question (Yes/No) about the test item they had just read. The general instruction for the participants was to read each sentence carefully but quickly.

[5] However, a participant read only two out of four versions of a given test item (i.e. only one of each island/non-island pairs, and only one of each plausible/implausible pair).

6.3.4 Results

The analysis began with the treatment of outliers. For any word position, raw reading times above or below 2.5 Standard Deviations (SD) were replaced with the cutoff value for that position. This affected 4% of the data. Any missing cells were replaced with the following formula: subject or item mean + condition mean – grand mean. This replacement accounted for approximately 3% of data. In answering comprehension questions (both test sentences and fillers), all participant groups showed a high accuracy rate (Native 90.63%; Advanced L2 87.94%; Intermediate L2 83.26%), implying that they were paying attention to the task.

After treating for outliers, we submitted participants' mean reading times for each region to a series of 2 (Plausible/Implausible) x 2 (Island/Non-island) x 3 (Native/Advanced L2/Intermediate L2) ANOVAs with plausibility and islandhood as within-subjects factors and proficiency as between-subjects factor. In most instances, proficiency had a main effect in both critical and non-critical regions implying that L2ers generally read the experimental sentences slower than native controls. The mean reading time for native speakers in this experiment was 348 ms while it was 636 ms for advanced L2ers and 739 ms for intermediate L2ers. However, proficiency was not observed to interact with plausibility or islandhood in any of the non-critical regions, in particular, those words leading to the two critical regions (first verb, adverb) in each sentence. In the same way, no main effect of islandhood, plausibility or interaction between the two was observed in non-critical regions for any of the three groups. Given this pattern, our discussion below will only focus on results on the two critical regions and the real gap position. Participants' mean reading times for these regions (including some surrounding words) in each condition are presented in **Figure 1** (Native Controls), **Figure 2** (Advanced L2 Group) and **Figure 3** (Intermediate L2 group).

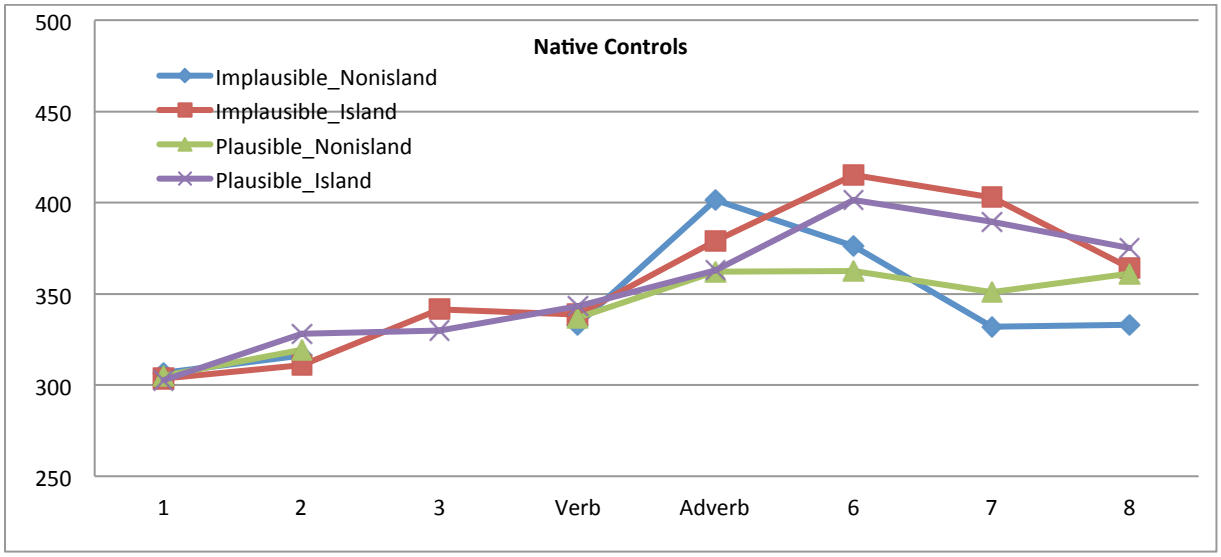

Figure 6.1: Mean reading times for native controls in all four conditions. The Y axis shows reading times in milliseconds. The X axis shows word positions including the two critical regions, *Verb*, *Adverb* and the real gap position[6] (6).

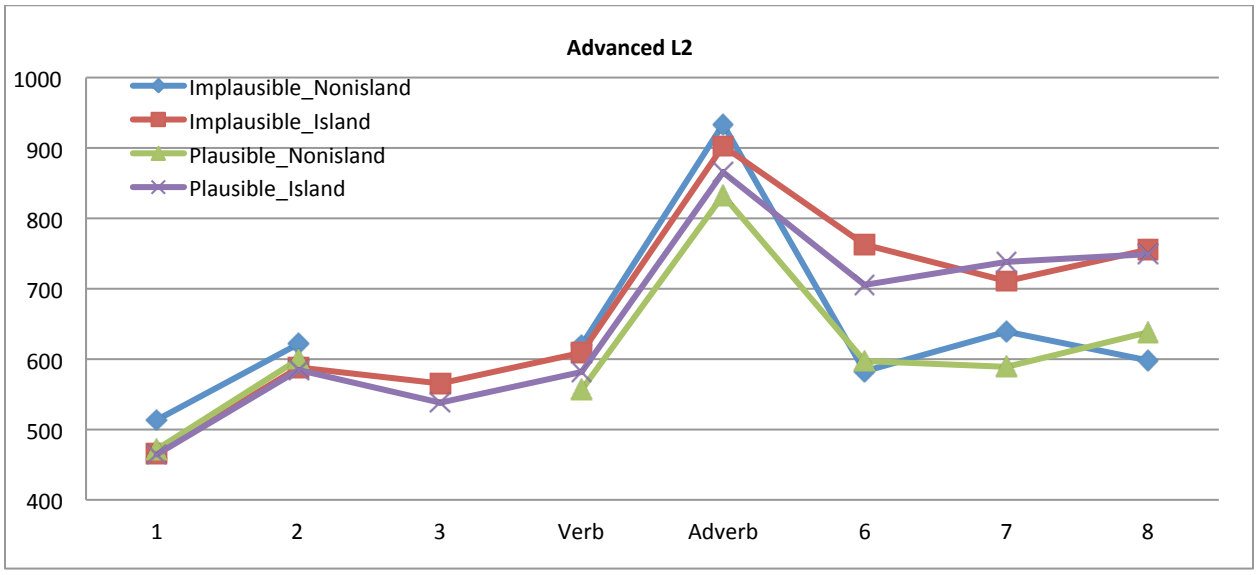

Figure 6.2: Mean reading times for advanced L2ers in all four conditions. The Y axis shows reading times in milliseconds. The X axis shows each word position including the two critical word positions, *Verb*, *Adverb* and the real gap position (6).

[6] In each of the figures for Experiments 1 and 2, only *Verb* and *Adverb* represent critical regions, 1 to 3 precede the critical regions, and 6 to 8 follow them.

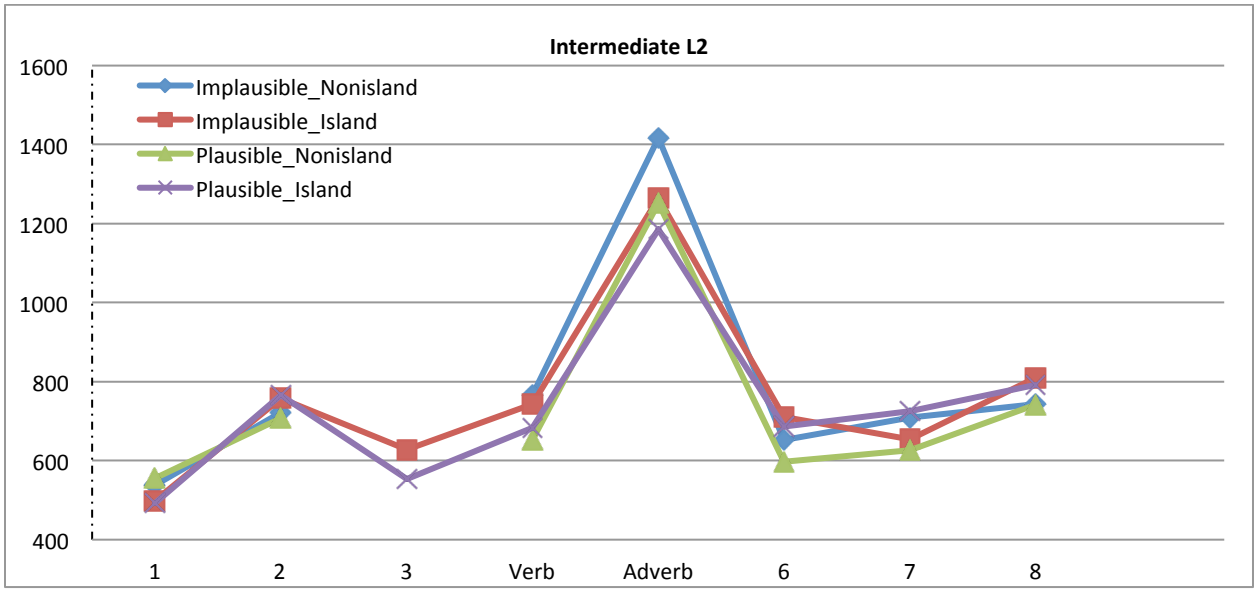

Figure 6.3: Mean reading times for intermediate L2ers in all four conditions. The Y axis shows reading times in milliseconds. The X axis shows each word position including the two critical word positions, *Verb, Adverb* and the real gap position (6).

First Critical Region (Verb). A summary of the mean reading times for the first critical region (first verb in the test sentence, identified as *Verb* in Figures 1 to 3) is presented in Table 2. Our test of ANOVA on the reading times in this region revealed a main effect of plausibility in both by-participant and by-item analyses, $F1$ (1, 72) = 16.29, $p < .001$, $F2$ (1, 44) = 7.87, $p < .001$. This, as our reading data clearly shows, resulted from the fact that participants in general read implausible non-island sentences (*Mean* = 499 ms across three groups) slower than their plausible counterparts (461 ms).

However, plausibility interacted with proficiency in this region, $F1$ (2, 72) = 6.76, $p < .002$, $F2$ (2, 22) = 13.29, $p < .001$. As revealed in subsequent analyses, plausibility had a stronger effect on the intermediate L2ers (e.g. plausible non-island: 653 ms; implausible non-island, 765 ms) than the other two groups. Indeed, this difference only reached significance for the intermediate group (t (14) = -2.70, $p <.01$) but not for native controls (t (38) = 0.28, $p >.77$) or

advanced L2ers (t (20) = -1.72, p >.09). Further, three other effects were found in the item analysis: islandhood ($F1$ (1, 72) = 0.13, p > .71, $F2$ (1, 11) = 7.48, p < .01), an interaction between islandhood and plausibility ($F1$ (1, 72) = 1.85, p > .17, $F2$ (1, 11) = 8.58, p < .01) and a three-way interaction between islandhood, plausibility and proficiency ($F1$ (2, 72) = 0.90, p > .41, $F2$ (2, 22) = 5.94, p > .009). As revealed in subsequent post-hoc comparisons considering all three groups together, they read the two island conditions without a significant difference, (t (74) = -1.27, p >.20). A significant difference between the two non-island conditions was only found for the intermediate group, t (14) = -2.70, p <.01. Except these, no other main effects or interactions were found.

Condition	Native	Adv. L2	Inter.L2
Implausible Non-Island	333	620	765
Implausible Island	339	609	742
Plausible Non-Island	337	556	653
Plausible Island	343	582	683

Table 6.2: Mean reading times for the first critical region (verb)

Summarizing our results for the first critical region (verb: *wrote*), plausibility had a main effect in both participant and item analyses. The interaction between islandhood and plausibility was only found in the item analysis. As revealed in post-hoc comparisons, in this region plausibility had a strong effect on intermediate L2ers but not on the other participant groups. However, the intermediate group, unlike the other two groups, showed the pattern we predicted in this region itself, i.e. they read the two island conditions without a significant difference (t (14) = -1.83, p >.08), but they read the implausible non-island condition significantly slower than the plausible non-island condition.

Second **Critical Region (adverb)**. The mean reading times for this region are presented in Table 3. In general, all participant groups showed longer mean reading time in the two non-island conditions than in their island counterparts. Our analysis in this region (the adverb) revealed a main effect of islandhood in the item analysis ($F1$ (1, 72) = 3.10, $p > .08$, $F2$ (1, 11) = 27.01, $p < .001$), a main effect of plausibility in the participant analysis ($F1$ (1, 72) = 13.00, $p < .001$, $F2$ (1, 11) = 0.26, $p > .61$), and a significant interaction between islandhood and plausibility in both participant and item analyses ($F1$ (1, 72) = 4.07, $p < .04$, $F2$ (1, 11) = 22.97, $p < .001$). This was further qualified by proficiency (a three-way interaction) in the item analysis ($F1$ (2, 72) = 6.51, $p > .49$, $F2$ (2, 22) = 6.49, $p < .006$). Subsequent analyses were conducted to explore the nature of this three-way interaction.

Condition	Native	Adv. L2	Inter.L2
Implausible Non-Island	402	933	1417
Implausible Island	379	903	1264
Plausible Non-Island	362	833	1251
Plausible Island	363	866	1185

Table 6.3: Mean reading times (RTs) for the second critical region (adverb)

As expected, the native control group showed a significant RT difference between plausible non-island (362 ms) and implausible non-island (402 ms) conditions (t (38) = -2.18, $p <.03$), and their reading of the two island conditions in this region showed no significant difference, (t (38) = -0.93, $p >.35$). Thus, they were more sensitive to the interaction between plausibility and islandhood in this region (adverb) than in the first critical region (verb). Crucially, the same pattern as the native speakers' was observed for the advanced L2 group between the two non-island conditions, where the L2ers showed a significant difference (t (20) = -2.81, $p <.01$), and

two island conditions, where the difference was not significant (t (20) = -0.68, p >.50). For the intermediate group, the difference between the two non-island conditions was marginal (t (14) = -1.98, p >.06) in this region. Still, they did not differ in their readings between the two island conditions (t (14) = -0.92, p >.37). This contrast suggests that there was some sensitivity to the interaction between island and plausibility even for the intermediate L2 group.

The results of this region can be summarized as follows. The reading times for both native controls and advanced L2ers were longer in non-island sentences than in island sentences. Plausibility not only had a main effect but also interacted with islandhood in both participant and item analyses. As our subsequent analyses revealed, the plausibility distinction was only found in non-island conditions. Thus, in island conditions, no reliable evidence of the plausibility effect was found for native controls and advanced L2ers. The intermediate group behaved slightly differently in this region but they also showed some sensitivity to the island constraint, i.e. even for them, the island appeared to have a main effect.

Real Gap position. A summary of participants' mean reading times for this region (subcategorizer *about*/*saw*) is presented in Table 4. Neither the participant nor the item analyses revealed a main effect of plausibility ($F1$ (1, 72) = 3.05, p > .08, $F2$ (1, 11) = 4.28, p >.06), implying that participants did not read plausible sentences differently from their implausible counterparts in this region. Plausibility also did not interact with any other factors. But both participant and item analyses revealed a main effect of islandhood ($F1$ (1, 72) = 10.02, p < .002, $F2$ (1, 11) = 6.52, p < .02), which interacted with proficiency only in the item analysis, $F1$ (2, 72) = 1.61, p > .20, $F2$ (2, 22) = 5.71, p > .01.

Condition	Native	Adv. L2	Inter. L2
Implausible Non-Island	376	583	652
Implausible Island	415	763	710
Plausible Non-Island	363	597	597
Plausible Island	401	706	686

Table 6.4: Mean reading times for the real gap position (*about* or *saw*)

Given that proficiency was found to interact with islandhood, in subsequent analyses, we conducted separate ANOVAs for each participant group for this region. The analysis with native controls revealed a main effect of islandhood ($F1$ (1, 38) = 4.65, $p < .03$, $F2$ (1, 11) = 10.66, $p <.008$). But no other main effects or interactions were found. In the analysis with advanced L2ers, no main effects or interactions were found. Meanwhile, the analysis with the intermediate group revealed a main effect of islandhood, $F1$ (1, 14) = 4.25, $p < .05$. This appears to indicate that in this region, native controls and intermediate L2ers distinguished between islands and non-islands while the advanced L2 group read those at a similar rate.

In parallel, a different pattern was observed in region 7 (*was*), which immediately follows the real gap position. In this region, native controls, ($F1$ (1, 38) = 14.52, $p < .001$) and advanced L2ers ($F1$ (1, 20) = 6.97, $p < .01$ showed a strong sensitivity to islands but not the intermediate L2ers, $F1$ (1, 14) = 0.29, $p > .59$. For advanced L2ers, the island effect continued to be significant even in region 8 (F1 (1, 20) = 4.13, $p < .05$), whereas it proved to be non-significant for the other two groups, native ($F1$ (1, 38) = 3.44, $p > .07$) and Inter.L2 ($F1$ (1, 14) = 2.22, $p > .15$).

Thus, from Region 6 (the real gap) to 8, the island effect showed up in some way across the three groups. It immediately showed up on the subcategorizer (real gap) for intermediate L2ers.

For native controls, this effect showed up on the subcategorizer and the following word (Regions 6 and 7). For advanced L2ers, this effect was slightly delayed as it showed up both in regions 7 and 8.

6.3.5 Discussion

In this experiment, our native controls (at least as far as the second critical region/adverb is concerned) behaved as predicted. In the second critical region (adverb), they read the implausible non-island condition significantly slower than the plausible non-island condition, implying that the plausibility mismatch had an impact on their reading times in non-island conditions. In contrast, they read the two island conditions without a significant difference, implying that they only attempted to form filler-gap dependencies in non-island conditions at this region. These results strongly replicate what Traxler and Pickering (1996) and Omaki and Schulz (2011) found for English native speakers in their studies. Crucially, the two L2 groups in this study displayed the same pattern. The advanced L2 group, similar to English monolinguals, also showed this pattern at the second critical region. The intermediate L2 group displayed a similar pattern, although this took place at the first critical region (Verb). Unlike the other two groups, they showed a strong sensitivity to the plausibility/islandhood interaction on the first verb itself (first critical region). Given these results at the two critical regions, we can conclude that both L2 groups in this study were sensitive to islands in forming filler-gap dependencies in English relative clauses.

However, some studies exploring filler-gap dependency formation in both L1 and L2 processing have found that the real gap position can be as revealing as the provisional gap in terms of inferring the decisions that the parser makes during the process. For instance, Traxler and Pickering (1996) found in their eye-tracking study that their native English speaker

participants took longer to read the real gap position when the provisional gap was plausible than when it was implausible (the filler does not match the selectional restrictions of the verb triggering the provisional gap). Their explanation was that the parser finds it more difficult to recover from an initial plausible misanalysis (at the provisional gap) than an implausible one, i.e. "readers semantically commit to a plausible analysis more than an implausible analysis" (p.466). Cunnings et al. (2009) also found this region to be revealing as to whether the parser postulates a provisional gap before the filler is finally integrated at the real gap position. But the results of our study did not reveal a main effect of plausibility for the real gap position. Also, it did not interact with proficiency. This implies that in this region, none of the participant groups distinguished between plausible and implausible sentences.

At the real gap position (*saw*/*about*) and the following words, we found a main effect of islandhood as revealed in participant and item analyses. We also found that islandhood had a strong effect on advanced L2ers and native controls while it had less impact on the intermediate L2ers. At the real gap position, both native controls (t (39) = -2.21, p <. 03) and L2ers (t (36) = -2.44, p < .02) read island sentences significantly slower than non-island sentences. This is the exact opposite of what we observed at the provisional gap (critical regions: verb and adverb) for these groups, i.e. at the provisional gap, non-island sentences showed a longer reading time than island sentences. This asymmetry between island and non-island conditions is a common finding in the L1 processing literature too (see e.g. Traxler & Pickering, 1996). According to Gibson (1998), one assumption is that in processing islands, the parser spends a relatively longer reading time at the real gap position because the linear distance between the filler and the gap increases the integration cost of the filler at this site. Thus, the relatively longer reading time in island conditions is also additional evidence to assume that in this study at least advanced L2ers and

native controls did not postulate gaps inside islands. If they postulated gaps inside islands, the activation of the filler at the provisional gap (see Marinis et al., 2005) would be expected to reduce its integration cost at the real gap position, implying that island and non-island sentences should have been read without a difference at the real gap position.

6.4 Experiment 2

In *Experiment 1*, we found evidence that advanced L2ers behave similarly to English monolinguals in their active use of island constraints to guide the filler-gap dependency formation during real-time language comprehension. In this experiment, we investigate whether these results can be replicated in a different type of filler-gap dependency formation, namely topicalization. Given that both topicalization (when it involves A-bar movement) and wh-movement exhibit similar island effects in English, native controls in this study would be expected to use a similar processing mechanism to account for filler-gap dependencies in topicalization too. Also, if Sinhala native speakers in this study are indeed capable of building deep syntactic representations to account for the L2 input during real-time comprehension, there is no reason to expect that they would process filler-gap dependencies in topicalization differently from English monolinguals.[7] Finally, as far as we are aware, no prior study has tested the L2 processing of topicalization to test L2 processing hypotheses such as the SSH discussed in the previous chapter.

6.4.1 Participants

The participants in this experiment were the same as in Experiment 1.

[7] However, due to typological differences between the two languages regarding topicalization (see Chapter 2), the SSH would predict difficulties in processing for L2ers in these instances too.

6.4.2 Materials

For this experiment, we constructed twelve sets of four sentences which were partially modeled on the test sentences used in Traxler and Pickering (1996) and Omaki and Schulz (2011), but the plausible/implausible NP pairs corresponded to topicalized NPs. A sample test set of test item across conditions is given below:

(5) a. **Plausible Non-island**
This/ consultant*,/ the /manager /****phoned/ hurriedly/*** *about/ before/ leaving*/ the /country.

b. **Implausible Non-island**
This/ equipment*,/ the/ manager/* ***phoned/ hurriedly/*** *about/ before/ leaving*/ the/ country.

c. **Plausible Island**
This/ consultant*,/ the manager/ who/* ***phoned/ hurriedly/*** *liked/ before/ leaving*/ the/ country.

d. **Implausible Island**
This/ equipment*,/ the/ manager/ who/* ***phoned/ hurriedly/*** *liked/ before/ leaving*/ the/ country.

The test items used in this experiment are structurally similar to those used Experiment 1 except that the filler in these sentences is a topicalized element. Again, the difference between the two non-island conditions (*a* and *b*) is on the head NP (*consultant*/e*quipment*) which either matches (a) or mismatches (b) the selectional properties of the first verb (*phoned*): the provisional gap. In island conditions, the first verb is embedded inside an island. Thus, if participants are sensitive to islands in forming filler-gap dependencies, a plausibility distinction is predicted between the two non-island conditions around the first verb (*phoned*). No such distinction is predicted between the two island conditions in this region. So, the two critical regions for our analysis include the first linear verb (*phoned*) and the adverb (*hurriedly*). The real

gap position in the non-island conditions is after the first preposition (*about*), and in island conditions it is after the main verb *liked*.

6.4.3 The Procedure and Equipment

The same as in Experiment 1.

6.4.4 Results

In the same way we did in Experiment 1, we submitted participants' mean reading times to a series of 2 (Plausible/Implausible) x 2 (Island/Non-island) x 3 (Native/Adv.L2/Inter.L2) ANOVAs with plausibility and islandhood as within subject factors and proficiency as between subject factor. Proficiency always had a main effect in both critical and non-critical regions implying that L2ers generally read the experimental sentences slower than native controls. Given this, in the rest of the discussion, we will refer to proficiency only if it interacts with any other factors such as plausibility and islandhood. Below we will discuss our results for the two critical regions (first verb, adverb) and the real gap position (triggered by a subcategorizing preposition in non-islands and by the main verb in islands). Participants' mean reading times for these positions (and the surrounding words) are presented in **Figure 4** (Native controls), **Figure 5** (Advanced L2 Group) and **Figure 6** (Intermediate L2 group).

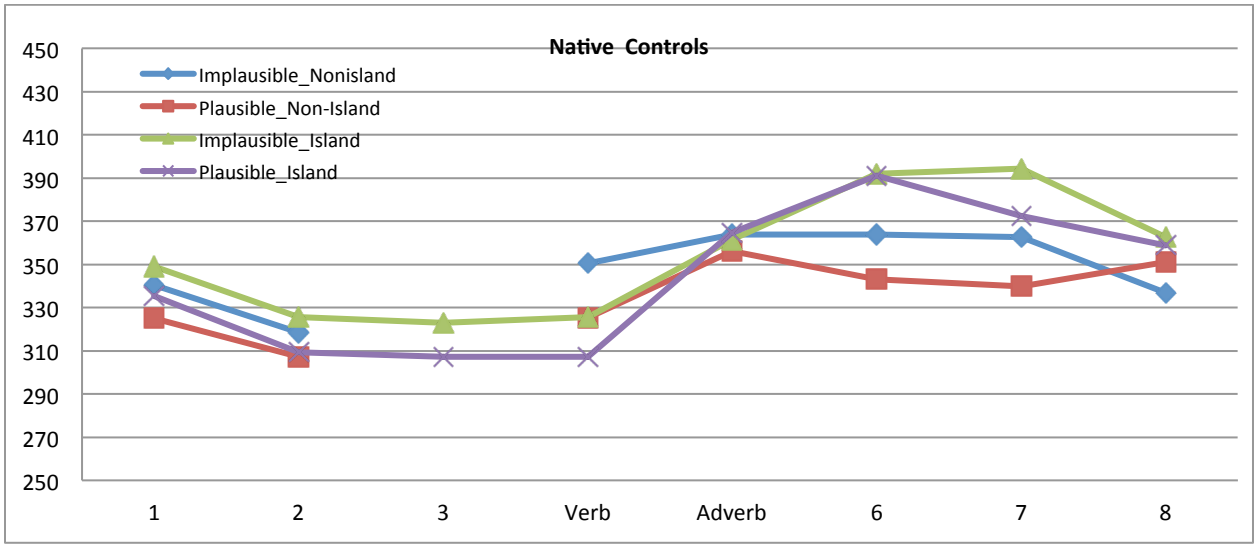

Figure 6.4 Topicalization: Mean reading times for native controls in all four conditions. The Y axis shows reading times in milliseconds. The X axis shows each word position including the two critical regions, *Verb*, *Adverb*, and the real gap (6).

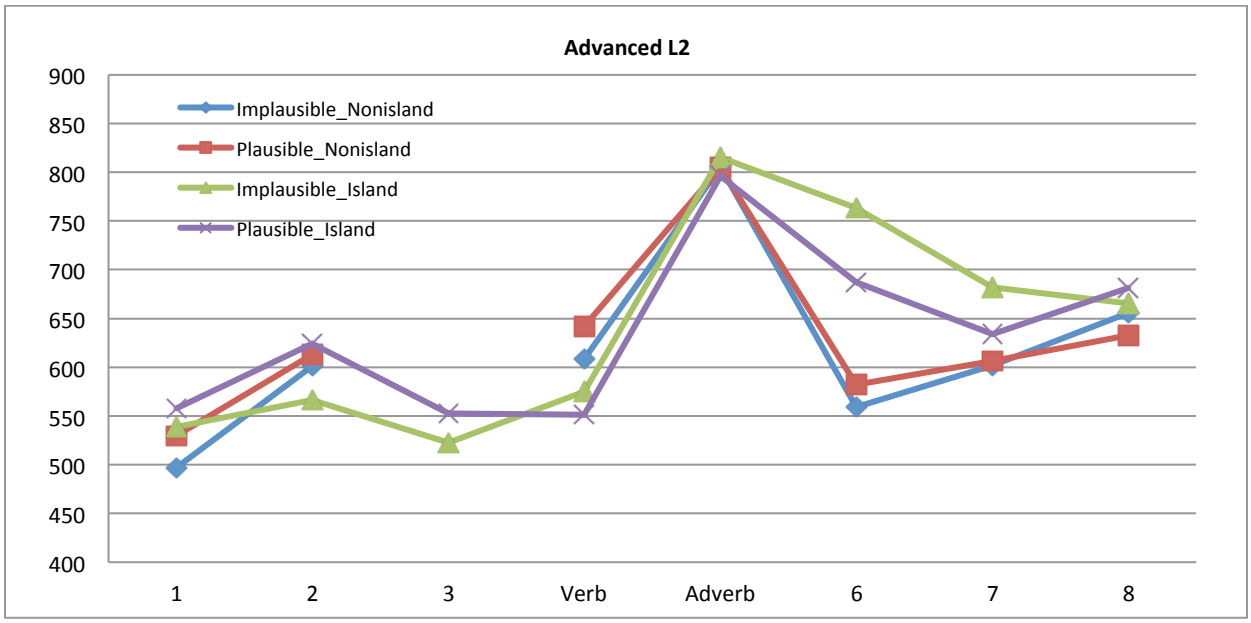

Figure 6.5 Topicalization: Mean reading times for advanced L2ers in all four conditions. The Y axis shows reading times in milliseconds. The X axis shows each word position including the two critical words *Verb*, *Adverb* and the real gap (6).

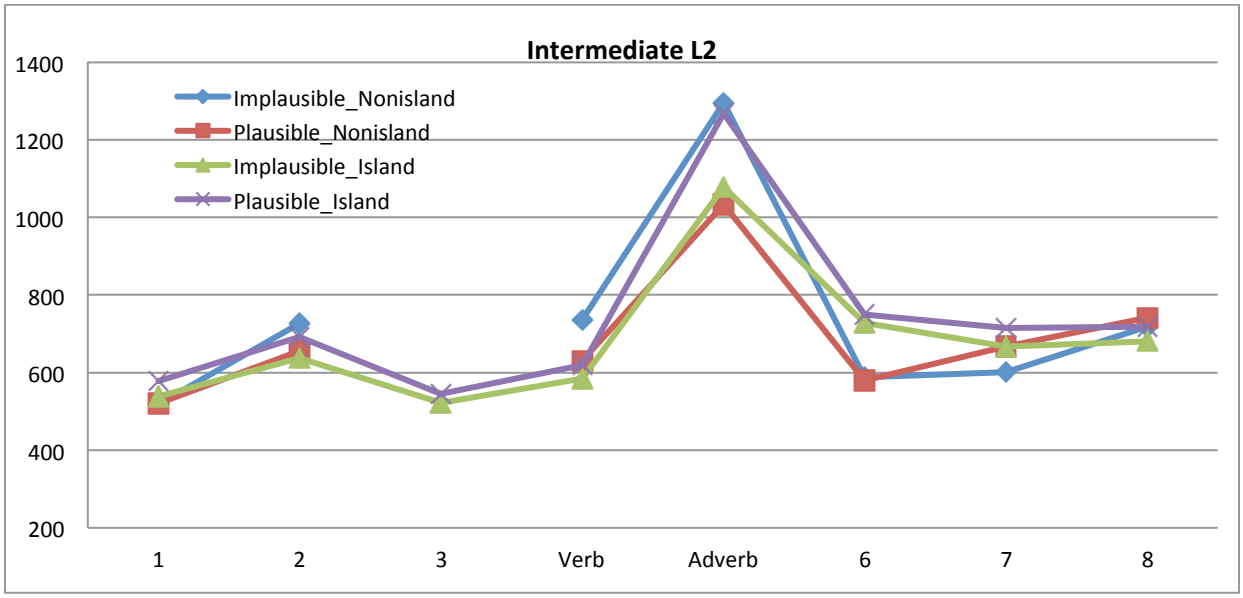

Figure 6.6 Topicalization: Mean reading times for advanced L2ers in all four conditions. The Y axis shows reading times in milliseconds. The X axis shows each word position including the two critical words *Verb*, *Adverb* and the real gap (6).

First Critical Region (Verb), corresponding to the first verb in each test sentence. Participants' mean reading times for the first critical region are presented in Table 5. Our test of ANOVA on the reading times for this region revealed a main effect of islandhood ($F1$ (1, 72) = 19.13, $p < .001$, $F2$ (1, 11) = 7.04, $p < .02$), implying that all participants taken together read island conditions (402 ms) faster than non-island conditions (414 ms), which proved to be significantly different, t (74) = 3.78, $p < .001$. However, neither the participant not the item analysis revealed a main effect of plausibility for the first critical region, $F1$ (1, 72) = 2.99, $p > .08$, $F2$ (1, 11) = 1.70, $p > .21$. Also, plausibility did not interact with islandhood, $F1$ (2, 72) = 5.53, $p > .17$, $F2$ (1, 11) = 0.76, $p > .40$. However, the participant analysis revealed a three-way interaction between plausibility, islandhood and proficiency, $F1$ (2, 72) = 5.27, $p < .007$, $F2$ (2, 22) = 2.39, $p > .13$. In exploring the nature of this interaction, we conducted separate repeated measures ANOVAs on the mean reading times for each participant group in this region.

Condition	Native	Adv. L2	Inter.L2
Implausible Non-Island	351	608	736
Implausible Island	326	575	585
Plausible Non-Island	325	642	631
Plausible Island	307	551	620

Table 6.5. Topicalization: Mean reading times for the first critical region, the verb.

As far the native controls are concerned, both participant and item analyses revealed a main effect of islandhood ($F1$ (1, 38) = 7.55, $p < .009$, $F2$ (1, 11) = 6.20, $p < .03$) and plausibility ($F1$ (1, 38) = 4.96, $p < .03$, $F2$ (1, 11) = 21.39, $p < .001$), but no interaction between the two ($F1$ (1, 38) = 0.22, $p > .63$, $F2$ (1, 11) = 0.38, $p > .54$). As revealed in post-hoc pairwise comparisons, native controls read the two island conditions (316 ms) faster than the two non-island conditions (338 ms), which proved to be significantly different, t (38) = -2.74, $p < .009$. The same distinction was observed between the two plausible conditions together (both island and non-island) (316 ms) and the two implausible conditions (338 ms), t (38) = -2.22, $p < .03$, implying some sensitivity to plausibility too. But no significant difference was found between the two non-island conditions, t (38) = -1.77, $p > .08$, or the two island conditions, t (38) = -1.19, $p < .06$. To summarize, our native controls in the first critical region showed a strong level of sensitivity to the island constraint, i.e. they read island sentences significantly faster than non-island sentences. But the plausibility effect was less strong and it did not interact with islandhood. Still, they also read the two plausible conditions faster than the two implausible conditions.

Similarly to the native group, the analysis for the advanced L2 group revealed a main effect of islandhood in both participant and item analyses, $F1$ (1, 20) = 8.15, $p < .01$, $F2$ (1, 11) = 12.05, $p < .005$. But plausibility had no main effect, $F1$ (1, 20) = 0.07, $p > .78$, $F2$ (1, 11) = 0.05,

$p > .82$. Still, their participant analysis revealed an interaction between plausibility and islandhood, $F1\ (1, 20) = 4.62$, $p < .04$, $F2\ (1, 11) = 0.61$, $p > .44$. As revealed in follow up analyses, in the first critical region, advanced L2ers read plausible island sentences (551 ms) significantly faster than plausible non-island sentences (641 ms), $t\ (20) = 3.97$, $p < .001$. A similar pattern was observed between the implausible non-island (608 ms) and implausible island (554 ms) conditions though this difference did not reach significance, $t\ (20) = 1.20$, $p > .24$. Overall, similar to native controls, advanced L2ers also read the two island conditions (562 ms) significantly faster than the two non-island conditions (624 ms), $t\ (20) = -2.85$, $p < .01$, even if they did not differ between the two non-island conditions, $t\ (20) = 1.56$, $p < .13$. To sum up, advanced L2ers, similar to native controls, showed a strong level of sensitivity to the island constraint and some level of sensitivity to plausibility in this region.

In the first critical region, intermediate L2ers differed from both advanced L2ers and native controls given that they showed no main effects of plausibility ($F1\ (1, 14) = 1.43$, $p > .25$, $F2\ (1, 11) = 1.48$, $p > .24$), islandhood ($F1\ (1, 14) = 3.14$, $p > .09$, $F2\ (1, 11) = 2.62$, $p > .13$) or any interaction between the two factors ($F1\ (1, 14) = 2.51$, $p > .13$, $F2\ (1, 11) = 3.26$, $p > .09$).

Second **Critical region (adverb).** The mean reading times for the second critical region are summarized in Table 6. Our test of ANOVA for this region revealed no main effects of plausibility ($F1\ (1, 72) = 1.08$, $p > .30$, $F2\ (1, 11) = 0.26$, $p > .61$) or islandhood ($F1\ (1, 72) = 0.49$, $p > .25$, $F2\ (1, 11) = 0.02$, $p > .88$). But both analyses revealed an interaction between plausibility and islandhood ($F1\ (1, 72) = 19.55$, $p < .001$, $F2\ (1, 11) = 9.80$, $p < .01$), which was further qualified by proficiency ($F1\ (2, 72) = 17.00$, $p < .001$, $F2\ (2, 22) = 4.11$, $p < .05$). As revealed in subsequent analyses, the interaction between plausibility and islandhood came from the intermediate group, $F1\ (1, 14) = 15.77$, $p < .001$, $F2\ (1, 11) = 9.14$, $p < .01$. They read the

plausible island condition (1268 ms) significantly slower than the plausible non-island condition (1077 ms), t (14) = -4.38, $p < .001$. Also, their reading times for the two island conditions were significantly different, t (14) = 2.28, $p < .03$ in this region. This is the opposite of what one would expect if they were sensitive to the island constraint in forming filler-gap dependencies in these cases. However, neither native controls nor advanced L2ers showed any reliable main effects of plausibility, islandhood or an interaction between these two factors in this region. Both these groups read all four conditions without a reliable difference in this region.

Condition	Native	Adv. L2	Inter. L2
Implausible Non-Island	364	805	1295
Implausible Island	362	815	1077
Plausible Non-Island	356	804	1034
Plausible Island	365	796	1268

Table 6.6. Topicalization: Mean reading times for second critical region (adverb).

Real Gap. An ANOVA on this region revealed a main effect of islandhood ($F1$ (1, 72) = 36.33, $p < .001$, $F2$ (1, 11) = 42.13, $p < .001$) which also interacted with proficiency ($F1$ (2, 72) = 5.35, $p < .007$, $F2$ (2, 22) = 4.91, $p < .03$). However, for all three groups the difference between islands and non-islands was significant, Native, t (38) = -3.51, $p <.001$, Adv.L2, t (20) = -2.68, $p < .001$, Inter.L2, t (14) = -3.34, $p < .005$. So, the interaction between proficiency and islandhood at the real gap position differed only in terms of degree: advanced L2ers and native controls were more sensitive to the island distinction than intermediate L2ers. No other main effects or interactions were found.

Condition	Native	Adv. L2	Inter. L2
Implausible Non-Island	364	559	588
Implausible Island	392	763	728
Plausible Non-Island	343	582	579
Plausible Island	391	687	750

Table 6.7. Topicalization: Mean reading times for the real gap position

The results for region 7 revealed a similar pattern to the Real Gap regarding islandhood, which had a main effect ($F1$ (1, 72) = 7.34, $p < .008$, $F2$ (1, 11) = 9.24, $p < .01$), although it did not interact with proficiency ($F1$ (2, 72) = 0.23, $p > 0.78$, $F2$ (2, 22) = 0.17, $p > .78$). Plausibility had no main effect either in the participant or item analyses, $F1$ (1, 72) = 0.08, $p > 0.77$, $F2$ (1, 11) = 0.05, $p > .82$, but an item analysis revealed an interaction between plausibility and proficiency ($F1$ (2, 72) = 2.59, $p > .08$, $F2$ (2, 22) = 3.26, $p < .05$).

As revealed in subsequent analyses, in region 7, native controls read the plausible island condition (373 ms) significantly slower than the plausible non-island condition (340 ms), t (38) = -2.35, $p < .02$. A similar pattern was observed between the implausible non-island (363 ms) and implausible island (394) conditions, though it did not reach significance, t (38) = -1.20, $p > .23$. Finally, the analysis for region eight did not reveal any reliable main effects or interactions.

For the advanced group, a similar pattern was observed at the real gap position itself; they read the plausible island condition (687 ms) significantly slower than the plausible non-island (582 ms) conditions, t (20) = -2.24, $p < .03$. At the real gap region, they also differed between the implausible island conditions (763 ms) and the implausible non-island (559 ms), t (38) = -2.72, $p < .01$. The intermediate group only showed a significant difference between plausible island

(750 ms) and plausible non-island (579 ms) conditions at the real gap position, t (20) = -3.36, $p < .005$.

6.4.5 Discussion

In this experiment, our test of plausibility did not yield relevant evidence concerning participants' parsing decisions at the provisional gap position. Following our findings in Experiment 1, we predicted that participants' reading times for the two critical regions would differ between island (c & d) and non-island conditions (a & b) and this would interact with plausibility. The predicted pattern of interaction between islandhood and plausibility was observed only for the advanced L2 group in the first critical region.

However, our results still strongly indicate that both native controls and advanced L2ers actively used the island constraint to filter their filler gap dependency formation in topicalization (and intermediate L2ers showed a delayed effect of islandhood in the real gap region and in region 7). The most compelling evidence for this comes from the first critical region and the real gap position.

At the first critical region (verb), both native controls and advanced L2ers displayed a strong level of sensitivity to islandhood. The fact that both groups read island conditions faster than their non-island counterparts indicates that they did not attempt to form a filler-gap dependency inside islands. If they did, we would have expected to see no difference between the two island and non-island conditions at the provisional gap region (first critical region). Further, these two groups showed a strong effect of islandhood at the real gap position, although in the real gap region (and in the following word) the effect reversed, in that both groups read island conditions significantly slower than non-islands conditions (in addition, this effect extended to intermediate L2ers as well, at least at the real gap region). Recall that the results of Experiment 1 showed a

similar pattern in this region. In that experiment, we observed a longer reading time in island conditions than in non-island conditions, implying that participants only postulated gaps inside non-islands at the provisional gap. The argument was that if participants formed a filler-gap dependency inside island conditions, the RT difference between islands and non-islands would not be expected to arise at the real gap position, i.e. the activation of the filler at the provisional gap should reduce its integration cost at the real gap position for islands as well, which would have yielded no reading time differences between island and non-island conditions, contrary to what we actually found at the real gap.

However, we did not find strong evidence to assume that intermediate L2ers avoided postulating gaps inside islands in these topicalization cases. At the real gap, they showed some sensitivity to the islandhood distinction, but at the provisional gap, they did not distinguish between island and non-island conditions.

6.5 General Discussion

This study started with the goal of re-testing the Shallow Structure Hypothesis with two groups of L2ers immersed in English in the US. They were different in terms of their proficiency in L2 English (Advanced L2 (*n = 21*), Intermediate L2 (*n = 15*). We were interested in two main issues: the issue of L1 transfer on L2 processing and how proficiency in the target language interacts with processing mechanisms L2ers employ during real-time L2 comprehension. Given that the SSH predicts that L2ers underuse syntactic information in real-time processing of LD dependencies in the target language, we investigated the nature of syntactic representations Sinhala L1/English L2ers build in processing filler-gap dependencies in relative clauses and topicalization in English. Even though a number of prior studies have investigated the processing

of wh-dependencies by L2ers (see e.g. Juffs, 2015 for a review), very little is known about the real-time processing of topicalization, even in the case of English monolinguals. In the discussion below we discuss each participant group separately, in light of the results from the two experiments.

In both our experiments, English monolinguals behaved as predicted regarding their sensitivity to islandhood. In Experiment 1, they showed sensitivity to plausibility at the first potential gap position, implying that in making initial parsing decisions, they integrate information from syntax as well as lexical semantics (see Boland et al., 1995; Gibson, 1998). This is evident in the observation that in non-island conditions, they read the provisional gap position slower when the filler did not match selectional restrictions of the provisional subcategorizer. However, in this study, unlike in some other studies such as Boland et al. (1995) and Traxler and Pickering (1996), the plausibility effect did not show up on the subcategorizer itself but on the following adverb.[8] Thus, in this regard our results replicate what Omaki and Schulz (2011) found for English native speakers in their study, i.e. even for their group, the plausibility effect was delayed until the adverb which immediately followed the provisional gap.

However, a slightly different reading pattern was observed in Experiment 2. In the subjects' processing of A-bar dependencies in topicalization, the plausibility mismatch effect showed up on the subcategorizer itself. The difference between plausible and implausible conditions was not statistically significant at this position, even though the provisional gap showed slightly longer reading times for the implausible condition. Still, when compared to the relative clause A-bar dependencies (Experiment 1), in most instances, plausibility did not have a significant effect in

[8] This may have been partially affected by the specific testing method used in those studies, i.e, eye tracking (Traxler & Pickering, 1996) and SPR (Boland et al., 1995).

Experiment 2. But even in this experiment, subjects read the two plausible conditions (both island and non-island) differently from implausible conditions, providing evidence for their integration of lexical-semantic information during real-time comprehension.

Despite the different status of plausibility in the processing of relative clauses and topicalization, native controls in both experiments displayed convincing evidence that they actively use the island constraint to guide their filler-gap dependency formation. In both experiments, they read islands differently from non-islands at the provisional gap position, which always reached significance. The same was observed at the real gap position between island and non-island conditions, a finding which is distinct from what Cunnings et al. (2009) found for English monolinguals in their eye-tracking study. In that study, unlike L2ers, native controls read island/non-island conditions without a significant difference at the real gap position. However, overall what we found for native controls in this study replicates what has commonly been found in the literature concerning the role of islands in real-time L1 comprehension: in real-time comprehension, they are sensitive to island constraints (see Phillips, 2006).

Finally, in this study, native controls were found to process relative clauses differently from topicalization. They showed less sensitivity to plausibility in topicalization than in relativization. Recall that as far as the provisional gap is concerned, a significant difference between the two non-island conditions was observed in relativization but not in topicalization: in Experiment 1, they read implausible non-island sentences slower than their plausible counterparts. Also, in topicalization, the plausibility effect showed up on the provisional subcategorizer (potential gap position) itself. But in relativization, it showed up on the following adverb.

Differences in parsing behavior between different types of A-bar dependencies have also been reported in some other studies on L1 syntactic processing. For instance, Felser, Clahsen and

Munte (2003) conducted an fMRI study on German native speakers' processing of topicalization and relativization in their L1 syntax. Their results showed a P600 effect on the verb (real gap position) for wh-movement but not topicalization. Assuming that P600 on the verb indicates 'the cost of syntactic processing,' they interpreted these results as implying that "integrating a wh-filler with its subcategorizer is computationally more costly than integrating a topicalized constituent, irrespective of the structural complexity of the intervening material." (Felser, et al., 2003c, p. 353). If this is true, in our study, native speakers' strong sensitivity to plausibility in relativization but not in topicalization could be due to differences in the cost of syntactic processing between the two different kinds of A-bar dependencies. One possibility is that in relativization, they tried to reduce the syntactic complexity by appealing to more semantic cues, which resulted in an elevated reading time (at the provisional gap) for implausible vs. plausible sentences. But this is a hypothesis which needs to be further evaluated, possibly considering additional empirical evidence.

Turning now to the advanced L2 group, they behaved very similarly to native controls in both experiments, regarding their sensitivity to islandhood and plausibility. In Experiment 1, they read the two non-island conditions with a significant difference at the provisional gap. But in the island conditions, this distinction was not observed, implying that they avoided postulating gaps inside syntactic islands, like native speakers. But also like native speakers, plausibility had a weaker effect for Advanced L2ers in topicalization than in relativization. In Experiment 1, the plausibility effect showed in the second critical region (adverb), rather than on the first verb. But in topicalization, this effect showed up on the first verb itself. The real gap position showed a similar pattern in both experiments, for the advanced L2ers: they read the island conditions significantly slower than non-island conditions, like the native speakers. Taking all this evidence

into consideration, advanced L2ers in this study displayed reliable evidence of their sensitivity to islands in filler-gap dependencies in English, both in relativization and topicalization. They also seemed to process relative clauses partially differently from topicalization, implying that during real-time language comprehension, they employ parsing strategies differently to process the two types of A-bar dependencies.

The intermediate group in this study showed some inconsistencies in their performance across the two experiments. In Experiment 1, they showed evidence of their sensitivity to islands in forming filler-gap dependencies, i.e. at the provisional gap position, they read the two island conditions without a significant difference, and they read the implausible non-island condition significantly slower than the plausible non-island condition. But in Experiment 2, they did not show reliable evidence to assume that they avoided gaps inside islands. In processing topicalization, they failed to distinguish between island and non-island conditions at the provisional gap. Also, unlike for the other two groups, plausibility had a strong impact on them in both experiments, i.e. this effect appeared immediately on the provisional subcategorizer itself. Even at the real gap position, in both experiments, they displayed less sensitivity to islandhood than the other two groups. For both native controls and advanced L2ers, islandhood continued to have an effect even two words after the real gap position. But for the intermediate L2ers this effect was limited to the position of the subcategorizer. Given all these findings, it is reasonable to conclude that intermediate L2ers have some sensitivity to island constraints in processing, but they have difficulties in actively applying that constraint on a regular basis to guide their dependency formation in the target language. However, the most interesting finding is that they are more consistent in their performance in relativization, the type of A-bar

dependency that Felser et al. (2003c) argued to be more challenging to process than topicalization.

Thus, the results that we have found for advanced L2ers in this study pose a challenge to the Shallow Structure Hypothesis (Clahsen & Felser, 2006a), as it is currently formulated. If L2ers, as assumed by the SSH, inherently underuse syntactic information in processing complex A-bar dependencies in their target language, this observed difference between intermediate and advanced L2ers is not expected. Both groups should have processed these dependencies in a non-native-like fashion. On the contrary, the advanced L2ers in this study have demonstrated that native-like deep syntactic processing (i.e. in a sense that opposes the SSH perspective) is possible in L2 acquisition too. This finding is consistent with what other studies have found for proficient bilinguals in various L2 contexts (see e.g. Hopp, 2006, 2007; Omaki & Schulz, 2011; Rodriguez, 2008; Sagarra & Herschensohn, 2008).

This study, in addition, has shown that such native-like syntactic processing is possible even when L2ers' native language is typologically distinct from the target language in the relevant syntactic domain. Contra the predictions by Clahsen & Felser (2006) and even unlike considerations made by Omaki and Schulz (2011), our results show that at least at an advanced level of L2 competence, L1 transfer does not interfere with L2 processing, in the domains of A-bar dependencies that we investigated here. If it did, the absence of Subjacency (island) effects in Sinhala relative clauses and topicalization should have forced these L2ers to process them in English in a non-native fashion. This study has also provided evidence that proficient L2ers, similar to native controls, also have the ability to adjust their parsing processes in accordance with different challenges imposed by distinct A-bar dependencies. Finally, possibly as predicted by Omaki and Schulz (2011), shallow processing appears to be a strategy used more often by

less proficient L2ers during their early stages of L2 development. But their reliance on shallow processing decreases when L2ers become more proficient in the target language. This could explain the difference that we observed between intermediate and advanced L2ers in this study.

In conclusion, we echo Herschensohn (2008, p. 275) in assuming that "although late bilinguals (adult L2 learners) show quantitative differences from early bilinguals and monolinguals in latency and RT, they, nevertheless, gain qualitative patterns that resemble native processing." Meanwhile, any differences between L1 and L2 processing, as Hopp (2007, p. 194) argues, could be due to factors such as the "complexity of computational processes required, the computational task demands and the computational resources as well as the proficiency level of L2 speakers."

Chapter 7

Summary and Conclusion

7.1 Summary and Theoretical Implications

This dissertation started with the goal of re-evaluating the predictive power of two prominent hypotheses in current generative SLA, namely the Feature Interpretability Hypothesis (FIH) (Hawkins & Hattori, 2006; Smith & Tsimpli, 1995; Tsimpli, 2003; Tsimpli & Dimitrakopoulou, 2007) and the Shallow Structure Hypothesis (SSH) (Clahsen & Felser, 2006a/2006b; Marinis, Roberts, Felser & Clahsen, 2005; Cunnings, Batterham, Felser & Clahsen, 2009). Both hypotheses, as we have elaborated in different chapters, make strong predictions concerning the kind of ultimate attainment possible in post-childhood L2 acquisition.

The Interpretability Hypothesis, in particular, maintains that post-childhood L2 speakers fail to develop native-like underlying mental representations for the target language syntax because their access to UG is restricted in the domain of uninterpretable syntactic features: unlike interpretable features, uninterpretable futures are subject to an early critical period (the acquisition of feature specifications for one's native language). According to the Feature Interpretability Hypothesis, even though L2 speakers appear to match native speakers in different 'performance measures,' they analyze the target language syntax using 'patching strategies' borrowed from their L1 grammatical system. For instance, Japanese native speakers have been argued to use scrambling to analyze wh-questions in English (Hawkins & Hattori, 2006).

In parallel, the Shallow Structure Hypothesis assumes that in the real-time processing of complex target language syntax (A-bar dependencies), second language speakers fail to build detailed, hierarchically complex syntactic representations, and unlike native speakers of a target language, they over-rely on non-structural information such as lexical semantics and contextual cues. This is so, irrespective of whether L2 speakers demonstrate native-like competence in offline tasks. Therefore, the two hypotheses in tandem assume that the ultimate attainment in post-childhood L2 acquisition is characterized by deficiencies both in the domain of competence and processing.

In testing the Interpretability Hypothesis, we posed two research questions at the beginning of this dissertation. The first question concerned whether proficient L2 speakers (in their steady state) are capable of building native-like mental representations in the target language syntax, specifically whether they can successfully acquire any new uninterpretable syntactic features not instantiated in their native language. The second question was whether UG is activated in those L2ers whose exposure to English (at least initially) is predominantly in a classroom setting. To answer these questions, we conducted two different experiments, using a Grammaticality Judgment and a Truth Value Judgment task. Converging evidence from the two experiments clearly showed that our L2 speakers have successfully acquired the relevant uninterpretable feature (*uwh**) in English wh-questions. They are not only sensitive to the locality constraints (*Subjacency and Superiority*) associated with this feature in the L2 English grammar, but they also are sensitive to fine-grained formal properties of the target language grammatical system, including those corresponding to the distinction between weak vs. strong islands and two kinds of superiority violations in English. Given that Superiority and Subjacency violations are not instantiated in Sinhala (wh-)scrambling and (in-situ) wh-questions, the available counterparts in the language to overt wh-movement in English, our results constitute evidence against the

hypothesis that Sinhala-English L2ers are using an L1-based 'patching' strategy to analyze wh-questions in English. The evidence that they can distinguish between scrambling (a movement operation in their L1 syntax) and overt wh-movement (a movement operation in the target language) is itself strong evidence that they have acquired the movement triggered by an uninterpretable syntactic feature in English wh-questions. They have done so despite the fact that at least their initial exposure to the target language was predominantly in a classroom setting in Sri Lanka, and they do not live in a context of full immersion in a predominantly English speaking environment.

So, these results directly answer the two research questions we posed in this regard. Contra the predictions of the Interpretability Hypothesis, our findings show that highly proficient L2 speakers are indeed capable of building target-like mental representations even in those domains where L2 acquisition involves the mastery of a new uninterpretable feature. The fact that these L2ers have been able to overcome a Poverty of the Stimulus problem, imposed by both their L1 syntax and L2 input also implies that they have maintained direct access to UG in post-childhood L2 acquisition. Further, in line with White and Juffs' (1998) findings for Chinese/English bilinguals in China and Martohardjono's (1993) findings for Indonesian/English bilinguals, our results indicate that UG can be activated even in those late L2ers whose primary exposure to a target language takes place in a classroom setting. Finally, we argued that these results can reasonably be interpreted as additional evidence for full access to UG principles and constraints in adult L2 syntax (e.g. Campos et al., 2014; Epstein et al., 1996; Schwartz & Sprouse, 1996; White, 2003).

In the first part of the dissertation (Chapters 3 & 4), we found evidence that highly proficient Sinhala/English bilinguals have acquired syntactic competence in the domain of wh-

dependencies in L2 English. This motivated us to raise two additional questions concerning their ultimate attainment. The first question concerned the extent to which proficient bilinguals (in their steady state) are capable of employing their underlying syntactic competence during real-time L2 comprehension. The second question was to which extent the L1 syntax had any impact on real time processing in the target language syntax. By addressing these two questions, we also re-evaluated the predictive power of the Shallow Structure Hypothesis. Our focus was on island constraints in sentence processing.

Given the contradictory findings in the L2 literature concerning the role of island constraints during real-time L2 comprehension (Cunnings, Batterham, Felser & Clahsen, 2009; Omaki & Schulz, 2011), in Experiment 1 we tested whether Sinhala/English bilinguals are sensitive to syntactic islands in forming filler-gap dependencies in English relative clauses. Similar to Omaki & Schulz (2011), we found evidence that our advanced bilinguals actively use the island constraint to guide their filler-gap dependency formation in L2 syntax. In Experiment 2, we tested this in a different type of A-bar dependency formation, namely topicalization. Crucially, our results provide new evidence that this is possible for adult L2 learners whose L1 (Sinhala) does not show evidence of the application of island constraints in A-bar dependencies in relative clauses and topicalization, differently from the L2 learners tested by Omaki and Schulz (2011), whose L1 (Spanish) shows sensitivity to island constraints, similarly to English. Converging evidence from our two experiments revealed that advanced L2ers can consistently use the island constraint in real-time processing, despite challenges potentially imposed by the complexities of the types of A-bar dependencies we considered (and despite absence of island constraints in the same domains in the learners' L1 grammar). In both experiments, L2ers performed very similar to native controls regarding evidence that they are sensitive to island vs. non-island syntactic

domains and to the interaction of islandhood with a non-syntactic factor, namely plausibility. In addition, although less proficient L2ers displayed some level of sensitivity to islands, there was no convincing evidence to believe that they used this constraint in a consistent manner. Thus, our overall results, as we argued in Chapter 6, pose an important challenge to the Shallow Structure Hypothesis.

In addition, unlike other studies testing the SSH, we also found some evidence suggesting that shallow processing can be a temporary strategy observed during early stages of interlanguage development. Our intermediate L2ers, in contrast to both advanced L2ers and English monolinguals, showed higher sensitivity to plausibility and less sensitivity to island constraints in both experiments; this could be taken to indicate that they used at least some shallow processing in their comprehension of filler-gap dependencies in A-bar domains. However, more empirical evidence is needed before strong conclusions can be made regarding real-time processing by intermediate L2ers.

Further, contra hypotheses from prior studies (see e.g. Omaki & Schulz, 2011), the processing experiments revealed that the presence or absence of a certain syntactic constraint/feature in L2ers' native language does not have to have an impact on the way they process the target language. At least at an advanced level of L2 competence, we found evidence that L1 transfer did not interfere with L2 processing. If it had interfered, the absence of island effects in Sinhala relative clauses and topicalization should have forced these L2ers to process both English relative clauses and topicalization in English without showing sensitivity to the island (Subjacency) constraints, contrary to what our experimental results revealed.

7.2 Concluding Remarks

Taken together, the two components of this dissertation have contributed to a better understanding of the ultimate attainment in L2 acquisition, a topic that has been extensively discussed in recent generative SLA (see e.g. Birdsong, 2009; Herschensohn, 2009; Lardiere, 2013). Additionally, our investigation has also shed some light on the characteristic properties of the developing stages of the Interlanguage, both in terms of competence and processing. More importantly, contra the predictions of the SSH and FIH, these findings indicate that highly proficient L2 speakers are indeed capable of achieving both native-like competence and native-like processing in the target language syntax. These findings are also consistent with what has been reported in other studies in different L2 contexts: Campos-Dintrans et al. (2014), Dong, (2014), Foucart and Frenck-Mestre (2012), Gess and Herschensohn (2001), Hopp (2006), Omaki and Schulz (2011), Sagarra and Herschensohn (2008). Hence, following Foucart and Frenck-Mestre (2012), Herschensohn (2013), Hopp (2007), and Omaki and Schulz (2011), we conclude that both the Shallow Structure Hypothesis and the Interpretability Hypothesis are not strongly supported, as they are currently formulated. In our view, they face problems concerning what L2 speakers are capable of attaining in a target language, especially at a high proficiency level. If these two hypotheses have any relevance (as suggested by e.g. Omaki & Schulz, 2011 for the SSH), that would be in the context of those L2ers who are in early or intermediate stages of their Interlanguage development.

Finally, Hawkins and Hattori's (2006) study with Japanese/English bilinguals ends with a precautionary note concerning the interpretation of L2 performance data. They state "caution is

required in interpreting apparent target-like L2 performance as evidence for the acquisition of underlying properties of grammar assumed to be present in the grammars of native speakers" (p. 298). Given what we have found in this study, it is reasonable to state as a concluding remark that similar caution is required in interpreting second language speakers' slight deviations from the target norm either in their production or comprehension as evidence for non-native like underlying mental representations in the target language syntax. The same logic applies to shallow structure-based accounts of L2 processing.

7.3 Suggestions for Future Research

There are at least three main issues that came up in this study which should be further investigated in future research. First and foremost, our finding that L2 speakers use more or less shallow processing relative to their proficiency in the target language should be further tested, ideally with a broader sample of beginner, intermediate and advanced L2ers. This could provide further evidence to consider whether shallow processing is indeed a temporary property only observed in early stages of L2 development, as the results of this dissertation seem to indicate. Second, further converging empirical evidence is needed from sentence processing research to determine whether islands indeed impose a greater processing difficulty for the second language parser. At least as argued by Cunnings et al. (2009), second-language speakers avoid postulating gaps inside islands not because they lack sensitivity to the island constraint in processing, but because islands impose greater processing difficulties for them. Finally, due to constraints imposed by both time and resources, the processing component of this study could not be replicated with our Sinhala/English bilingual participants in Sri Lanka. A test of L2 processing

with them can reveal whether there are any qualitative differences in the ultimate attainment between L2ers in their L1 dominant and L2 dominant settings.

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