SCOPING OUT OF ADJUNCTS

Evidence for the parallelism between QR and *wh*-movement

Misako Tanaka

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UCL

Declaration

I, Misako Tanaka, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

This thesis is dedicated to the memory of my aunt, Maki Yanagawa, who passed away in April 2014.

Abstract

What gives rise to reversal of quantifier scope has been a long-standing question in the study of linguistics. In the framework of Generative Grammar, it has been standard since May (1977) to analyse scope shift as a form of covert movement, Quantifier Raising (QR). Evidence for this analysis comes from the fact that QR is sensitive to the very same island constraints that restrict overt movement (e.g. *wh*-movement). However, the widely assumed parallelism between scope-shift and *wh*-movement, which the theory of QR rests on, has not been experimentally examined in any depth. This thesis reports an experimental study that examined the parallelism between QR and *wh*-movement in terms of their sensitivity to the adjunct island constraint, in order to test the QR theory empirically.

An experimental study based on acceptability judgement tasks was carried out in order to test QR and *wh*-argument extraction out of three types of non-finite adjuncts: bare participial gerunds, after-prepositional gerunds, and during-PPs. The outcome mostly revealed similarities in the locality of QR and *wh*-extraction, supporting a parallelism between the two, and hence the theory of QR. On the other hand, the outcome also suggested some differences between these two operations: *wh*-argument extraction out of a bare participial gerund is marginally acceptable, while QR out of the same environment is unacceptable.

On the basis of this result, I argue that both QR and *wh*-argument extraction out of a non-finite adjunct are subject to the same syntactic constraint: a barrier-effect of the adjunct phase boundary. On the other hand, they are additionally subject to different constraints at the syntax-semantics interface. QR is subject to Scope Economy, whereas *wh*-extraction is subject to the Single Event Grouping Condition. The remainder of this thesis discusses how these assump-

tions can capture the parallelism and asymmetries between QR and *wh*-argument extraction.

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Chapter 1

Introduction

The central question to be addressed in this thesis is whether quantifier scope-shift can be analyzed as movement, Quantifier Raising (QR: May 1977; 1985). The aim of this thesis is to present empirical evidence for parallelism between QR and *wh*-movement on the basis of sensitivity to the adjunct island constraint (see Huang 1982). And to discuss to what extent syntax, semantics, and the syntax-semantics interface determine and restrict scope-shift.

As is well known, sentences containing quantificational expressions in English like (1) are often ambiguous between a surface scope construal ($\exists > \forall$) and a construal in which the scope of the quantifiers is reversed ($\forall > \exists$).[1] It has been argued that surface scope is yielded by a c-command relation between the two quantifiers (Reinhart 1976), whereas inverse scope is yielded by a covert scope-shifting operation:

(1) A hitman shot every spy from Russia.

i. There was a hitman who shot every spy from Russia.

ii. For every spy from Russia, there was a hitman who shot that spy.

The surface scope reading (1-i) is that there was a particular hitman who shot every member of a group of Russian spies. For example, Mr Eastwood, a legendary hitman, was requested to shoot a group of three Russian spies and shot each spies A, B, and C.

[1] $\exists > \forall$ indicates that an existential quantifier takes scope over a universal quantifier, while $\forall > \exists$ indicates that a universal quantifier takes scope over an existential quantifier.

On the other hand, the inverse scope reading (1-ii) is that for every spy from Russia there was a possibly different hitman who shot that spy. A possible scenario in which the sentence under this reading is true, is that Spy A was shot by Mr Eastwood, but Spy B and Spy C were each shot by different hitmen: companions of Mr Eastwood. For instance, Spy B was shot by Mr Mitchum, whereas Spy C was shot by Mr Wayne.

The question of which operation gives rise to inverse scope interpretations has been controversial since the early days of linguistic research into quantifier scope in English. Reinhart (1976) argues that surface scope is determined by c-command relations between quantifiers at surface structure, whereas inverse scope is not determined by c-command but is entailed by the surface scope holds. However, May (1977) argues contra Reinhart that not all inverse scope interpretations can be accounted for by entailment (see Ruys 1992 and Reinhart 2006 for the details). May (1977) claims that ambiguous scope interpretations like (1-i) and (ii) can be obtained by Ā-movement of the quantificational expressions at LF (QR). For example, if we adopt May's (1977) original analysis, (1) should have two distinct covert syntactic representations at LF, as shown in (2). Each of the LF representations is yielded by QR of the two quantifiers, which adjoin to the IP-node:

(2) a. $[_{\text{IP}}$ $[_{\text{QP}_1}$ a hit man] $[_{\text{IP}}$ $[_{\text{QP}_2}$ every spy from Russia] $[_{\text{IP}}$ t_1 shot t_2]]]

b. $[_{\text{IP}}$ $[_{\text{QP}_2}$ every spy from Russia] $[_{\text{IP}}$ $[_{\text{QP}_1}$ a hitman] $[_{\text{IP}}$ t_1 shot t_2]]]

In (2a), the universally quantified object undergoes QR to the IP-adjoined site first, and then the existentially quantified subject moves to the higher IP-adjoined site. In (2b), on the other hand, the subject moves first, and then the object moves next. In the constructions derived by QR, the existential c-commands the universal in (a) and vice versa in (b). Due to the c-command relations between quantifiers, the LF structure (a) gives rise to the surface scope interpretation of (1), whereas (b) gives rise to the inverse scope interpretation.

The main motivation for May's theory of QR, which argues that QR is a covert movement operation, is the sensitivity of scope-shift to constraints on movement. As has been discussed by Rodman (1976) and much subsequent work, inverse scope like (1-ii) is blocked by certain syntactic restrictions like the Complex NP Constraint (CNPC), the Coordinate Structure Constraint (CSC), and the adjunct island constraint, namely island conditions on overt movement (Ross 1967)[2]. Examples used to motivate the characterization of adjuncts as islands include *wh*-movement and QR from conditional *if*-clauses, as shown in (3) and (4), respectively:

(3) a. John will invite Mary [if she visits her mother on Monday].

b. *Who will John invite Mary [if she visits t_{WH} on Monday]?

c. *When will John invite Mary [if she visits her mother t_{WH}]?

(4) An official will invite Ms Hepburn to open a new building [if she visits every city].

*"For every city, there is an official who will invite Ms Hepburn to open a new building if she visits that city. ($\forall > \exists$)"

For the reason that restrictions on scope-shift could in principle be reduced to independently motivated restrictions on overt movement, scope-shift was taken to be subject to the same restrictions as *wh*-movement. As far as I know, however, the parallelism between QR and *wh*-movement has not been experimentally investigated before.

Moreover, although conditional clauses are often used to test and present the parallelism between QR and *wh*-movement in sensitivity to adjunct islands like (3) and (4) (see Reinhart 1997; 2006 and others), finite clausal adjuncts are not suitable for two reasons. First, QR is likely to be clause-bounded unlike *wh*-movement (see Ruys 1992, Reinhart 2006 and others), so that it is difficult to determine whether QR is blocked by an adjunct island boundary or by a finite clause boundary.[3] Second, finite adjuncts are strong islands banning all types of extraction, and therefore do not allow us to properly examine the parallels

[2]For the adjunct island constraint, see Huang (1982). We will take a look at Huang's Condition on Extraction Domain (CED) approach to adjunct islands in Chapter 3.

[3]In Chapter 5, I will provide theoretical background of the clause-boundness of QR.

between QR and *wh*-movement. This is because QR and *wh*-extraction from those adjuncts are predicted to be always ill-formed (see Chapter 3 for strong island effects of finite adjuncts).

This thesis reports the results of two experimental studies which aim to uncover the facts concerning QR out of non-finite adjuncts. In the study, we looked at the three types of adjuncts: bare participial gerunds, *after*-prepositional gerunds and *during*-PPs in order to test the parallelism between QR and *wh*-movement out of adjuncts in a variety of different environments which show variable sensitivity to extraction.

(5) and (6) are examples of the test sentences used in the study. A universally quantified NP / a *wh*-argument is extracted out of a bare participial gerund in (a), an *after*-prepositional gerund in (b), and a *during*-PP in (c):

(5) a. A manager burst out laughing [listening to each comedy programme].

b. A guy let out a yelp [after seeing each goal].

c. A signalman dropped her flag [during each Harrier landing].

(6) a. Which programme did he burst out [laughing listening to t_{WH}]?

b. Which goal did the guy let out a yelp [after seeing t_{WH}]?

c. Which landing did you drop your flag [during t_{WH}]?

The outcome, summarized by the rankings in (7) and (8), demonstrates that QR and *wh*-argument extraction out of non-finite adjuncts pattern in similar ways, in that the non-finite adjuncts do indeed restrict QR and *wh*-argument extraction, but the restrictions are weaker than scope / absolute islands like the CNPC despite the absolute island view of adjuncts (Huang 1982, Uriagereka 1999).[4]

[4]In (7) and (8), '$\approx$' indicates a difference in acceptability which is not statistically significant (i.e. $A \approx B$ indicates that B was more acceptable than A, but the difference between A and B did not achieve conventional levels of statistical significance), '$<$' indicates a significant difference in acceptability, and '$\|$' indicates a boundary of acceptability: the categories to the right of $\|$ scored more than 3.0 out of 5.0. Note that this is an arbitrary boundary.

(7) **QR:** Scope island $\approx$ Bare Participial Gerund $<$ *After*-Prepositional Gerund $\| <$ *During*-PP $<$ no violation of syntactic constraint

(8) ***wh*-movement:** Absolute island $<$ *After*-Prepositional Gerund without causality $\| <$ *After*-Prepositional Gerund with causality $\approx$ Bare Participial Gerund $\approx$ *During*-PP $<$ no violation of syntactic constraint

This similarity between QR and *wh*-argument extraction empirically supports the parallelism between these two operation in terms of their sensitivity to non-finite adjunct islands, but we can also see an obvious difference between them if we inspect (7) and (8). As the rankings show, *wh*-argument extraction out of a bare participial gerund is marginally possible, whereas QR out of the same adjunct is as difficult as QR out of a scope island. If QR parallels *wh*-argument extraction, what gives rise to this difference in bare participial gerunds?

This thesis argues for that QR is Ā-movement by proposing that both QR and *wh*-argument extraction out of an adjunct are subject to a phase-based syntactic constraint (Chomsky 2000; 2001; 2008). On the other hand, to account for the difference between the rankings in (7) and (8), I also propose that QR and *wh*-movement are subject to additional constraints at the syntax-semantics interface: Scope Economy (Fox 1995; 2000) and the Single Event Grouping Condition (Truswell 2007; 2011), respectively. Moreover, on the basis of the specific linking hypothesis between the grammar and psycholinguistic judgements I propose, I argue that every instance of QR gives rise to a processing cost (see Reinhart 2006 for a similar argument), such that each instance of QR lightly reduces acceptability. Thus, the core arguments of this thesis are that all movement is subject to a syntactic phase-based constraint on extraction, and that *wh*-movement and QR are subject to different constraints at the syntax-semantics interface.

The outline of this thesis is as follows. Chapter 2 gives some theoretical background on scope-shift. We review the movement theory of scope-shift (QR), as proposed by May (1977; 1985) and updated with the Minimalist concept of Economy (Chomsky 1995) by Fox (1995; 2000) and Reinhart (2006). Additionally, alternative approaches are discussed, dealing with scope-shift as a semantic operation rather than as movement, such as flexible type-shifting (Hendriks 1993). I argue that the QR theory captures the outcome of the study, summarized in (7) and (8), better than the non-movement approaches do. At the end of the chapter, I present a preview of my proposal, based on the linking hypothesis between the grammar and judgements.

In Chapter 3, we review how the adjunct island constraint has been accounted for in the literature since Huang (1982). After going through the major theories of locality: the CED approaches (Huang 1982, Uriagereka 1999) and Barriers theory (Chomsky 1986), we discuss Truswell's (2007; 2011) event semantics-based approach, arguing that the possibility of *wh*-argument extraction out of adjuncts depends on whether a *wh*-question satisfies the Single Event Grouping Condition. I explain how Truswell's approach can capture non-finite adjuncts as more selective islands than the other theories do and provides more fine-grained profiles of *wh*-argument extraction than previous approaches. Truswell's intricate profile of non-finite adjuncts is exploited for the study, since it allows us to empirically test extraction out of adjuncts across many different data points. On the other hand, Truswell's account still needs to be complemented by a general theory of locality to capture the outcome of the study, and therefore I introduce Phase theory, which I adopt for my proposal developed in Chapter 6, and discuss how this theory can be modified to account for QR and *wh*-movement out of adjuncts as a brief preliminary of the sixth chapter.

In Chapter 4, the details and results of the main experiment are reported, which tested the hypothesis that QR is a covert version of movement restricted by the adjunct island constraint on movement. We measured acceptability of QR and *wh*-argument extraction from non-finite adjuncts by an acceptability judgement task. We discuss theoretical interpretations of the outcome, which indeed exhibits more intricate gradation of acceptability of these operations than what the grammar alone can predict (because violations of different constraints seem to have different effects on overall acceptability).

In Chapter 5, I report the details of the follow-up study, conducted to confirm the existence of Scope Economy by testing QR out of finite clauses.

It is in Chapter 6 that I make the core argument for the movement theory of scope-shift on the basis of the results of the main experiment. As Figure 1.1 shows, on the basis of the specific linking hypothesis between the grammar and psycholinguistic judgements obtained in the study, we consider what this fine-grained set of results might mean for the grammar:

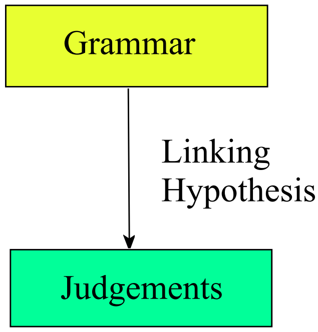


Figure 1.1: Linking hypothesis between the grammar and judgements

On the basis of the linking hypothesis between the grammar and the psycholinguistic judgements, I propose that QR and *wh*-argument extraction out of an adjunct are subject to syntactic and interface restrictions, and that these restrictions impose a processing cost. I explain how my proposal can account for the QR ranking in (7) and the parallelism between QR and *wh*-movement. Finally, we discuss solutions for questions remaining from the main experiment on the difference between QR and *wh*-movement in bare participial gerunds, obligatory QR (Fox 1995; 2000), and the similarity between bare participial gerunds and *while*-prepositional gerunds.

Chapter 7 concludes this thesis.

Chapter 2

Quantifier scope in English and the model of grammar

The parallelism between QR and *wh*-movement can be captured if scope-shift is a covert movement operation subject to the same syntactic constraints as overt movement, but not all existing theories of quantifier scope explain scope-shift in terms of movement. The aim of this chapter is to provide theoretical background by reviewing several existing theories of quantifier scope and sketch out a strategy for capturing the outcome of the study, which was briefly reported in Chapter 1 and will be reported in more detail in Chapter 4, by exploring whether a syntactic theory makes it possible to give a general treatment of *wh*-movement and scope-shift. I discuss why I choose to explore the theory of QR over alternative semantic approaches to quantifier scope, but I do not formally judge or evaluate alternative approaches in this thesis.

The strategy sketched out here will be developed into a theory in Chapter 6, where I argue that scope-shift is movement restricted by the same syntactic constraint as overt movement but subject to additional constraints at the syntax-semantics interface.

The outline of Chapter 2 is as follows: First, Section 2.1 introduces Montague's (1973) Proper Treatment of Quantification (PTQ), the classical linguistic account for quantifier scope in English, a precursor to the theory of QR (May 1977). Next, the first part of Section 2.2 explains the theory of QR within the GB framework (May 1977; 1985), while the second part explains the economy-based QR theories in the Minimalist framework by Fox (1995; 2000) and Reinhart (2006). Section 2.3 goes through three semantic theories of quantifier scope: Cooper's (1975; 1979; 1983) Quantifier Storage, Hendriks' (1993) flexible type-shifting, and Steedman's (2012) Skolem specification of indefinites in Combinatory Categorial Grammar (CCG) to see how semantic operations give rise to scope ambiguity and how those semantic theories may explain the sensitivity of scope-shift to the Complex NP Constraint (CNPC). We also discuss why the theory of QR is preferred over the other approaches on the basis of the outcome of the study. In Section 2.4, as a preliminary of my proposal made in Chapter 6, I present my account of QR on the basis of the specific linking hypothesis between the model of grammar and judgements.

2.1 Montague's (1973) PTQ: Quantifying-in

In this section, we consider Quantifying-in in PTQ by Montague (1973). Here are two reasons why I first introduce Montague's account for quantifier scope. First, it is Montague's Quantifying-in that is a direct precursor of QR theory by May's theory of QR (1977, 1985). Second, Rodman (1976), who first pointed out the parallelism between scope-shift and *wh*-movement in terms of the CNPC (Ross 1967) yielded by relative clauses, adopted Montague's PTQ to analyze the island constraint on these two operations.

Montague (1973) accounts for scope ambiguity by Quantifying-in, applying to all generalized quantifiers including indefinites. Montague's PTQ provides (i) syntactic rules, which define how expressions may combine with each other in order to build a sentence, and (ii) translation rules, which show how single or combined expressions can be translated into semantic representations. (1) summarizes how Quantifying-in takes place at syntax and semantics:[1]

[1] The syntactic part of Quantifying-in is defined by S14, one of the syntactic rules of PTQ, while the semantic part of that is definied by T14, one of the translation rules of PTQ. For the definitions of S14 and T14, see Montague (1973: 20 and 27 respectively in the reprinted version).

(1) **Quantifying-in (Montague 1973)**

a. **Syntax:** A quantifier applies to a primary sentential expression with an arbitrary indexed pronoun and replaces that pronoun.

b. **Semantics:** In translation of (a), the meaning of the quantifier applies to the sentential expression lambda-abstracted over the indexed free variable and binds that variable.

In PTQ, it is assumed that a quantified sentence is initially built without inserting quantified expressions to argument positions of a predicate. Arbitrarily indexed pronouns, interpreted as free variables, are instead inserted to those argument positions to compose an initial sentential expression. This is because first order predicates (eg. *shoot*) can directly take entities as their arguments but not generalized quantifiers (i.e. second-order predicates). After a sentential expression is initially built by substituting pronominal arguments, (1a) takes place in syntax, whereas (1b) takes place in translation.

For example, (3) and (4) show analysis trees[2] for the syntactic derivation of the surface scope and for that of the inverse scope of (2) (repeated from Chapter 1), respectively:

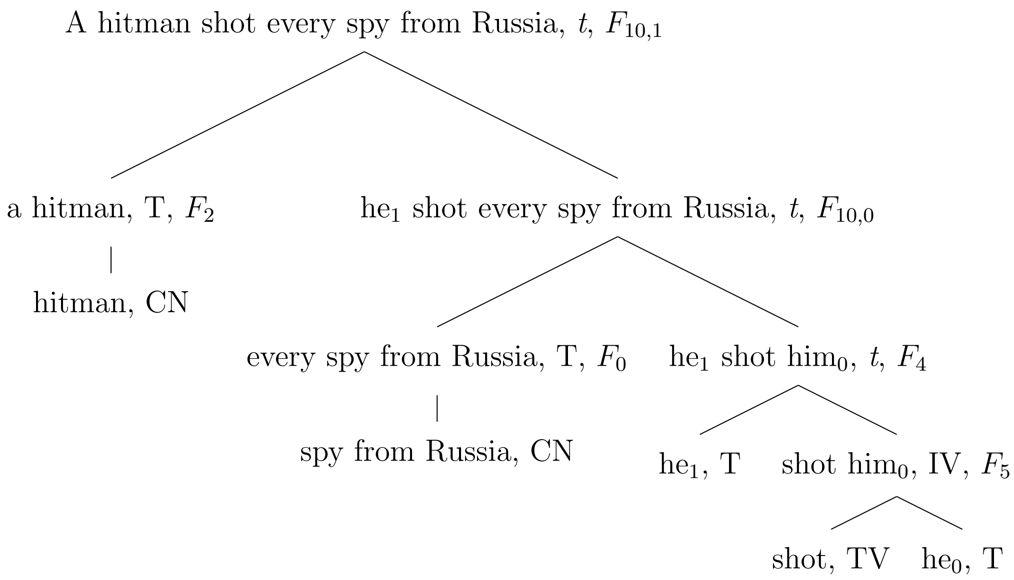
(2) A hitman shot every spy from Russia.

i. There was a hitman who shot every spy from Russia. ($\exists > \forall$)

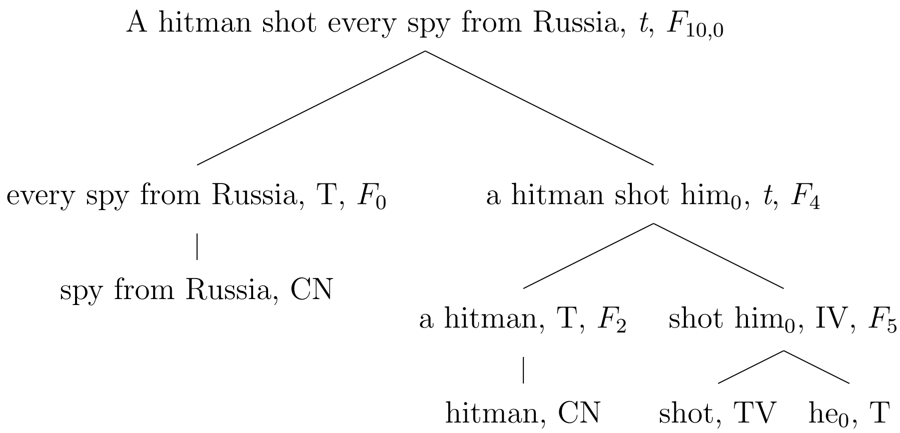
ii. For every spy, there was a hitman who shot that spy from Russia. ($\forall > \exists$)

[2]In the analysis trees, each expression is followed by its category and a structural operation applying to it, respectively. Each expression belongs to some category; for example, t (sentence expression), T, IV, TV, and CN. Syntactic rules in PTQ (S1-S17) define which categories can be combined by which structural operation (F_{0-15}, defined in S1-S17). See Montague (1973: 18-20 in the reprinted version) for the details.

(3) [3]



(4)



It is the order of Quantifying-in of each of the two quantifiers that differentiates (3) from (4). Because the syntactic rules of PTQ presuppose primitive syntactic structures but lack hierarchical phrase structures presupposed in Generative Grammar, scopal orders are dependent on in which order each of two quantifiers undergo Quantifying-in. A quantifier that undergoes Quantifying-in later and that linearly precedes the other in the semantic representation takes wide scope.

[3]In the PTQ, the set of basic categories of terms (B_T) includes nominative forms of pronouns like *he*$_0$*, he*$_1$ but not accusative forms of pronouns like *him*$_0$*, him*$_1$. Therefore, when a pronominal term is introduced for the object at the bottom of the analysis trees in (3) and (4), it originally takes a nominative form *he*$_0$. By S5 (see Montague 1973: 20 in the reprinted version), when a pronominal term is taken by a transitive verb as the internal argument, that pronoun takes an accusative form and then is transformed into *him*$_0$.

In (3), the initial sentence expression *he*$_1$ *shot him*$_0$ is formed by making use of indexed pronouns, free variables at this stage, as tentative arguments of the verb. Afterwards, Quantifying-in operates in two steps. First, the universal object *every spy from Russia* (T) combines with the initial sentence expression (t) by S14, the syntactic rule of quantification. As indicated by $F_{10,0}$, S14 allows the pronoun indexed with 0 to be replaced by the universal object here. Thus, the secondary sentence expression *he*$_1$ *shot every spy from Russia* (t) is formed. Next, the existential subject *a hitman* applies to the secondary sentence expression by S14. As indicated by $F_{10,1}$, the pronoun indexed with 1 is replaced by the existential NP. Thus, the full sentence expression is built.

In (4), the existential subject directly applies to *shot him*$_0$ (IV) by S4, thus the initial sentence expression is *a hitman shot him*$_0$. Then, the universal object undergoes Quantifying-in and replaces the pronoun indexed with 0 by S14. This derivation forms the full sentence expression.

Let us now take a look at how each of the sentence expression built by syntax in (3) and (4) can be translated into semantic representations, presented in (5) and (6), respectively.[4] Here, each translation begins where the first sentence expression (t) is formed. Quantifying-in operates under T14 ($\gamma = \alpha(\lambda x_n.\beta)$), allowing the meaning of a quantifier to apply a lambda-abstracted sentence expression over a numerally indexed free variable (α is a quantifier, while β is a sentential expression that the quantifier applies to):

(5) a. $\mathrm{SHOT(x_0)(x_1)}$

b. By T14: $\gamma = \alpha(\lambda x_n.\beta)$

$\lambda\mathrm{P}.\forall\mathrm{x}[\mathrm{SPY\_FROM\_RUSSIA(x)} \rightarrow \mathrm{P(x)}](\lambda\mathrm{x_0}.\mathrm{SHOT(x_0)(x_1)})$

$= \forall\mathrm{x}[\mathrm{SPY\_FROM\_RUSSIA(x)} \rightarrow \mathrm{SHOT(x)(x_1)}]$

c. By T14:

$\lambda\mathrm{Q}.\exists\mathrm{y}[\mathrm{HITMAN(y)} \wedge \mathrm{Q(y)}](\lambda\mathrm{x_1}.\forall\mathrm{x}[\mathrm{SPY\_FROM\_RUSSIA(x)} \rightarrow \mathrm{SHOT(x)(x_1)}])$

$= \exists\mathrm{y}[\mathrm{HITMAN(y)} \wedge \forall\mathrm{x}[\mathrm{SPY\_FROM\_RUSSIA(x)} \rightarrow \mathrm{SHOT(x)(y)}]]$

[4]For the full details of the of the translation rules in PTQ including intensional logic (i.e. T1 - T17), see Montague (1973: 25-27 in the reprinted version). Here, I follow Ruys and Winter (2011: 27-29) in providing simplified versions of the rules.

(6) a. $\exists y[\mathrm{HITMAN}(y) \wedge \mathrm{SHOT}(x_0)(y)]$

b. By T14:

$\lambda P.\forall x[\mathrm{SPY\_FROM\_RUSSIA}(x) \rightarrow P(x)](\lambda x_0(\exists y[\mathrm{HITMAN}(y) \wedge \mathrm{SHOT}(x_0)(y)))$
$=\forall x[\mathrm{SPY\_FROM\_RUSSIA}(x) \rightarrow \exists y[\mathrm{HITMAN}(y) \wedge \mathrm{SHOT}(x)(y)]]$

(5a) is the translation of the primary sentence expression *he*$_1$ *shot him*$_0$ in (3). The verb takes free variables x_0, x_1 as its tentative arguments. In (5b), by T14, the free variable x_0 in (5a) is lambda-abstracted over, and then the universal quantifier applies to the derived predicate. Finally, in (5c), again, by T14, the free variable x_1 in (5b) is lambda-abstracted over, and the existential quantifier applies to the derived predicate. Thus, the translation for the surface scope (5c) is derived by two steps of Quantifying-in under T14.

In (6a), on the other hand, the existential quantifier has already applied without Quantifying-in. In (6b), x_0 in (6a) is lambda-abstracted over, and then the universal quantifier binds it by T14. The resulting translation (6b) corresponds to the inverse scope reading (2-ii).

In sum, Quantifying-in is a syntactic (1a) / a semantic operation (1b), applying to a primary sentential expression composed of a predicate and arbitrary indexed pronouns. A quantifier applying to a sentential expression later by Quantifying-in takes scope over the other quantifier applying first since the former precedes the latter in a linear order in the translation.

Next, it is by Quantifying-in in the modified version of PTQ that Rodman (1976) first explained the parallelism between scope-shift and *wh*-constructions with regard to the sensitivity to the CNPC. Let us take a look at Rodman's account of the effect of the CNPC (Ross 1967) on scope-shift, illustrated in sentences like (7).[5]

(7) Clint caught a hitman who shot every spy. $(\exists \gg \forall, {*\forall} \gg \exists)$

As well known, scope-shift is subject to the CNPC (see Ruys 1992 and others). In (7), the universal within the relative clause cannot take scope over the existential. (7) can be interpreted as follows: there was one particular hitman

[5]Note that Rodman (1976) only discusses the CNPC as it pertains to relative clauses.

who shot every spy and then was caught by the interpol but not as that the interpol caught more than one hitman. This indicates that the relative clause construction disallows the universal to scope out of that construction.

Due to problems of Montague's original PTQ to account for the CNPC on scope-shift,[6] Rodman modifies PTQ to ban wide scope of a universal out of a relative clause as follows. First, Rodman modifies S3 to require free variables embedded in relative clauses to be marked by superscript R. Next, Rodman also modifies S14 to disallow variables marked by superscript R to be bound by quantifiers applying to sentential expressions by Quantifying-in.

As given in (8), the embedded free variable is marked by superscript R (by S3), and that marked variable cannot be bound by the universal NP applying to the sentential expression by Quantifying-in (by S14). Thus, Rodman accounts for the impossibility of inverse scope out of the CNPC:

(8) Clint caught a hitman who shot him_0^R.

Similarly, the modified version of S3 also accounts for the CNPC's effects on *wh*-extraction. In (9), the DP *the spy* embedded in a relative clause cannot be relativized, as marked by the ungrammaticality of the sentence.

(9) *Clint found the spy who the interpol caught a hitman who shot (him_0^R).

Unlike the case of Quantifying-in, *wh*-fronting first requires a free variable to be replaced with *wh-him*$_0$ by S3 and undergo deletion and *wh*-preposing processes under S3' and S3" for a well-formed *wh*-construction (see Rodman for the details).

In (9), however, a free variable *him* in the embedded object position is not allowed to be a relative pronoun *wh-him*$_0$ but instead marked as *him*^{R} by the modified S3, and then this marked variable cannot enter to a binding relation

[6]Here are problems of Montague's original PTQ for accounting for the CNPC on scope-shift. First, PTQ has a syntactic rule for relativization with *such that* (S3), but this rule does not deal with relativization with *wh*-pronouns or with *that*. Second, S14, the syntactic rule of quantification, may permit a quantifier that undergoes Quantifying-in to bind a free variable even contained in a relative clause.

with *the spy* by the same rule. Due to the failure of binding, relativization of *the spy* fails, and thus (9) is ill-formed.[7]

As presented above, Rodman's modified version of the PTQ indeed accounts for relative clause restrictions on both covert scope-shift and *wh*-relativization, but this analysis is not insightful. Rodman's analysis, based on the fact that relativization blocks those operations, does not explain why relative clauses are islands for those operations. Rodman could add new syntactic and translation rules to account for the complement NP type of the CNPC, but this should be subject to the same problem and fail to explain what it is about these particular syntactic constructions that blocks scope-shift and *wh*-extraction.

In this section, we first have had a look at how Montague's (1973) Quantifying-in in PTQ explains scope ambiguities and Rodman's (1976) analysis of the relative clause type of the CNPC by the modified PTQ. Montague's Quantifying-in has both syntactic and semantic aspects, and Rodman's analysis demonstrates that Quantifying-in may account for the parallelism between scope-shift and *wh*-extraction in terms of the relative clause type of the CNPC. However, I pointed out that Rodman's analysis depends on the fact that this particular construction blocks the two operations but does not explain why relative clauses are islands. I argue that the PTQ's syntax, which lacks hierarchical phrase structures, is not powerful enough to explain what structurally restricts those operations and still needs a help from syntactic theories to explain this.

2.2 Quantifier Raising (QR)

2.2.1 In the GB framework: May (1977; 1985)

As explained in Chapter 1, May (1977) argues that scope-shift is triggered by $\bar{\text{A}}$-movement of generalized quantifiers ($<<e, t>, t>$) at Logical Form (LF), Quantifier Raising (QR). May's main proposals are that (i) there is another syn-

[7]Note that the syntactic rules for deletion of relative pronouns and *wh*-preposing (S' and S") make a distinction between overt *wh*-relativization and covert scope-shift, which require quantifiers locate in situ on the syntactic structure by replacing free variables by quantifiers under S14.

tactic level of representation distinct from S-Structure (SS), LF, whose representations present semantic relations among constituents in sentences and account for quantifier scope and variable binding; and that (ii) Ā-movement of quantifiers, a mapping operation from SS to LF, derives LF-structures giving rise to inverse scope.

Scope ambiguity in sentences like (2) is claimed to arise from LF structures of the sentences distinct from overt syntactic structures (SS). LF structures are covert syntactic constructions invisible from overt syntax, and they represent semantic relations among sentence constituents; for instance, scopal relations between quantifiers in sentences like (2). LF representations yield the syntactic inputs to semantics, and then semantic interpretations can be obtained from those LF representations. As repeated from Chapter 1, (10a) and (b) are LF-representations yielded by QR for the surface scope and the inverse scope of (2):

(10) a. $[_{\text{IP}}$ $[_{\text{QP1}}$ a hit man] $[_{\text{IP}}$ $[_{\text{QP2}}$ every spy from Russia] $[_{\text{IP}}$ t_1 shot t_2]]]

b. $[_{\text{IP}}$ $[_{\text{QP2}}$ every spy from Russia] $[_{\text{IP}}$ $[_{\text{QP1}}$ a hit man] $[_{\text{IP}}$ t_1 shot t_2]]]

We can see similarity between QR, shown in (10), and syntactic applications of Quantifying-in, shown in (3) and (4) in Section 2.1, in that argument positions of quantifiers are occupied by traces / indexed pronouns and in that moved quantifiers / quantifiers applied by Quantifying-in are located on clause-denoting nodes. On the other hand, in addition to the movement / non-movement distinction, QR differs from Quantifying-in in that c-command relations between quantifiers determine quantifier scope rather than precedence in a linear order.

Later, in May (1985), QR has completely diverged from Quantifying-in. He alternatively proposes Scope Principle allowing two adjacent QR-ed quantifiers in a mutual c-command relation to freely create two different scopal relations at the single LF representation in (10b) unlike May (1977). This approach does not require the LF structure (10a) and rather deals with it as an illicit representation.[8]

[8] The reason why May has made this change on his analysis is because the LF structure for the surface scope in (10a), where the subject trace is not properly governed, violates the Empty Category Principle (ECP), on the basis of his assumption that syntactic constraints which apply at S-Structure should also apply at LF.

As discussed in Heim and Kratzer (1998), several phenomena can be considered as evidence for QR. Here is May's (1985) discussion on Antecedent Contained Deletion (ACD) (see also Bouton 1970, Sag 1976, Kennedy 1997 etc) as an argument for QR. In ACD sentences like (11a), the VP inside the relative clause modifying the matrix object is deleted, as indicated by the parentheses. The antecedent VP of the deleted VP is the matrix VP containing the deleted VP (*cheat every gambler Mr Redford did* (*cheat*)). Despite violating the identity condition (Sag 1976), requiring the antecedent and the deleted VPs to be identical in the case of normal VP deletions, ACD sentences like (11a) are unexpectedly well-formed. May (1985) accounts for the well-formedness by arguing that QR of the object quantifier hosting the relative clause for resolution of a type-mismatch gives rise to identical antecedent and deleted VPs at LF, as given in (11b):

(11) a. Mr Newman cheated every gambler Mr Redford did (cheat).

b. $[_{\text{IP}}$ $[_{\text{QP}}$ every gambler $[_{\text{CP}}$ Op_1 Mr Redford did (cheated t_1)$]]_2$ $[_{\text{IP}}$ Mr Newman cheated $t_2$$]]$

As shown in (11b), as a result of QR of the universal, the elided VP (indicated by parentheses) is not contained in the antecedent VP anymore. The deleted VP also contains a trace created by movement of a relative operator, whereas the

Besides the ECP, (10a) is restricted by the Path Containment Condition (PCC) (Pesetsky 1982). The PCC was originally proposed to account for the grammaticality of sentences involving two Ā-movement paths like (8) (cited from Pesetsky 1982: 267). For example, (i), in which two *wh*-movement paths are nested, is marginally acceptable, while (ii), in which one path crosses the other path, is ill-formed. On the basis of the evidence like (i) and (ii), Pesetsky argues that the PCC permits nested paths but bans crossing paths.

(i). ?What subject_1 do you know who_2 PRO to talk to t_2 about t_1?

(ii). *Who_2 do you know what subject_1 PRO to talk to t_2 about t_1?

May (1985) claims that covert Ā-movement paths like QR should be also subject to the PCC like *wh*-movement paths. Indeed, the PCC accounts for not only overt Ā-movement paths but also Superiority effects on multiple *wh*-movement and interactions between *wh*-elements and quantifiers, assumed to involve covert Ā-movement (see May 1985 for the details). In the case of multiple QR, the two QR paths are nested in (10b), whereas they are crossing in (10a). Thus, May argues that (10a) is an illicit LF representation.

antecedent VP has a trace left by QR. Thus, both of the two VPs have identical LF structures, and the ACD sentence can be interpreted without any problem. The strength of the theory of QR is that a single QR operation can resolve type-mismatches in the case of non-subject quantifiers and ACD constructions.

ACD is also considered to be evidence for LF in that the identity condition on VP-deletions cannot be stated in terms of overt syntax. To license ACD, a covert syntactic representation is required to provide an antecedent for the elided VP. QR serves as a mapping operation from overt syntax to LF to render the ACD construction well-formed and interpretable.

In sum, May (1977; 1985) proposes that inverse scope, which cannot be obtained from an overt c-command relation between two quantifiers, results from an LF representation yielded by QR, a movement operation that maps from a SS representation to an LF representation. Scopal configurations determined at LF are sent to the semantics. As evidence for QR, we have seen that QR for resolving a type-mismatch with a non-subject quantifier is independently necessary for resolving ACD.

As we will observe in Chapter 4, the data from this study support the parallelism between scope-shift and *wh*-movement with regards to sensitivity to the adjunct island constraint. This result also supports the theory of QR in that scope-shift is restricted by the same island constraints that restrict movement generally. May's QR theory, however, was formulated in the GB framework, and certain aspects are problematic in the light of Minimalist Program; for example, Chomsky (1995) argues against the possibility of free optional movement. The next subsection will introduce three updated versions of the theory of QR proposed within the Minimalist framework.

2.2.2 In the Minimalist framework: Fox (1995; 2000) and Reinhart (2006)

May (1977; 1985) framed his theory of QR in terms of the GB framework, in which Move α allows optional movement to apply freely. Note that 'optional' means here that movement operations do not require a syntactic trigger. However, as we have seen in (10), May's QR theory (both 1977 and 1985) requires non-subject quantifiers to obligatorily move to clause-denoting nodes.

Due to the shift from the GB theory to the Minimalist Program, where movement is allowed to apply if it satisfies economy conditions, applications of QR have been argued to be more restricted than May originally assumed. For example, Hornstein (1995) argues that QR should be eliminated from a list of Ā-movement since it is optional, does not require morphological feature-checking, and does not satisfy *last resort* (Chomsky 1995), unlike canonical instances of Ā-movement, such as *wh*-movement.[9] Let us now turn to two representative updated versions of the theory of QR developed by Fox (1995; 2000) and Reinhart (2006), which argue that QR should be subject to certain kinds of economy conditions. A major difference between Fox and Reinhart is that the former assumes obligatory QR to clause-denoting nodes like May, while the latter does not.

First, Fox (1995; 2000) proposes Scope Economy, a semantic economy condition blocking optional QR unless that operation yields a new scope interpretation.

[9]In departure from the QR theory, Hornstein (1995), who adopts the copy theory of movement (Chomsky 1995), argues that A-movement for case-feature checking gives rise to scope-shift. Horntein assumes that relative scope is determined by c-command relations between undeleted copies of quantified arguments. Inverse scope is yielded by A-movement of quantifiers in subject position and in object position to Spec AgrS and Spec AgrO, respectively, and by deletion of the higher copy of the existential subject. Scope ambiguity arises because more than one possible LF structures can be obtained by movement and deletion, in which different c-command relations are available between undeleted copies of A-chains.

The outcome of the study, which was previewed in Chapter 1, suggests that Hornstein's A-movement approach incorrectly predicts that non-finite adjuncts should be absolute islands for scope-shifting movement in that quantifiers within those adjuncts have no case-related motivation to move to matrix A-positions.

For instance, the marginal acceptability of scope-shift from a temporal adjunct is unexpected under Hornstein's account. In the case of scope-shift from a *during*-PP, wide scope of a universal out of the *during*-PP is marginally possible, but this scope-shift cannot be parasitic on A-movement because quantified NPs can get case internal to the adjunct, while PPs do not need case. Hence, Hornstein cannot syntactically motivate the marginal possibility of wide scope in this case. Moreover, Hornstein's argument indicates that there should be limited parallelism between scope-shift and *wh*-movement in that the former is A-movement unlike the latter. However, the outcome of the study demonstrates that non-finite adjuncts are selective islands for both movement operations contra Hornstein's prediction.

There are two types of QR applications: (i) obligatory QR of a non-subject quantifier to repair a type-mismatch; and (ii) optional QR for scope-shift, subject to Scope Economy.

Fox's QR approach accounts for the surface scope and the inverse scope of (2), as shown in (12) and (13), respectively:

(12) $[_{\text{IP}}\ [_{\text{QP1}}$ A hit man$]\ [_{\text{VP}}\ [_{\text{QP2}}$ every spy from Russia$]\ [_{\text{VP}}\ t_1$ shot $t_2]]]$

(13) $[_{\text{IP}}\ [_{\text{QP2}}$ every spy from Russia$]\ [_{\text{IP}}\ [_{\text{QP1}}$ A hit man$]\ [_{\text{VP}}\ t_2'\ [_{\text{VP}}\ t_1$ shot $t_2]]]]$

In (12), the universal object undergoes obligatory QR to a λ-abstracted clause-denoting node ($\langle e, t\rangle$), VP, since quantified NPs (higher-order predicates $\langle\langle e, t\rangle, t\rangle$, Barwise and Cooper 1981) give rise to a type-mismatch in non-subject positions. Transitive verbs ($\langle e, \langle e, t\rangle\rangle$) may only take internal arguments of type $\langle e\rangle$. The universal leaves a trace of type $\langle e\rangle$ at the launching site, and thus the predicate takes the trace as its internal argument. At the landing site, the moved universal can take the λ-abstracted clause-denoting node as its argument; as a result, a truth-value of the sentence ($\langle t\rangle$) is yielded and a type-mismatch is resolved (see also Heim and Kratzer 1998).

On the other hand, the existential subject can take the VP ($\langle e, t\rangle$) as its argument in the VP-internal subject position, so that it does not undergo obligatory QR but does move to Spec IP for case-checking. As a result, at the LF representation in (12), the existential subject c-commands the universal object; hence, the surface scope reading is obtained.

Next, for the inverse scope, as shown in (13), after moving by obligatory QR to the VP-adjoined site, the universal object undergoes optional QR to the IP-adjoined, where it c-commands the existential subject. This application of optional QR is licensed by Scope Economy in that QR gives rise to a new reading.

Contrary to (13), optional QR is blocked by Scope Economy in cases like (14), where a non-scopal expression is located in subject position. Optional QR of the quantified object across the proper name subject does not yield a new scope interpretation:

(14) a. Mr Eastwood shot every spy from Russia.

b. * [$_{IP}$ [every spy from Russia]$_2$ [$_{IP}$ [Mr Eastwood]$_1$ [$_{VP}$ t_2' [$_{VP}$ t_1 shot t_2]]]]

Note that, in addition to Scope Economy, Fox proposes that QR is also subject to Shortest Move. Without Shortest Move, Fox's account would allow a non-subject quantifier to directly move to adjoin to the IP-node across the subject. If the universal object is allowed to undergo obligatory QR to the higher IP-node rather than the VP-node, Fox cannot account for the contrast between (13) and (14b).

As explained above, contrary to May (1977; 1985), Fox (1995; 2000) restricts free-applications of QR by Scope Economy and Shortest Move. Let us now have a look at evidence against free-application of QR provided by Fox (see also Reinhart 2006). As discussed by Sag (1976) and Williams (1977), scope ambiguity in (15) disappears if the sentence is put into the first conjunct of an ellipsis construction in which the subject of the second conjunct is a non-scopal expression, as in (16a). On the other hand, if the subject of the second conjunct is an indefinite, as in (16b), scope ambiguity surfaces again:

(15) A cowboy will shoot every outlaw in the town. ($\exists \gg \forall$, $\forall \gg \exists$)

(16) a. A cowboy will shoot every outlaw in the town, and Mr Fonda will too.

($\exists \gg \forall$, *$\forall \gg \exists$)

b. A cowboy will shoot every outlaw in the town, and a bounty hunter will too. ($\exists \gg \forall$, $\forall \gg \exists$)

In the ellipsis constructions in (16), the VPs in the second conjuncts are deleted at PF, but if some LF operation applies in the first conjunct, the same operation should also apply in the second conjunct to keep parallelism between the two conjuncts. The scope ambiguity in (16b) indicates that optional QR of the universal NP *every outlaw* over an indefinite subject should take place in both the conjuncts, as shown in (17):

(17) a. [$_{\text{IP}}$ [Every outlaw in the town]$_2$ [$_{\text{IP}}$ [a cowboy]$_1$ will [$_{\text{VP}}$ t_2 [$_{\text{VP}}$ t_1 shoot t_2 and]]]]

b. [$_{\text{IP}}$ [Every outlaw in the town]$_2$ [$_{\text{IP}}$ [a sheriff]$_1$ will [$_{\text{VP}}$ t_2 [$_{\text{VP}}$ t_1 shoot t_2]]]]

On the other hand, the absence of the inverse scope reading in (16a) indicates a lack of optional QR of the universal over the indefinite subject in the first conjunct, contrary to (16b). Fox argues that the parallelism between the two conjuncts blocks the application of optional QR in case the subject of the second conjunct is a non-scopal element as in (16a). Optional QR across the non-scopal element in the second conjunct does not yield scope-shift, so that Scope Economy disallows this operation. Because optional QR does not operate in the second conjunct, it cannot take place in the first conjunct, either. Thus, the wide scope of the universal is unavailable in (16a).

The evidence demonstrated above supports Fox's argument that applications of optional QR are not free, and also shows that both Scope Economy and Shortest Move are required to explain the contrast in (16).

In sum, Fox's (1995; 2000) approach differs from May's (1977; 1985) QR theory, which freely allowed optional applications of QR, in that QR optionally takes place only if the application alters a scope relation (Scope Economy). A type-mismatch with a non-subject quantifier is resolved by the first instance of QR of that quantifier (obligatory QR), which takes a form of a mapping system from syntax to semantics. Due to Shortest Move, requiring QR to land at the closest clause-denoting node, only optional QR is allowed to give rise to scope-shift.

Let us now move on to consider Reinhart's (2006) proposed economy constraint, Interface Economy, which is similar in sprit to Fox's proposal. Reinhart's Interface Economy is similar to Fox's Scope Economy in that optional QR is licensed only if the operation yields a new scope interpretation (because of the similarity, from now on, I will call this economy condition Reinhart's version of Scope Economy rather than Interface Economy). On the other hand, unlike Fox, Reinhart does not assume that a non-subject quantifier undergoes obligatory QR or that QR is subject to Shortest Move.

For instance, (18) illustrates Reinhart's accounts of the scope ambiguity in (2). Surface scope is determined by c-command in the overt syntactic structure (Reinhart 1976: see also Chapter 1) as shown in (a), whereas the inverse scope is yielded by optional QR of the universal object across the existential subject as given in (b):

(18) a. [$_{\text{IP}}$ [$_{\text{QP1}}$ A hit man] [$_{\text{VP}}$ t_1 shot [$_{\text{QP2}}$ every spy from Russia]]]] ($\exists > \forall$)

b. [$_{\text{IP}}$ [every spy from Russia]$_2$ [$_{\text{IP}}$ [a hit man]$_1$ [$_{\text{VP}}$ t_1 shot t_2]]]] ($\forall > \exists$)

Reinhart argues that optional QR is a reference-set computation required by the syntax-semantic interface to fulfill imperfection of the overt syntax. In (18a), the surface scope is obtained by c-command in overt syntax, so that there is no gap between the syntactic structure and the semantic representation of surface scope, and therefore QR does not take place. On the other hand, in (18b), the inverse scope cannot be recovered from the overt c-command relation between the two quantifiers; hence, to fulfill a mismatch between the overt syntactic structure and the semantic representation for inverse scope, Reinhart's version of Scope Economy allows the universal object to undergo QR across the existential. Because Reinhart does not assume Shortest Move, the universal object moves directly to adjoin to IP. In a sentence with a non-scopal subject, as in (14a), no QR takes place.

Reinhart points out that it is more difficult to obtain the inverse scope interpretation than the surface scope interpretation in sentences like (2) (see Gil 1982 for empirical studies showing that surface scope readings are preferred to inverse scope readings) in that the former requires reference-set computation, giving rise to processing costs. This is one of the reasons why Reinhart claims that there is no obligatory QR of non-subject quantifiers for resolution of a type-mismatch. Reinhart instead assumes that a type-mismatch with a non-subject quantifier should be resolved at the level of semantics.

Let us discuss differences between Fox (1995; 2000) and Reinhart (2006), summarized in Table 2.1:

	Fox (1995; 2000)	**Reinhart (2006)**
QR of non-subject QPs	Obligatory + Optional	Optional
Economy	Shortest Move + Scope Economy	Scope Economy
Resolution of a type-mismatch	LF	Semantics

Table 2.1: Fox (1995; 2000) vs. Reinhart (2006)

First, Fox requires obligatory QR of non-subject quantifiers before those quantifiers undergo further optional QR, contrary to Reinhart. In Fox's approach, obligatory QR for resolution of a type-mismatch works as a mapping operation from syntax to semantics in that non-subject quantifiers are arguments in overt syntax but have to work as higher-order predicates in the semantics. In other words, obligatory QR sets up LF representations at the interface level to be examined by Scope Economy in semantics rather than directly transmitting the syntactic output to the semantics. Then, optional QR is constrained by Scope Economy, a semantic economy condition.

On the other hand, under Reinhart's proposal, optional QR acts as a mapping operation from syntax to the semantics to repair imperfection between the two at the interface. Reinhart assumes that a type-mismatch with a non-subject quantifier should be resolved by semantic operations; for example, binding operations between lambda-operators and bound variables in the original sites of quantifiers, which should take place in semantics rather than at LF.

Next, Reinhart argues that the assumption of obligatory QR by Fox is purely theoretical and has no empirical evidence. In addition to obligatory QR, she also discusses the use of Shortest Move in Fox's theory. As explained before, Fox needs Shortest Move in order for object quantifiers not to directly move to adjoin to IP rather than VP by obligatory QR because scope-shift should be yielded only by optional QR to IP-nodes. This means that syntax always needs to consider for each QR operation whether or not it respects Shortest Move. If quantifiers in object position always undergo QR and their landing sites are fixed by Shortest Move, even quantified sentences that have no scope ambiguity like (14a) should require additional processing costs compared to sentences with no quantifiers. On the other hand, Reinhart's theory, which does not assume Shortest Move and obligatory QR, predicts that it is more costly to interpret ambiguous sentences like (2) than unambiguous sentences like (14a) and that the inverse scope reading of (2) should be more costly to interpret than the surface scope reading.

Let us now evaluate those theories on the basis of the empirical evidence from the study (in Chapter 4). First, as presented in Chapter 1, the rankings of QR and *wh*-movement look parallel but the results differ for bare participial gerunds. QR from bare participial gerunds was as unacceptable as QR from scope island, whereas *wh*-extraction from bare participial gerunds was as acceptable as that from *during*-PPs.

Here is a preliminary of part of discussion in Chapter 6. I argue that the difference in bare participial gerunds can be explained by Scope Economy. The outcome of the QR test shows a contrast in acceptability between temporal adjuncts (*during*-PPs and *after*-prepositional gerunds) and bare participial gerunds. QR from bare participial gerunds was more difficult than QR from the other two adjunct types. I argue that the difference is down to the presence / absence of temporal operators indicated by overt temporal prepositions. Scope Economy predicts that successive cyclic QR is possible out of temporal adjuncts containing temporal operators but unavailable out of bare participial gerunds, not headed by overt temporal prepositions and lack the operators.

QR of a universal across a temporal operator within a temporal adjunct may license a new scopal relation; hence, I assume a universal quantifier contained inside a temporal adjunct may undergo local QR across a scopal operator introduced by the temporal preposition first. This application of QR is licensed by Scope Economy, and then the universal may be allowed to undergo further QR across the existential subject in the matrix clause. On the other hand, QR from bare participial gerunds cannot be licensed by Scope Economy due to absence of a temporal operator within the adjunct. Thus, both Fox's and Reinhart's versions of Scope Economy can account for the contrast between bare participial gerunds and temporal non-finite adjuncts by the (un)availability of successful QR across a scopal operator within the adjunct.

On the other hand, for successful *wh*-argument extraction from non-finite adjuncts, following Truswell (2007; 2011), I assume that the failure of spatio-temporal overlapping between events gives rise to difficulty in *wh*-extraction from *after*-prepositional gerunds. On the other hand, bare participial gerunds and *during*-PP require the two events to be spatio-temporally overlapping; hence, island effects on *wh*-extraction from those two adjuncts are ameliorated.

The proposal sketched above will be developed into an explicit theory in Chapter 6. Regarding the use of Scope Economy to capture the difficulty of QR from bare participial gerunds, there is no evidence that either theory is superior.

However, one of the test conditions in the study, QR from *during*-PPs, casts doubt on Fox's proposal of obligatory QR. This issue will be also discussed in Chapter 6, and I give the preliminary discussion below. In (19), the inverse scope reading was acceptable for many of my participants. The universal NP *each rugby match* is a complement of the temporal preposition *during*. If the universal moves to the closest clause-denoting node VP by obligatory QR as required by Shortest Move, then it has to move across the adjunct boundary even for the surface scope:

(19) [$_{\text{IP}}$ [$_{\text{QP1}}$ A girl] [$_{\text{VP}}$ let out a yelp [$_{\text{PP}}$ *during* [$_{\text{QP2}}$ each rugby match]]]]

Assuming that adjoining to the adjunct PP allows successive cyclic QR from that adjunct (in Chapter 6, I will propose a formulation of the adjunct island constraint within Phase theory (Chomsky 2000; 2001; 2008), the first step of QR landing at the PP-adjoined site should yield another type-mismatch). This indicates that a type-mismatch of the universal in situ position cannot be resolved by obligatory QR without a repairing operation like type-shifting (Hendriks 1993). If so, the first instance of QR does not always resolve a type-mismatch in the cases like (19) and inverse linking (May 1985), and then this should weaken a motivation of Fox's proposal of obligatory QR (we will discuss inverse linking in detail in Chapter 6). In contrast, Reinhart's approach does not face the same problem, but she still needs to answer how a type-mismatch with a non-subject quantifier can be satisfied by semantic operations without obligatory QR.

Finally, I would like to point out a problem of Reinhart, who does not assume Shortest Move and other syntactic economy conditions on QR. Reinhart's approach is not restrictive enough to account for the scope freezing phenomenon observed in double object constructions in English, namely, the impossibility of wide scope of the direct object over the indirect object. In other words, she needs a reason for why the syntax-semantics interface allows optional QR of the indirect object across the direct object in dative constructions but not in double object constructions.[10] Indeed, Fox's approach also encounters the same problem.

Moreover, as will be discussed in Chapter 6, neither Fox's nor Reinhart's approaches are sufficient for capturing the weak restriction on QR out of adjuncts, which even QR out of temporal adjuncts is subject to. In Chapter 6, I will propose a theory of QR, assuming that QR out of adjuncts is subject to not only a syntactic constraint based on Phase theory with a concept of Barriers (Chomsky 1986) but also Scope Economy.

To conclude, Fox's (1995; 2000) and Reinhart's (2006) economy-based QR theories are worth adopting to account for the experimental data for the following reasons. First, the theory of QR can easily explain the reason why scope-shift is subject to the adjunct island constraint restricting overt movement, since scope-shift is also a kind of movement. Next, Scope Economy constraining optional QR can capture the contrast between QR from non-finite adjuncts with temporal operators and QR from those without any scopal elements: bare participial gerunds.

However, I also pointed out that the first instance of QR does not always resolve a type-mismatch without an additional repair operation, on the basis of QR from PPs. Reinhart's approach, which does not assume obligatory QR, is not faced with this problem, but her view of QR lacks an account of how QR is restricted by the syntax. I have argued that neither Fox's nor Reinhart's QR theories are sufficient to account for scope freezing and QR out of adjuncts.

In Chapter 6, to account for the data of QR out of adjuncts, I will propose an economy-based QR approach, closer to Reinhart's view than Fox's view in that there is no obligatory QR but differs from Reinhart's one in that a type-mismatch with a non-subject quantifier can be resolved by successive cyclic QR

[10] As well-known, in double object constructions in English, the scopal order between quantifiers in direct object and indirect object position is rigid. Indirect object quantifiers always take narrow scope below direct object quantifiers in sentences like (i). See Bruening (2001) for discussion on scope freezing. Because the topic of scope freezing is not the focus of this thesis, I will not commit to a specific analysis is here.

(i). You gave a girl in the class each French novel. $a \ll each$, $*each \ll a$

(i.e. I assume that QR for type resolution indeed exists but is not always the first step of QR). I will also propose a Phase-based syntactic constraint and a revised formulation of Scope Economy to explain QR out of adjuncts. After discussing semantic approaches in the next section, I will present a basic outline of my proposal.

2.3 Semantic theories of quantifier scope

Let us now turn to semantic theories of quantifier scope. This subsection will outline three different semantic theories of quantifier scope, which are taken to be representative of semantic accounts in literature (Jacobson 2002, Ruys and Winter 2011, and others): Quantifier Storage (Cooper 1975; 1978; 1983), flexible type-shifting (Hendriks 1993), and Skolem specification of indefinites in Combinatory Categorial Grammar (CCG) (Steedman 2012). We will have a look at how each of these theories explains scope ambiguity and the CNPC, as it applies to covert scope-shift.

First, Quantifier Storage is a semantic operation which applies to generalized quantifiers including indefinites. The meaning of quantifiers can be stored until those quantifiers can be retrieved and interpreted. Scopal order is dependent on the order in which quantifiers are retrieved.

Second, unlike Quantifier Storage, type-shifting is an operation which applies to predicates rather than to quantifiers. Argument positions of predicates can be type-raised to directly accommodate quantifiers in situ without type-mismatches. Under this approach, scopal orders are dependent on the order in which type-shifting applies to argument position of the predicate.

Third, Skolem specification in CCG applies to indefinites. Indefinites are assumed to be Skolem terms containing unspecified Skolem functions, rather than existential quantifiers; scopal order is dependent on the stage at which Skolem specification takes place.

What the three semantic operations have in common are (i) that none of these operations involve covert movement, (ii) they operate to satisfy the interpretation of quantifiers and to derive well-formed semantic representations, and (iii) scope-shift is dependent on the order / timing of application.[11]

2.3.1 Quantifier Storage: Cooper (1975; 1979; 1983)

Cooper (1975; 1979; 1983) argues that scope ambiguity results from different semantic representations yielded by purely semantic mechanisms, namely, Quantifier Storage, which consists of two operations: (i) *storage* of the meaning of quantifiers; and (ii) *retrieval* of the meaning of quantifiers. The initially stored interpretation of a quantifier can be retrieved at a later stage in the derivation, where that quantifier is required to apply to the sentential expression. Scope interpretations depend on where the meaning of each stored quantifier is retrieved and applied to the sentential meaning, much like Montague's (1973) Quantifying-in.

Let us now have a look at how Quantifier Storage accounts for the scope ambiguity of (2). For simplification, I adopt Carpenter's (1997) and Ruys and Winter's (2011) simplified explanations of Quantifier Storage.

First, Φ_1 in (20) is a representation of the meaning of the sentence (2) in Cooper's system. Φ_1 consists of ordered pairs: (i) the core meaning of the sentence on the left side; and (ii) pairs of quantifiers and variables bound by those quantifiers (eg. x is bound by Q1, whereas y is bound by Q2 in (20)) on the right side. Q1 and Q2 represent the meaning of the universal object and the existential subject, respectively.

(20) $\Phi_1 = \langle \mathrm{SHOT(x)(y)}, \langle \mathrm{x/Q1}, \mathrm{y/Q2} \rangle \rangle$,

Where:

$\mathrm{Q1} = \lambda \mathrm{A}.\forall \mathrm{z}[\mathrm{SPY\_FROM\_RUSSIA(z)} \rightarrow \mathrm{A(z)}]$

$\mathrm{Q2} = \lambda \mathrm{B}.\exists \mathrm{u}[\mathrm{HITMAN(u)} \wedge \mathrm{B(u)}]$

It is assumed that (2) has a single syntactic structure that can be mapped to either of two semantic representations. The surface scope and the inverse scope can be derived from two different semantic derivations: (21) and (22), respectively.

[11] Each of the theories involve intensional semantics in the original literature. For simplification, I will explain these theories in an extensional framework.

(21) a. $\Phi_2 = \langle \text{Q1}(\lambda\text{x.SHOT(x)(y)}), \langle \text{y/Q2} \rangle \rangle$

b. $\Phi_3 = \langle \text{Q2}(\lambda\text{y.Q1}(\lambda\text{x.SHOT(x)(y)}), \langle - \rangle \rangle$

c. $\exists\text{y[HITMAN(y)} \wedge \forall\text{x[SPY\_FROM\_RUSSIA(x)} \rightarrow \text{SHOT(x)(y)]]}$

(22) a. $\Phi_4 = \langle \text{Q2}(\lambda\text{y.SHOT(x)(y)}), \langle \text{x/Q1} \rangle \rangle$

b. $\Phi_5 = \langle \text{Q1}(\lambda\text{x.Q2}(\lambda\text{y.SHOT(x)(y)}), \langle - \rangle \rangle$

c. $\forall\text{x[SPY\_FROM\_RUSSIA(x)} \rightarrow \exists\text{y[HITMAN(y)} \wedge \text{SHOT(x)(y)]]}$

The surface scope reading is obtained as follows. In Φ_2 in (21a), Q1 is retrieved from storage, and then combines with the lambda abstracted core meaning of the sentence. Next, in Φ_3 in (21b), Q2 is retrieved from storage, and takes the lambda abstracted core representation as its argument. In the derivation, Q1 binds the variable x, whereas Q2 binds the variable y, as specified by pairs of quantifiers and variables in the storage in (20). The derivations in (21a) and (21b) result in the semantic representation in (21c), where the existential quantifier (Q2) takes wide scope over the universal quantifier (Q1).

The inverse scope is derived as follows. In Φ_4 in (22a), Q2 is retrieved from storage and combines with the core meaning first. Next, Q1 is retrieved from the storage and takes the lambda-abstracted core representation Φ_5 as its argument, as shown in (22b). Thus, the derivations in (22a) and (22b) give rise to the inverse scope representation (22c).

In summary, in Cooper's Storage system, what distinguishes (21c) from (22c) is the order of quantifier retrieval. If the retrieval of Q1 is followed by that of Q2, surface scope is obtained. If the retrieval of Q2 precedes that of Q1, inverse scope is obtained. Unlike May (1977; 1985), who argues that different syntactic representations of the sentence give rise to different interpretations, Cooper argues that different semantic representations of the sentence yield scope ambiguity. Unlike QR, Quantifier Storage is a purely semantic mechanism, but the core meanings in Φ_3 and Φ_5 are identical to semantic representations created by QR (see Heim and Kratzer 1998).

Like Rodman (1976), Cooper attempts to explain the effects of the CNPC on scope-shift and *wh*-relativization. Rodman and Cooper adopt different frameworks, but Cooper's treatment of the CNPC is similar to Rodman's. Rodman (1976) only discusses the CNPC as it applies to relative clauses, but Cooper (1983) deals with not only relative clauses but also clausal complements in like (23b), which shows that a *wh*-phrase cannot be fronted out of the clausal complement to a noun:

(23) a. Which outlaw do you believe that the sheriff shot?

b. *Which outlaw do you believe the claim that the sheriff shot?

Cooper (1983) assumes that scope-shift is a case of free quantification in the sense that the syntactic structure does not reflect inverse scope, whereas *wh*-fronting is a case of controlled quantification requiring obligatory storage of a binding operator yielded by a *wh*-phrase such that the syntactic structure overtly reflects the *wh*-scope. In other words, he deals with both the phenomena as quantification but distinguishes covert scope-shift from overt *wh*-fronting by distinguishing different kinds of quantification.

Like Rodman, Cooper argues that either a variable or a *wh*-gap contained inside a complex NP is marked, and the marked variable or gap is not allowed to be bound by a quantifier or a *wh*-phrase retrieved from the store.[12] Because of the similarity to Rodman's treatment, I refrain from explaining Cooper's treatment in detail here. Like Rodman, Cooper's account of the CNPC is not insightful in that it takes as a given which syntactic structures are islands and does not explain why such a construction would block binding operations resulting from Quantifier Storage.

2.3.2 Flexible type-shifting: Hendriks (1993)

In all the theories discussed thus far, it is assumed that scope-shift is yielded by operations on quantifiers. We have seen that such operations may also resolve a type-mismatch with quantified objects. The flexible type-shifting theory

[12]Note that although Cooper (1983) only deals with the CNPC, he introduces this restriction as a constraint on *wh*-gaps and quantifying out of *islands*.

of Hendriks (1993) assumes that type-shifting operations enable predicates (eg. transitive verbs) to directly take generalized quantifiers as their arguments by lifting the semantic type of those predicates. This means that type-shifted predicates can take quantified objects in situ. We will see that scopal order can be determined by which argument position of a two-place predicate is raised first.

Hendriks (1993) follows Partee and Rooth's (1983) assumption that predicates may have more than one semantic type. Partee and Rooth (1983) originally propose their type-shifting theory for sentences involving conjunction reduction, but Hendriks makes use of their type-shifting approach to account for quantified sentences. For example, a transitive verb like *shot* is basically of type ($<e,<e,t>>$). It can take entities (e) as its arguments but not generalized quantifiers ($<<e,t>,t>$). This is why, for example, Fox (1995; 2000) and Heim and Kratzer (1998) assume that quantified objects undergo obligatory QR to clausal nodes. Hendriks, on the other hand, argues that each argument position of a predicate can be freely type-raised from $<e>$ to $<<e,t>,t>$, and then that predicate can directly take generalized quantifiers in situ. Note that contrary to Hendriks, Partee and Rooth assume that type-shifting is subject to a kind of economy condition, such that it can only apply if it is necessary for successful composition of the sentence. For further details of Partee and Rooth's account, see Partee and Rooth (1983), Hendriks (1993), Winter (2007), and Ruys and Winter (2011).

Let us now take a look at how Hendriks' Type-Shifting theory accounts for the scope ambiguity in (2). The transitive verb in (2), *shot*, initially has the basic translation in (24). It may take arguments taking entities (e) as its argument but not quantified arguments like *a hitman* and *every spy from Russia*.

(24) $\lambda y_{<e>}.\lambda x_{<e>}.\mathrm{SHOT}(x)(y)$

Hendriks argues that argument raising can be applied to both the external and the internal arguments of a transitive verb in two steps. (25a) and (26a) are semantic representations of *shot* in which argument raising has been applied in different orders. The former gives rise to the surface scope interpretation as shown in (25c), while the latter gives rise to the inverse scope interpretation as shown in (26c).

(25) a. $\lambda P_{<<e,t>,t>>}.\lambda Q_{<<e,t>,t>>}.Q(\lambda y.P(\lambda x.SHOT(x)(y)))$

b. $\lambda P.\exists y[Hitman(y) \wedge P(\lambda x.SHOT(x)(y))]$

c. $\exists y[Hitman(y) \wedge \forall x[Spy\_From\_Russia(x) \rightarrow SHOT(x)(y))]]$

(26) a. $\lambda P_{<<e,t>,t>>}.\lambda Q_{<<e,t>,t>>}.P(\lambda x.Q(\lambda y.SHOT(x)(y)))$

b. $\lambda Q.\forall x[Spy\_From\_Russia(x) \rightarrow Q(\lambda y.SHOT(x)(y)))]$

c. $\forall x[Spy\_From\_Russia(x) \rightarrow \exists y[Hitman(y) \wedge SHOT(x)(y)))]]$

In (25a), argument raising applies to the internal argument position first and then to the external argument position. Hence, as shown in (25b), the existential quantifier, the external argument of (2), is applied to the type-shifted transitive verb (25a) first. Next, the universal quantifier, the internal argument of (2), is applied to (25b). Thus, the surface scope reading is obtained.

In (26a), on the other hand, two-step argument raising applies to the two argument positions in the reverse order. Consequently, the order of application of the two quantifiers to the type-shifted predicate is also reversed, as shown in (26b) and (26c). The result in (26) is the inverse scope reading.

To sum up, Hendriks' flexible type-shifting is a semantic operation on predicates, in contrast to operations on quantifiers like QR, Quantifying-in, and Quantifier Storage. This operation can resolve type-mismatches in situ. For scope-shift, as we have seen in (25) and (26), scopal orders depend on which argument position of the predicate is raised first. The order of argument raising determines which quantifier can be applied to the type-raised predicate first, and then a quantifier that is applied last takes wide scope.

Finally, let me briefly introduce how Hendriks explains the CNPC. Hendriks points out that if we allow relative pronouns like *who* to be type-raised in sentences like (8), this may incorrectly yield the wide scope of a universal quantifier contained inside the relative clause despite the CNPC. Hendriks resolves this problem by stipulating that type-shifting rules do not apply to certain lexical categories such as relative pronouns. Hendriks also accounts for the Coordinate

Structure Constraint (CSC) by banning applications of type-shifting rules on coordinating expressions. For further technical details, see Hendriks (1993).

Hendriks' resolution of the problem is similar to Rodman's and Cooper's treatments on the CNPC in that he bans operations of type-shifting to lexical categories involved in island effects. Like Rodman's and Cooper's analyses, Hendriks' approach requires a presumption of which constructions yield island effects and therefore lacks insight.

2.3.3 Combinatory Categorial Grammar: Steedman (2012)

Combinatory Categorial Grammar (CCG) assumes that each expression has a categorial syntactic type in the categorial lexicon. An expression combines with its adjacent expression to form a sentential expression by combinatory syntactic operations, which are strictly dependent on categorial type.

The most basic combinatory operation, functional application, is given in (27) (Steedman 2012:79). In addition, a forward composition rule (Steedman 2012: 82) is also given in (28). For example, (27a) says that if an expression whose category is Y occurs to the right (indicated by a plain slash) of another expression whose category is X / Y, the latter takes the former as its argument, and thus a combined expression of category X is obtained (See Steedman 2012 for the details).

(27) a. X / Y: f Y: $a \rightarrow$ X: fa (>)

b. Y: a X \ Y: $f \rightarrow$ X: fa (<)

(28) *Forward composition* (>**B**)

X/Y: f Y/Z: g $\rightarrow_{\mathbf{B}} X/Z : \lambda x.f(gx)$

Unlike Montague (1973) and the others, Steedman (2012) does not treat indefinites as existential quantifiers, but rather as Skolem terms derived from Skolem functions (sk). Skolem functions are functions from any number of individual arguments ($d_1, d_2, ...d_n$) and a (non-empty) set of entities P to entities in P. A Skolem function not taking any individual argument is called a Skolem constant. With a Skolem constant, the resulting Skolem term denotes a specific entity picked out from set P.[13] On the other hand, if individual arguments of a Skolem function are variables bound by a universal quantifier, the resulting Skolem term denotes entities which vary with the universal. See Chierchia (2001), Winter (2001), and Schlenker (2006).

(29a) and (29b) show left-branching derivations for the inverse scope and surface scope readings (respectively) of (2). Steedman argues that unspecified Skolem terms can undergo specification at any stage of the derivation, and that the scope of the indefinite is determined by the point at which this operation takes place. Scope inversion takes place (i) if the type-raised NP argument involves a variable bound by a universal quantifier, and (ii) if an unspecified Skolem term undergoes specification after the type-raised NP combines with the Skolem term.[14]

(29) a.

A hitman	shot	every spy from Russia
$S/(S\backslash NP)$:	$(S\backslash NP)/NP$:	$(S/NP)\backslash((S\backslash NP)/NP)$:
$\lambda P.P\ (skolem'hitman')$	$\lambda x\lambda y.shot'xy$	$\lambda Q\lambda y.\forall x[spy\_from\_Russia'x \rightarrow Qxy]$

$$S\backslash NP : \lambda y.\forall x[spy\_from\_Russia'x \rightarrow shot'xy] \quad <$$

$$S : \forall x[spy\_from\_Russia'x \rightarrow shot'x(skolem'hitman')] \quad >$$

$$S : \forall x[spy\_from\_Russia'x \rightarrow shot'x\ sk^{(x)}_{hitman'}]$$

[13]The reason Skolem functions are used in the study of scope is due to the fact that Skolem constants can account for the unexpected widest scope of indefinites. If indefinites are treated simply as existential quantifiers, the island-escaping nature of indefinites is difficult to explain under the QR approach. See Winter (1997), Kratzer (1998), and Schlenker (2006).

[14]Steedman assumes that indefinites and generalized quantifiers have the same categorial type and take type-raised NP arguments ($NP^{\uparrow}$), but that indefinite articles/determiners contain *unspecified* Skolem functions ($skolem'_n$), unlike the generalized quantifier determiners shown in (ii) (cited from Steedman 2012:109), as shown in (i) (Steedman 2012:114).

(i). *a, an, some*: $NP^{\uparrow}_{3SG}/N_{3SG} : \lambda p\lambda q.q(skolem'p)$

(ii). *each, every*: $NP^{\uparrow}_{3SG}/N_{3SG} : \lambda p\lambda q\lambda \ldots \forall x[px \rightarrow qx \ldots]$

Like a generalized quantifier determiner, an unspecified Skolem function $skolem'_n$ takes a set of entities such as $hitman'$ as its N argument: $skolem'hitman'$, as shown in (i). On the other hand, contrary to a generalized quantifier determiner, which takes a type-raised NP argument (a lambda-abstracted sentential expression) as its argument, a type-raised NP argument of the indefinite determiner acts as a predicate of the Skolem term.

b.

$$
\begin{array}{lll}
\underline{\text{A hitman}} & \underline{\text{shot}} & \underline{\text{every spy from Russia}} \\
S/(S\backslash NP) & (S\backslash NP)/NP & (S/NP)\backslash((S\backslash NP)/NP) \\
: \lambda P.P\ (skolem'hitman') & : \lambda x\lambda y.shot'xy & : \lambda Q\lambda y.\forall x[spy\_from\_Russia'x \rightarrow Qxy] \\
\cline{2-3}
: \lambda P.P(sk_{hitman'}) & \multicolumn{2}{c}{S\backslash NP : \lambda y.\forall x[spy\_from\_Russia'x \rightarrow shot'xy]} \quad < \\
\hline
\multicolumn{3}{c}{S : \forall x[spy\_from\_Russia'x \rightarrow shot'x(sk_{hitman'})]} \quad >
\end{array}
$$

Categorial types of the three constituent (*a hitman, shot,* and *every spy from Russia*) of the sentence are identical to those in (29), and the way of composing the constituents by functional applications is also the same for the derivation of the inverse scope in (29a) and of the surface scope in (29b). However, what distinguishes the inverse scope from the surface scope reading is the timing of specification of a Skolem term. In (29b), the Skolem term on the indefinite subject is specified before that subject undergoes functional application to combine with the constituent *shot every spy from Russia*, whereas the Skolem term in (29a) is specified after the sentential expression is derived.

In (29a), the environment of the Skolem term $^{(x)}$ indicates that the Skolem term contains a variable x bound by the universal quantifier in its environment at the time of specification. This means that the set of hitmen in the Skolem term may vary with the universal. Hence, the scope of the indefinite is under the scope of the universal quantifier, and the inverse scope reading is therefore obtained.

In (29b), on the other hand, the environment of the specified Skolem term is empty. Since the indefinite subject combines with the VP containing the universal later than the Skolem specification takes place, the unspecified Skolem term is not in the scope of the universal yet at the time of specification. This means that the Skolem constant selects a specific hitman from the set before the universal takes scope over the Skolem term. As a result, the scope of the indefinite is independent from the scope of the universal, and the indefinite denotes a specific hitman. Thus, the surface scope interpretation is obtained.

Let us now consider how Steedman accounts for scope inversion being subject to CNPC. On Steedman's approach, categorial types of relative pronouns prevent unspecified Skolem terms from depending on the scope of universal NPs contained inside relative clauses. First, Steedman explains that type requirements of relative pronouns ($(N\backslash N)/(S/NP) : \lambda q\lambda n\lambda y.ny \wedge qy$) yield island effects on *wh*-constructions. In (30), the constituent *who shot*, which contains a relative pronoun *who*, cannot combine with the head noun *hitman* of the relative clause, unless that constituent takes an argument of type NP. Thus, the type-driven derivation crashes, and (30) is ungrammatical.

(30) *Who [did the interpol catch]$_{S_Q/NP}$ a$_{NP/N}$ hitman$_N$ [who$_{(N\backslash N)/(S/NP)}$ shot$_{(S/NP)\backslash NP}$]$_{(N/N)\backslash NP}$?

On the other hand, although Steedman (2012) does not explicitly account for CNPC effects on scope-shift in quantified sentences like (7), categorial types of relative pronouns may also yield island effects for that scope phenomenon. Due to the type of a relative pronoun, a universal quantifier embedded inside a relative clause needs to be contained in an N argument of an unspecified Skolem term rather than in its type-raised NP argument. As we have seen in (29), the universal may restrict a Skolem term only if that quantifier is taken as a type-raised NP argument of the indefinite determiner. Therefore, even if Skolem specification takes place at the end of the derivation of (7), the Skolem term cannot be dependent to the scope of the universal. (31) shows a categorial type of each expression in (7), while (32) shows a semantic reduction for each composition in the derivation ($>, <$ indicate functional application rules in (27a) and (27b), respectively).

(31) Clint$_{S/(S\backslash NP)}$ caught$_{(S\backslash NP)/NP}$ a$_{(S\backslash NP)\backslash((S\backslash NP)/NP)/N}$ hitman$_N$ who$_{(N\backslash N)/(S\backslash NP)}$ shot$_{(S\backslash NP)/NP}$ every spy$_{(S\backslash NP)\backslash((S\backslash NP)/NP)}$

(32) a. shot every spy: $\lambda y.shot'(skolem'spy')y$ $(<)$

b. who shot every spy: $\lambda n\lambda y.ny \wedge \forall x[spy'x \rightarrow shot'xy]$ $(>)$

c. hitman who shot every spy: $\lambda y.hitman'y \wedge \forall x[spy'x \rightarrow shot'xy](<)$

d. a hitman who shot every spy: $\lambda p.p(skolem'_{\lambda y.hitman'y \wedge \forall x[spy'x \rightarrow shot'xy]})$ $(>)$

e. caught a hitman who shot every spy: $\lambda z.caught'(skolem'_{\lambda y.hitman'y \wedge \forall x[spy'x \rightarrow shot'xy]})z$ $(<)$

f. Clint caught a hitman who shot every spy: $caught'(skolem'_{\lambda y.hitman'y \wedge \forall x[spy'x \rightarrow shot'xy]})clint'(>)$

g. Clint caught a hitman who shot every spy:
$caught'(sk_{\lambda y.hitman'y \wedge \forall x[spy'x \rightarrow shot'xy]})clint'$

In (32), we can see that the universal is contained inside the argument of the Skolem term. The unspecified Skolem term is not in the scope of the universal when the indefinite article combines with the head of the relative in (32d); hence, whenever the Skolem term is specified after (32d), its scope is never dependent on the scope of the universal. Thus the categorial type of the relative pronoun makes the relative clause be an argument of the Skolem term and then prevents the unspecified Skolem term from being bound by the universal.

We have seen how Steedman's approach explains the relative clause sub-cases of CNPC on *wh*-constructions and scope-shift. Unlike analyses by Rodman, Cooper, and Hendriks on CNPC, Steedman's analysis does not require the assumption that relative clauses are islands. Categorial types of relative pronouns, which are used to syntactically build relative clauses in general, block those two operations without adding new restrictive rules. In this respect, Steedman's analysis on CNPC effects is considered to be superior to the other semantic analyses.

2.3.4 Discussion

In Section 2.3, we have taken a look at the three representative semantic approaches to quantifier scope: Quantifier Storage, flexible type-shifting, and Skolem specifications in CCG. Let us now discuss whether these theories and Montague's (1973) Quantifying-in are suitable for explaining the empirical data from the study by comparing them with the economy-based QR theory.

First, on the basis of the CNPC, we have seen that each of the semantic approaches can explain how the CNPC blocks covert scope-shift / *wh*-fronting (except Hendriks' type-shifting theory, which explains the CNPC on scope-shift but not on *wh*-fronting). Although island constraints like the CNPC are normally explained as syntactic constraint on overt movement in Generative Grammar, Jacobson (2002) raises Rodman's (1976) account of the CNPC on Quantifying-in, as evidence demonstrating that a weak-direct compositionality theory can equivalently explain the island constraint on scope-shift and *wh*-relativization. Then, she claims that the parallelism between scope-shift and *wh*-constructions in terms of island constraints do not give the LF theory an advantage over the semantic theories. In terms of the capability of those theories to explain the CNPC, I do not disagree with Jacobson.

The three semantic theories: Quantifying-in, Quantifier Storage, and type-shifting can account for but cannot predict that relative clauses restrict scope-shift / *wh*-fronting. Consequently, all the three theories require additional rules to account for the CNPC. For example, recall that Rodman stipulates that a pronoun embedded in a relative clause is marked and hence cannot be bound by a quantifier. This account suggests that the original rules in the PTQ permit scope-shift out of relative clauses.

Similar points apply to Quantifier Storage and flexible type-shifting. These theories cannot make predictions about this kind of syntactic restriction, they need to create extra rules applying to stipulate additional construction specific rules. The reason why the three semantic approaches fail to predict the CNPC is because those purely semantic theories are insensitive to differences in syntactic structures beyond compositionality.

Steedman's CCG is superior to the other three semantic accounts in that the basic type-raising rule necessary for syntactic composition predicts the presence of a scope island. In Steedman's theory, categorial types of relative pronouns not only build relative clauses but also block *wh*-fronting / scope-shift. CCG can express syntactic notions (eg. case) via categorial types, so the theory is more sensitive to structural differences than the other three and can correctly predict the character of the CNPC.

On the other hand, like the semantic theories, syntactic approaches like QR also require stipulations to explain which syntactic structures build islands and how island constraint block movement.[15] Therefore, it is hard to claim that the syntactic theories are superior to the semantic theories on the basis of the island facts.

Nonetheless, for this thesis, I choose to explore whether the syntactic theory makes it possible to generalize over scope-shift and *wh*-movement. Compared

[15] See Chapter 3, where we will take a look at what stipulations existing theories of locality make in order to explain adjunct islands.

with the semantic approaches, the syntactic theory has a better chance of providing a unified account of locality in scope-shift and *wh*-extraction. To account for the outcome of the experimental studies, I argue that it is necessary to make use of syntactic concepts like cyclicity and syntactic selection, as will be discussed in Chapter 6. Assuming that both QR and *wh*-movement are subject to locality, extraction out of a non-finite adjunct should be done successive cyclically via adjunction to the edge of that adjunct, which provides an escape hatch for the movement. To explain the possibility of argument extraction and impossibility of adjunct extraction from non-finite adjuncts, we may need to assume that those adjunct boundaries are syntactically selective for different Ā-dependencies (see Chapter 3 for Cinque's (1990) theory of Ā-dependencies on the basis of different moving categories).

Let us consider how semantic approaches may explain QR out of adjunct islands without assuming locality by taking a look at the type-shifting approach proposed by Artstein (2005) on temporal adjuncts like (33):

(33) a. A secretary cried after each executive resigned. (Artstein 2005: 541)

b. A secretary cried during each film.

Artstein, following Pratt and Francez (2001), assumes those adjuncts form temporal generalized quantifiers taking scope over the matrix clause. Type-shifting derives a temporal generalized quantifier ($<<i, t>, t>$, which takes a set of time intervals as its argument) from a temporal adjunct clause like an *after*-clause as in (33a). The reason why type-shifting of the embedded VP is required is because a type-mismatch arises if the QP *each executive*($<<e, t>, t>$) combines with the embedded VP *resigned* ($<e, <i, t>>$), where derivations of generalized quantifier PPs like *during each film* in (33b) do not require type-shifting. The resulted temporal clausal generalized quantifier *after each executive resigned* has the same semantic type ($<<i, t>, t>$) as the temporal PP generalized quantifier (*during each film*). Thus, the embedded universal can take the wide scope over the existential subject in (33) if the temporal generalized quantifier takes the lambda-abstracted matrix clause over time as its argument. See Artstein (2005) for the technical details.

Because the whole adjunct constitutes a quantifier scoping over the existential subject in (33), scope-shift does not violate the adjunct island constraint in Artstein's account. However, Artstein's type-shifting approach cannot explain the significant difference between scope-shift from *after*-prepositional gerunds and from *during*-PPs, observed in the study (see Chapter 4).[16] In Chapter 6, I will argue that this difference results from a structural asymmetry between the two types of adjuncts. The phase-based locality condition requires more steps of QR to get out of *after*-prepositional gerunds than *during*-PPs; as a result, the former gives rise to a higher processing cost than the latter. Thus, on the basis of the locality of movement, the theory of QR can capture how structural differences between adjuncts is a factor yielding acceptability gradation. On the other hand, Artstein's account may not predict this acceptability gradation in that both the adjunct clause and the PP in (33) are simply treated as temporal generalized quantifiers and therefore their structural differences are irrelevant.

As discussed above, both the theory of QR and the semantic theories can explain how islands restrict scope-shift and *wh*-movement on the basis of certain stipulations; hence, it is not easy to claim that the theory of QR is superior to the semantic accounts. However, for the purpose of this thesis, I decide to adopt the theory of QR over the semantic approaches because it is optimal to make use of a syntactic theory of locality, which the semantic theories do not assume, to account for the intricate data obtained study.

In sum, I have chosen to explore the theory of QR over the semantic theories, as the syntactic theory enables us to make use of syntactic notions related to locality like cyclicity, escape hatches for extraction, and sensitivity for different moving categories, which are necessary for capturing the acceptability gradation exhibited by QR and *wh*-extraction from the three different types of adjuncts.

However, I do not argue that the theory of QR is superior to the semantic theories for the following reasons. First, as explained through this section, like the syntactic theories, the semantic theories can also explain island constraint on

[16] Adjunct clauses were not tested in the study because tensed islands are regarded as strong islands in general (see Chapter 3 and Szabolcsi 2006) and therefore both scope-shift and *wh*-extraction are generally disallowed.

scope-shift and *wh*-constructions on the basis of some stipulation.

In Chapter 6, as briefly explained in Section 2.3.4, I will account for possibility of scope-shift out of temporal adjuncts by economy-based QR over temporal operators. On the other hand, as explained above, Artstein (2005) proposes a type-shifting approach, which assumes that temporal adjuncts may form temporal generalized quantifiers that can scope over the existentially quantified matrix subject. However, he suggests that scopal relations between normal quantifiers and temporal quantifiers may be accounted for by any of Quantifying-in, Quantifier Storage, and QR. This suggests that once the semantics of temporality creates scopal elements like temporal operators and temporal generalized quantifiers, each of these operations can capture quantifier scope in terms of temporality. In this respect, it is not easy to claim that the theory of QR is superior to the semantic accounts.

Finally, in Section 2.2.2, we discussed the problem of obligatory QR in the case of QR from *during*-PPs. In contrast to the theory of QR, the semantic theories, which assume that semantic operations take place to satisfy the interpretation of a quantifier and derive well-formed semantic representations, are not faced with the same problem. This is why Reinhart (2006), who argues contra the existence of obligatory QR, mentions that a type-mismatch with a non-subject quantifier may be satisfied by semantic operations in the way of Montague's PTQ. In terms of this issue, the semantic theories have an advantage over the theory of QR.

In conclusion, on the basis of the discussion in this chapter, I have chosen to explore an economy-based QR theory over the semantic theories as the core of my proposal, which will be developed in Chapter 6. The main reason of exploring the theory of QR is because the syntactic locality is required to predict and explain those intricate adjunct island effects showing gradation of acceptability. On the other hand, we still need some helps from the semantics to supplement the theory of QR. For example, to avoid the problem of obligatory QR, the interpretation of a generalized quantifier should be instead satisfied in a semantic way, as suggested by Reinhart (2006).

To conclude this chapter, the next section gives a preliminary discussion of my proposal.

2.4 QR and the model of grammar

In this section, on the basis of the linking hypothesis between the model of grammar and judgements (see Chapter 1), I present a simple version of my proposal, which will be shown to account for QR out of adjuncts in Chapter 6. I mainly adopt Reinhart's (2006) approach to QR, but I also make additional assumptions to compensate for Reinhart's (and Fox's 1995; 2000) weaknesses discussed in the previous section. Following Reinhart (2006), I argue that scope relations are determined by c-command, and that scope-shift is a kind of syntactic Ā-movement (QR). Semantic operations like type-shifting take place as a complement to syntactic scope-shifting operations.

Following Reinhart (2006), I adopt the following, displayed in Figure 2.1:

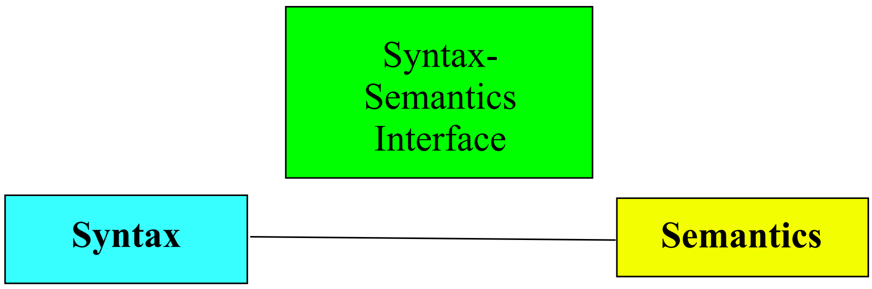


Figure 2.1: The model of grammar from Reinhart (2006) (excluding phonology and phonetics)

How quantifier scope is computed and interpreted in the model of grammar is illustrated as follows.

First, the syntax computes the overt syntactic structure of a quantified sentence like (2). The surface scope of (2) can be obtained by an overt c-command relation between the existential subject and the universal object, shown in (34a). The overt c-command relation satisfies what the syntax-semantics interface requires for the surface scope interpretation; therefore, QR does not need to apply. However, for the semantic representation of (34a) in (34b), the universal in the object position results in a type-mismatch.

(34) a. $[_{\mathrm{IP}}$ $[_{\mathrm{QP1}}$ A hit man] $[_{\mathrm{vP}}$ t_1 $[_{\mathrm{VP}}$ shot $[_{\mathrm{QP2}}$ every spy from Russia]]]]]

($\exists > \forall$)

b. $\exists$y[HITMAN(y) $\wedge$ $\forall$x[SPY_FROM_RUSSIA(x) $\rightarrow$ SHOT(x)(y)]]

Contrary to Fox (1995; 2000), who argues that a type-mismatch is resolved by obligatory QR as a mapping operation from the syntax to the semantics, I propose that a type-mismatch with a non-subject quantifier can be resolved by type-shifting at the semantics. Once the LF representation (34a) is transferred from the syntax to the syntax-semantics interface, to resolve a type-mismatch of the non-subject quantifier, the logical syntax requires an internal argument position of the predicate to be type-raised to take the object quantifier in situ at the semantic representation (Hendriks 1993). In Chapter 6, I will introduce a particular type-shifting rule for type-resolution of a non-subject quantifier at the LF structure that yields the surface scope like in (34a).

Thus, to derive the surface scope interpretation of (2), resolution of a type-mismatch with a non-subject quantifier at the semantics is required, but a reference-set computation required by the syntax-semantics interface (i.e. optional QR for scope-shift) is not. This is visually summarised in Figure 2.2:

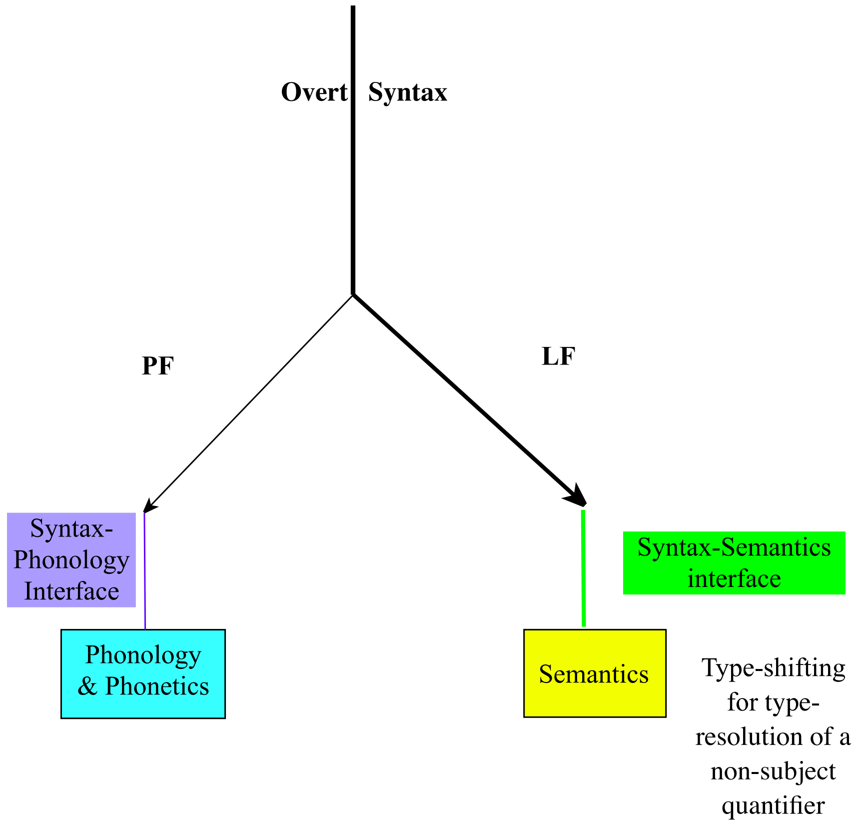


Figure 2.2: Derivation of the surface scope interpretation

Next, the inverse scope cannot be obtained by an overt c-command relation between quantifiers at the syntax. Hence, the syntax-semantics interface requires QR to fulfill an imperfection of the syntactic structure representing the inverse scope interpretation, as given in (35a):

(35) a. $[_{\text{IP}}$ $[_{\text{QP2}}$ every spy from Russia$]$ $[_{\text{IP}}$ $[_{\text{QP1}}$ a hit man$]$ $[_{\text{vP}}$ t_2' $[_{\text{vP}}$ t_1 $[_{\text{VP}}$ shot $t_2]]]]]$

b. $\forall$x[SPY_FROM_RUSSIA(x) $\rightarrow$ $\exists$y[HITMAN(y) $\wedge$ SHOT(x)(y)]]

I argue that QR is subject to both syntactic constraints and an additional constraint at the syntax-semantics interface, as illustrated below.

First, QR is restricted by syntactic constraints, since reference-set computation is an extension of the syntactic operations (see Reinhart 2006). As discussed in Chapter 6, I argue that QR is restricted by the Phase Impenetrability Condition (PIC) (Chomsky 2000; 2001; 2008); moreover, QR out of an adjunct is also subject to the syntactic restriction of the phase-hood of adjuncts, in addition to the PIC. This restriction will be discussed in detail in Chapter 6.

As will be explained in Chapter 3 (Section 3.5), the PIC is the locality condition that requires movement to operate successive cyclically via phase-edges. The definition of the PIC is given in (36):

(36) **Phase Impenetrability Condition (PIC)**

The domain of a head H of a phase HP is not accessible to operations outside of HP. Only H and its edge domain are accessible to such operations.

(Chomsky 2000: 108)

In (35a), the universal undergoes QR twice to give rise to an LF representation in which the universal c-commands the existential. The PIC requires movement out of a phase to take place successive cyclically via the phase edge. In order to move across the existential subject, the universal must undergo QR to adjoin to the IP via the edge of the first phase, vP, since the IP-adjoined site is in the next phase, CP. Thus, due to the requirement of the PIC, QR operates successive cyclically via an edge and gives rise to scope-shift at the final landing site.

However, if we adopt a Spell-Out-based explanation of the PIC (Chomsky 2000; 2001; 2008: see also Chapter 3), it would be controversial to claim that covert movement like QR is subject to the PIC. This is because LF operations like QR are presumed to take place after Spell-Out. We will return to this issue in Chapter 6, and discuss some possibilities for how QR is to be restricted by the PIC.

Here, I tentatively stipulate that even after Spell-Out, the locality requirement from the PIC is still in effect at LF. Assuming that a covert version of movement must obey the same locality condition restricting overt movement, QR should follow movement steps the PIC requires overt movement to follow.[17]

[17]This idea is one of the options I will raise in Chapter 6, and is reminiscent of Cecchetto's (2004) reasoning behind the argument that QR obeys the PIC despite occuring after Spell-Out. Cecchetto also assumes that the semantic component is accessed at one time only, at the end of the derivation, whereas the complement of a phase is transferred to the phonological component

Second, following Reinhart (2006), I argue that each operation of QR yields a light processing cost in that it is an illicit operation required by the interface. QR takes place twice for the inverse scope reading in (35a), whereas no QR takes place for the surface scope reading in (34). Hence, it is more costly to obtain the inverse scope than the surface scope in that the former requires QR but the latter does not, as previously argued for by Reinhart (2006) on the basis of Gil's (1982) empirical study.

Third, I argue that QR is subject to an additional constraint at the syntax-semantics interface: Scope Economy. In order to make Scope Economy compatible with the PIC, I modify Scope Economy in that at each phase, successive cyclic QR is subject to Scope Economy; each step of QR is licensed if the operation either resolves a type-mismatch or yields scope-shift at the landing site. In addition, I assume that Scope Economy is a restriction of the interface keeping watch on reference-set computations; therefore, violations of the condition yields a greater processing cost than each instance of QR.

As illustrated in (35a), the first instance of QR of the universal to the edge of the first phase, a clause-denoting node, is licensed by Scope Economy since it resolves a type-mismatch. The second instance of QR across the existential subject gives rise to scope-shift. Thus, each of the two steps of successive cyclic QR satisfies Scope Economy.

Figure 2.3 visually summarizes the operation and restrictions involved in the derivation of the inverse scope reading:

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cyclically, as is generally assumed by phase-based approaches. In other words, after the last step of successive cyclic QR takes place, the whole LF representation is transferred to the semantic component at once. See Cecchetto (2004) for further details.

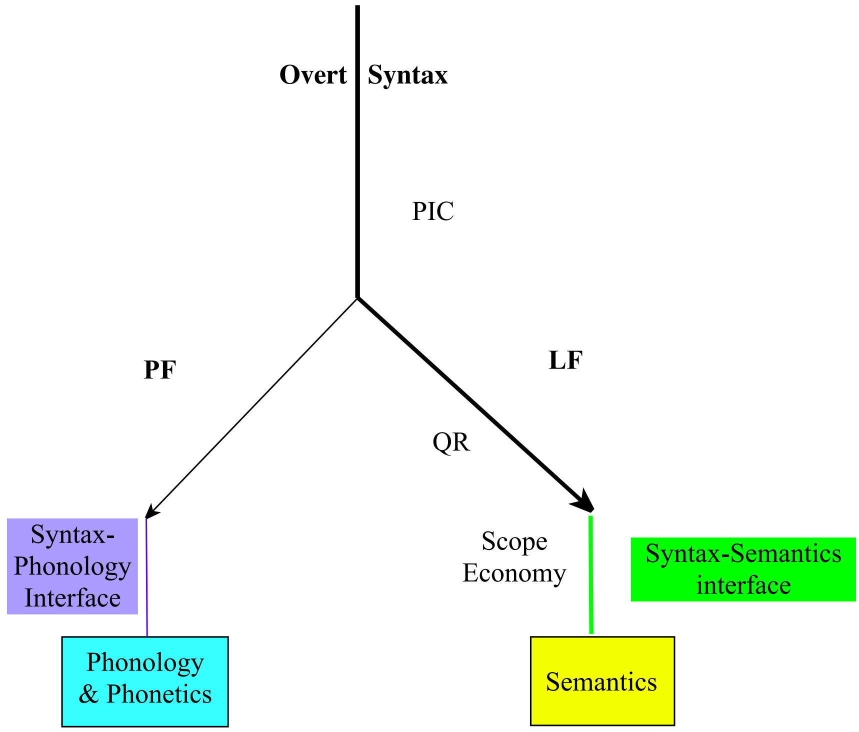


Figure 2.3: Derivation of the inverse scope interpretation (the PIC is assumed to still be visible at LF, as indicated by the bold black line)

Note that in this case, a type-mismatch with the universal object is resolved by successive cyclic QR that eventually yields scope-shift; type-shifting therefore does not take place as an additional repair operation unlike in (34).

Although I assume that type-shifting or Quantifier Storage takes place for resolution of a non-subject quantifier in situ for the surface scope, I do not assume that scope-shift is yielded by these semantic operations. As explained in Section 2.3.1, Cooper argues that scope ambiguity results from two different semantic structures yielded by Quantifier Storage. In this model, however, QR, a reference computation at the interface, gives rise to the LF structure (35a) yielding the semantic representation for the inverse scope (35b) before the semantics. Hence, Quantifier Storage does not need to apply for scope-shift at the semantics.

For the same reason, it can be assumed that type-shifting does not operate as a scope-shifting operation at the semantics. Moreover, if type-shifting always alters scopal relations, then it becomes difficult to capture the experimental data accounted for by the reduction mechanism of QR (see Chapter 6) since type-shifting is a semantic operation and not a costly reference-set computation. Exceptionally, type-shifting may apply as complement to QR in case of inverse linking and QR out of PPs.

In sum, QR is subject to restrictions from not only the syntax but also the syntax-semantics interface, in addition, each instance of QR gives rise to a processing cost. In Chapter 6, on the basis of the specific linking hypothesis proposed (see also Chapter 1), I will introduce the reduction mechanism which calculates the processing costs QR (and *wh*-movement) gives rise to over the course of the derivation, and predicts how much the acceptability of the sentence is reduced due to these processing costs.

The picture sketched above indicates that the availability of semantic operations must be limited. Here, I propose a weaker version of semantics than semanticists normally assume. For example, Hendriks' (1993) flexible type-shifting is so powerful that it requires restrictions on certain lexical categories to account for island constraints (see Section 2.3.2). In addition, I argue that type-shifting may only take place as a complement to QR: for satisfying the interpretation of a non-subject quantifier at the semantics; and for giving rise to possible landing sites for successive cyclic QR in case of inverse linking and QR from PPs, and that type-shifting does not alter quantifier scope. In Chapter 6, I will attempt to provide a type-shifting rule allowing type-shifting to repair a type-mismatch with an in-situ non-subject quantifier but disallowing the operation to give rise to scope-shift.

In conclusion, this chapter has discussed representative theories of quantifier scope on the basis of the result of the experimental study, which was previewed in Chapter 1. As a result of the discussion, following Fox (1995; 2000) and Reinhart (2006), I have adopted an economy-based QR approach. Section 2.4 presented the core strategy I adopt: economy-based QR theory supplemented by semantic mechanisms. The way in which the proposal links in with the model of the grammar was illustrated in Figure 2.1, 2.2, and 2.3.

The next chapter will review the existing theories of the adjunct island constraint as requisite theoretical background for the experiment testing *wh*-argument extraction and QR out of adjuncts, which will be reported in Chapter 4.

Chapter 3

On the selectivity of adjunct islands

3.1 Introduction

The goal of this chapter is to illustrate the selectivity of non-finite adjunct islands with respect to argument extraction, and to critically assess explanations offered by existing theories of the adjunct island constraint.

Among the theories discussed in this chapter, the following will be relevant to our discussion in Chapter 4 and Chapter 6: Chomsky's (1986) Barriers theory, Cinque's (1990) theory of Ā-dependencies, Truswell's (2007; 2011) event semantic approach, and Chomsky's (2000; 2001; 2008) Phase theory. Chapter 4 will report the results of the main experiment, which assessed the parallelism between QR and *wh*-movement on the basis of Truswell's fine-grained profile of adjunct islands. In Chapter 6, I develop a phase-theoretic account of the syntactic restrictions imposed by non-finite adjuncts on QR and *wh*-argument extraction, adopting ideas from Chomsky's notion of barriers and Cinque's theory of Ā-dependencies. I will also adopt Truswell's Single Event Grouping Condition as an additional constraint on *wh*-movement at the syntax-semantics interface. The discussion in this chapter will provide important theoretical background for subsequent chapters.

Islands, first studied extensively by Ross (1967), constrain movement. In general, islands are divided into two classes: strong and weak islands. On the traditional view, the distinction between weak and strong islands lies on (im)possibility of argument extraction out of islands. Strong islands block extraction of both adjuncts and arguments. Weak islands, on the other hand, (marginally) allow argument extraction but disallow adjunct extraction.

On the basis of this argument / adjunct asymmetry, *wh*-islands are categorized as weak islands, while adjunct islands have been categorized as strong islands, as illustrated by (1) and (2), respectively (Szabolcsi 2006: (5) and (6)).

(1) a. [1]*?[Which topic] did John ask [who was talking about t_{wh}]?

b. *How did John ask [who behaved t_{wh}]?

(2) a. *[Which topic] did you leave [because Mary talked about t_{wh}]?

b. *How did you leave [because Mary behaved t_{wh}]?

First, in Section 3.2, we consider the view of adjunct islands as strong (absolute) islands, namely Huang's (1982) and Uriagereka's (1999) Condition on Extraction Domain (CED) approaches, which propose that adjuncts constitute domains which block all types of extraction, as displayed in (2).

In Section 3.3, we discuss some counterexamples to the strong island view of adjuncts. I additionally show that the argument / adjunct asymmetry like (2) is too coarse to categorize islands. The selectivity of non-finite (or non-tensed) adjuncts, which permit only NP argument extraction, was initially observed by Chomsky (1986). Subsequently, Cinque (1990) observed that non-finite adjuncts only allow extraction of referential NP arguments in the sense of Rizzi's (1990) concept of referentiality. Cinque's observation suggests that non-finite adjuncts

[1]As explained by Cinque (1990), *wh*-islands are more restrictive than other weak islands like inner islands in that argument extraction from *wh*-islands yields degration like (1a), while argument extraction from other weak islands is unproblematic. Tense may also be responsible for the degradedness of (1a) compared to (i-a). See Szabolcsi (2006).

i. (a) ?Which particular problem were you wondering [how to phrase t_{wh}]?

(b) *How are you wondering [which problem to phrase t_{wh}]]?

(Cinque 1990: 3)

are 'non-selective' weak islands in that they are less selective than weak islands like *wh*-islands but more selective than strong islands like finite adjuncts.

We next discuss how Chomsky's and Cinque's Barriers approaches account for the selectivity of non-finite adjuncts. Because Cinque integrates Rizzi's (1990) notion of Relativized Minimality into his approach, I will first introduce Rizzi's theory (1990) and subsequently discuss whether the Minimality approach in the Minimalist framework (Chomsky 1995) may capture the selectivity of non-finite adjuncts.

Section 3.4 introduces Truswell's (2007; 2011) intricate profile of non-finite adjuncts. Truswell examines NP argument extraction from non-finite adjuncts in more details than Cinque did and observes that even extraction of referential NP argument from those adjuncts can be blocked if interpretation of the whole *wh*-question is not event semantically well-formed. Truswell's intricate profile of adjuncts is ideal for testing the parallelism between QR and *wh*-argument extraction across many different data points in the main experiment, which will be reported in Chapter 4. I argue however that his event semantic approach needs to be combined with a syntactic theory of locality to fully capture the weak restrictions of adjunct island boundaries I observed in the study.

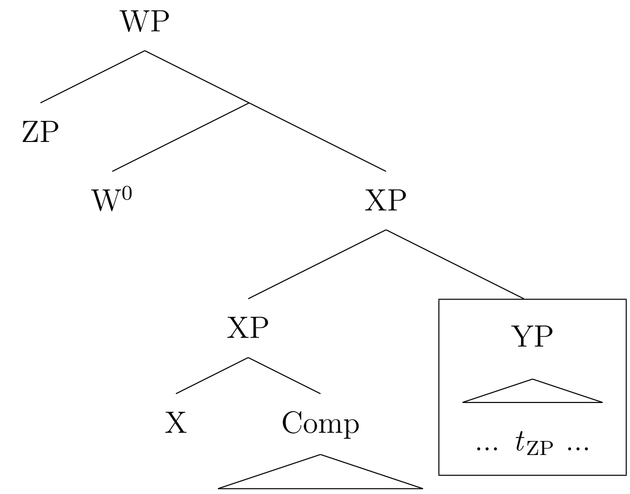
Therefore, in Section 3.5, I introduce Phase theory (Chomsky 2000; 2001; 2008), which I will adopt for my proposal to account for the weak locality effect of a non-finite adjunct on extraction in Chapter 6. We discuss problems facing a phase-theoretic account of adjunct islands, and possible extensions; for example, Chomsky's notion of barriers, as a preliminary of part of Chapter 6.

3.2 Adjuncts as absolutely strong islands

As well known, Ross (1967) was a milestone for research into various types of island constraint, but he did not discuss adjunct islands. Rather, it was Huang (1982) that first classified adjuncts as islands. Huang proposes the Condition on Extraction Domain (CED), defining adjuncts and subjects as domains blocking movement by the notion of proper government in the GB theory. Subsequently, in the Minimalist framework, Uriagereka (1999) similarly proposed that adjuncts and subjects are domains blocking extraction, but making use of Multiple Spell-Out rather than proper government to explain the impossibility of extraction from adjuncts and subjects. For our purposes, I focus on discussing CED effects of adjuncts on extraction here.

Both of Huang's and Uriagereka's approaches predict that any type of extraction from the domain of an adjunct should be banned, as depicted in (3). Here, YP is an adjunct; movement of ZP (either an argument or an adjunct) out of the domain constituted by YP is blocked:

(3) *



For Huang's (1982) CED approach, a certain domain allows extraction only if that domain is governed by a lexical head like V. Concretely, extraction from complements is allowed, whereas extraction from non-complements is disallowed. The distinction between complements and non-complements defined in terms of the presence / absence of a local relationship between a lexical head and a domain, which has to be immediately c-commanded by that lexical head (i.e. there should not be an intervening node c-commanding that domain) in order for extraction to be successful. For example, in (3), if we assume that X is a lexical head, Huang predicts that extraction from Comp, which is in a sisterhood relation with X and thus is immediately c-commanded by X, is permitted. On the other hand, the adjoined maximal projection YP is not c-commanded by the lexical head X and therefore is not a complement of X. Thus, extraction from the non-complement domain YP, is therefore predicted to be ill-formed by the CED.

On the basis of the distinction between complements and non-complements, outlined above, the CED predicts that extraction out of objects is allowed, but that extraction out of adjuncts should be disallowed. For example, the CED correctly explains well-formedness of (4) and ill-formedness of (5). The *wh*-argument is extracted out of the object, a sister of a lexical head V, in (4), whereas *wh*-argument extraction out of an adjoined phrase, which is not immediately c-commanded by a lexical head, is out in (5) (Huang 1982: 486, 503):

(4) Who did you see [pictures of t_{wh}]?

(5) *Who did Mary cry [after John hit t_{wh}]?

Although Huang's CED looks sufficient to account for the basic asymmetries between extraction out of a complement and extraction out of a non-complement, such as an adjunct, the CED incorrectly predicts that extraction from VP should also be banned. This is because VP is not c-commanded by a lexical head. For example, in (4), the CED incorrectly predicts that extraction of the *wh*-argument from VP would be disallowed. This constitutes a problem for the CED.

Let us now turn to Uriagereka's (1999) Minimalist counterpart of Huang's CED, based on the theory of Multiple Spell-Out (MSO). Since the shift from GB theory to the Minimalist Program, the notion of proper government, which the CED was based on, has been eliminated. Uriagereka's MSO theory captures the syntactic restrictions of the CED without using the definition of proper government. The goal of Uriagereka (1999) is to develop a Minimalist theory of linearization, expanding on Kayne's (1994) Linear Correspondence Axiom (LCA).

Uriagereka assumes that the computational system (i.e. syntax) allows Spell-Out to take place multiple times over the course of the derivation. He additionally proposes a strict version of the LCA, which forces Spell-Out of specifiers or adjuncts prior to Merge to the sentence structure. A Spelled-Out non-complement phrase has already been syntactically 'frozen', such that extraction out of such a Spelled-Out phrase should be ill-formed. On the other hand, Spell-Out of a complement is postponed until the whole sentence structure is built; therefore, extraction out of a complement, accessible to syntactic operations before Spell-Out, is possible. Thus, under Uriagereka's analysis, the difference between complements and non-complements amounts to a difference in the timing of Spell-Out, explaining the CED effects without invoking proper government.

To illustrate, let us now consider how Uriagereka's (1999) theory explains Huang's examples in (4) and (5). First, in (4), when C merges to the structure, the object has not been Spelled-Out yet and is still transparent for extraction. Hence, *wh*-argument extraction out of the object is well-formed. On the other hand, in (5), the adjunct clause has to be built and Spelled-Out before it merges in the adjoined position. When C merges in the course of the derivation, the *wh*-argument within the adjunct clause, which is syntactically frozen due to early Spell-Out, cannot be attracted and undergo movement. Therefore, *wh*-argument extraction out of the adjunct in (5) is not possible.

In summary, both Huang (1982) and Uriagereka (1999) class adjuncts as absolutely strong islands always blocking extraction. Their views of adjunct islands depend on the specific assumptions that the maximal projection of an adjunct is a domain disallowing extraction because of a lack of a satisfactory local relationship between a lexical head like V and that adjunct or early Spell-Out of that adjunct.

In the next section, we consider some counterexamples to the CED approaches, showing that argument extraction out of an adjunct is allowed with only mild degradedness. We then discuss three different theories of locality: Barriers approaches (Chomsky 1986 and Cinque 1990), Minimality approaches (Rizzi 1990 and Chomsky 1995), and Phase theory (Chomsky 2000; 2001; 2008), which treat adjuncts as 'non-selective' weak islands in that adjuncts are more selective compared to strong islands but less selective compared to weak islands like *wh*-islands, contrary to the CED view of adjuncts.

3.3 The selectivity of non-finite adjuncts

3.3.1 Barriers (Chomsky 1986)

As outlined in Section 3.2, the CED approaches argue for the strong island views of adjuncts. However, (6) (due to Chomsky 1986) suggests that adjuncts do not always block extraction of arguments, contrary to the predictions of the CED approaches:

(6) a. He is the person who they left $[_{\text{PP}}$ before speaking to $t_{\text{wh}}]$.

b. ??[2] He is the person to whom they left $[_{\text{PP}}$ before speaking $t_{\text{wh}}]$.

c. *How did you leave $[_{\text{PP}}$ before fixing the car $t_{\text{wh}}]$?

(Chomsky 1986: 32)

It was Chomsky's (1986) Barriers theory that firstly predicted adjuncts to be more selective than strong islands. After Huang's (1982) CED, Chomsky (1986) subsequently proposed Barriers theory, in which it is assumed that certain maximal projections can be defined as barriers restricting movement on the basis of government. For example, in the schematic tree depicted in (3), YP serves as a barrier restricting extraction of XP.

Chomsky's Barriers account is similar to the CED approach in that a certain maximal projection (e.g. YP in (3)) constitutes a domain that restricts movement, namely, a barrier. On the other hand, Barriers theory differs from the CED approaches in that the former can account for different degrees of acceptability resulting from extraction in contrast to the latter, which predicts every case of extraction to be either well-formed or ill-formed, with nothing in-between.

As schematized in (7), Chomsky's theory predicts different acceptability between adjunct extraction and argument extraction as well as acceptability gradation in argument extraction from different domains (β = barrier, Adj = adjunct, and Arg = argument):

*

(7) a. Adj $[_{\beta} \ldots\ t\ \ldots]$ (adjunct extraction: crossing one barrier)

*

b. Arg $[_{\beta}\ \ldots\ [_{\beta} \ldots\ t\ \ldots]]$ (argument extraction: crossing two barriers)

?

c. Arg $[_{\beta} \ldots\ t\ \ldots]$ (argument extraction: crossing one barrier)

[2]Chomsky (1986) does not explicitly give an acceptability grade for (6), but mentions in passing that it is unacceptable (see Chomsky 1986: 66).

First, as shown in (7a), adjunct extraction cannot cross even one barrier in that a trace in the Ā-launching site has to satisfy antecedent government because of the ECP. On the other hand, in the case of argument extraction, movement across more than one barriers yields ill-formedness because of a violation of Subjacency, as shown by (7b), whereas movement across just one barrier yields marginal acceptability, as shown by (7c). Subjacency with barriers may capture marginal possibility of argument extraction like (7b) and therefore can make a more fine-grained prediction for argument extraction out of an adjunct than the CED approaches do.

Let us now go back to extraction out of adjuncts in (6). Chomsky argues that the maximal projection of an adjunct is an inherent barrier.[3] In (6), in addition to the adjoined maximal projection (PP), IP is a barrier by inheritance; therefore, extraction out of the adjunct PP crosses two barriers, as shown in (8):

(8) a. He is the person [$_{\text{CP}}$ who [$_{\text{IP}/\beta}$ they left [$_{\text{PP}/\beta}$ before speaking to t_{wh}]]].

b. ??He is the person [$_{\text{CP}}$ to whom [$_{\text{IP}/\beta}$ they left [$_{\text{PP}/\beta}$ before speaking t_{wh}]]].

c. *[$_{\text{CP}}$ How did [$_{\text{IP}/\beta}$ you leave [$_{\text{PP}/\beta}$ before fixing the car t_{wh}]]]?

First, *wh*-adjunct extraction is out in (8c) because an Ā-trace of the *wh*-adjunct violates the ECP due to the barriers, as explained in (8a). Note that *wh*-NP-argument extraction is allowed in (8a), even though movement crosses two barriers like (8b). To account for the well-formedness of (8a), Chomsky proposes that if an NP-argument adjoins to the adjunct maximal projection, the inherent barrier (PP) is eliminated, and consequently, the IP-barrier by inheritance is also eliminated, as given in (9):

(9) He is the person [$_{\text{CP}}$ who [$_{\text{IP}}$ they left [$_{\text{PP}}$ t'_{wh} [$_{\text{PP}}$ before speaking to t_{wh}]]]]

[3]Simplified definitions of barriers are stated as follows. A maximal projection XP is a barrier for α only if (i) the XP (except IP) is not L-marked (i.e. not governed and theta-marked by a lexical category) and dominates α; (ii) the XP immediately dominates a non-L-marked maximal projection YP that dominates α. (i) is called an inherent barrier, while (ii) is called a barrier by inheritance. IP does not become an inherent barrier but can be a barrier by inheritance.

Chomsky mentions that this option may be allowed only for NP-argument extraction. Thus, NP-argument extraction out of the adjunct is well-formed in (9). On the other hand, Chomsky stipulates that PP-argument extraction does not have the adjoining option. Hence, this type of extraction is subject to a violation of Subjacency and is unacceptable, as shown in (8b).

As outlined in Section 3.1, the asymmetry between argument and adjunct extraction out of an adjunct, illustrated by (8), is commonly observed in weak island cases like *wh*-islands. As we have seen in (1a), extraction of a *wh*-argument from a *wh*-island is marginally allowed, whereas extraction of the *wh*-adjunct is ill-formed in (1b). Hence, the adjunct / (NP-) argument asymmetry in (8) indicates that adjunct islands behave like selective islands rather than absolute islands. Moreover, the contrast between NP- and PP-argument extraction in (8a) and (8b) cannot be captured by the traditional argument / adjunct asymmetry used to distinguish weak islands and strong islands.

In sum, Chomsky's (1986) data in (6) indicate that the CED approaches' account of adjuncts as strong islands is unsuccessful, in that at least argument extraction from adjuncts is not completely ill-formed. In the history of research into adjunct islands, Chomsky's Barriers theory was notable for raising the question of the plausibility of the categorization of adjuncts as strong islands and the traditional weak / strong island distinction, introduced in Section 3.1. Like the CED, barriers with the ECP accounts for the ill-formedness of adjunct extraction out of an adjunct, the maximal projection of which constitutes a barrier, like (8c). On the other hand, compared with the CED, barriers with Subjacency can give a more fine-grained account of argument extraction. To account for possibility of NP-extraction out of an adjunct in (8a), however, Chomsky's theory requires the additional assumption that adjoining to the adjunct maximal projection may eliminate a barrier-hood. Moreover, Chomsky does not clearly explain why PP-extraction, for which the adjoining option is unavailable, is difficult in (8b).

3.3.2 Barriers with Relativized Minimality: Cinque (1990)

Cinque (1990) integrates Rizzi's (1990) Relativized Minimality and the notion of referentiality into Chomsky's (1986) Barriers theory, providing a more in-depth study of argument extraction out of adjuncts. After briefly introducing Rizzi's Relativized Minimality, I explain Cinque's Ā-dependency account of extraction out of adjuncts.

3.3.2.1 Rizzi (1990): Relativized Minimality

Here, I introduce Rizzi's (1990) two important proposals, which are adopted by Cinque (1990): (i) Relativized Minimality (RM), a theory of locality which treats island effects as blocking effects yielded by intervenors; (ii) the concept of referentiality, which accounts for which kinds of argument may be extracted out of an island.

First, on the basis of Chomsky's (1986) Minimality barriers, Rizzi (1990) proposes that Relativized Minimality: a locality constraint accounting for an intervening effect yielded by Z on (antecedent / head) government between X and Y, as shown in (10).[4]

(10) X ..... (*Z) ..... Y

In terms of movement, Rizzi argues that movement from Y to X is blocked if there is an intervenor Z, sharing some syntactic characteristic with X, between X and Y in the movement chain. An intervenor Z can be either a head or an A- / Ā-specifier, as stated in (11).

[4] Chomsky's (1986) Minimality barriers differ from the general barriers introduced in Section 3.3.1 in that (i) Minimality barriers may not be maximal projections; (ii) they are barriers exclusively blocking antecedent government; and (iii) an intervening head in the government chain renders a projection containing that head be a barrier. Unlike Rizzi's (1990) Relativized Minimality, Minimality barriers are projections containing intervening heads which exclusively restrict antecedent governments by heads.

(11) **Relativized Minimality**

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

a. Z is a typical potential α-governor for Y, and

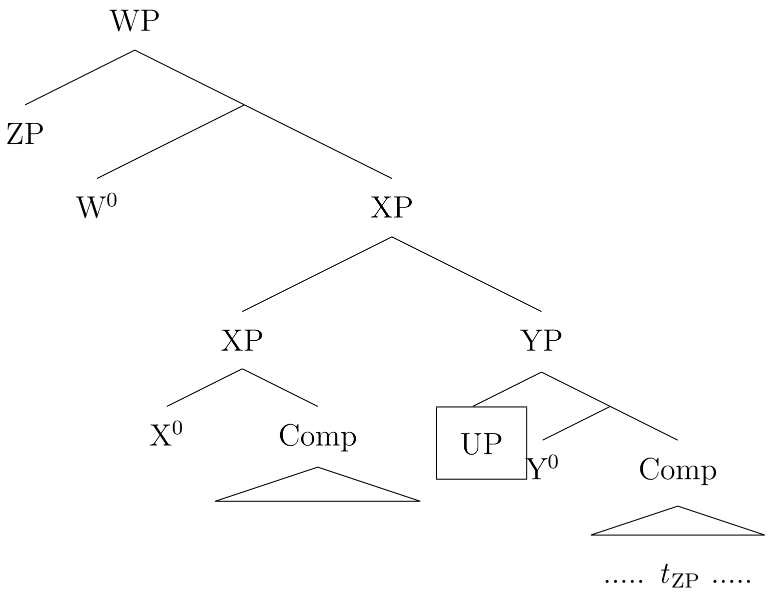
b. Z c-commands Y and does not c-command X.
(Where α ranges over heads, A-specifiers, or $\bar{\text{A}}$-specifiers)

(Rizzi 1990: 4)

Regarding island constraint on $\bar{\text{A}}$-movement like *wh*-movement, Rizzi's Minimality account differs from the CED approach and Barriers theory in that it takes intervenors to be blocking categories rather than domains. As we have seen in (3), the (post)-CED approaches and Chomsky's Barriers theory assume that adjunct island effects on movement are yielded by certain maximal projections like YP, which lack a satisfactory local relationship with a lexical category.

On the other hand, as shown in (12), Rizzi's Minimality approach assumes that an island effect on $\bar{\text{A}}$-movement of ZP to Spec WP is yielded by the presence of an intervenor UP in Spec YP, an $\bar{\text{A}}$-specifier closer to the landing site of ZP, as illustrated in (12):

(12) *



Rizzi's Minimality approach, however, is not suggestive for adjunct islands. In (12), assuming that YP is an adjunct, $\bar{\text{A}}$-movement is blocked if Spec YP hosts an $\bar{\text{A}}$-intervenor sharing the same syntactic property with a moving category. For example, *because*-clauses in (2) and *before*-prepositional gerunds in (6) do not overtly host potential Ā-interveners in Spec of the adjunct maximal projections, CP and PP, respectively.

Rather, as explained by Szabolcsi and Den Dikken (2002), Rizzi's Relativized Minimality had an impact on research on weak islands. Since Rizzi's invention of Relativized Minimality, various types of weak islands have been accounted for by Minimality approaches. For instance, in the case of *wh*-islands like (1), a *wh*-phrase in the Spec of the embedded CP serves as an Ā-intervenor blocking *wh*-movement out of the embedded CP. Negation and VP adverbs occupying Ā-specifiers also yield weak island effects (see Szabolcsi and Den Dikken 2002). Relativized Minimality is, however, not sufficient to capture the argument / adjunct asymmetry in extraction out of weak islands like (1).

Let us now turn to the concept of referentiality proposed by Rizzi. In addition to RM effects, Rizzi also argues that the possibility of extraction from islands may be dependent on referentiality of extractees. He proposes that referential (or D-linked in the sense of Pesetsky 1987) elements in θ-positions can carry referential indices and may enter to binding relations, which are not subject to (11). For example, in (1), the *wh*-argument moving from a θ-position is not subject to (11) in (a), whereas the *wh*-adjunct moving from a non-θ-position is restricted by the RM effect in (b).

Rizzi's concept of referentiality accounts not only for the traditional argument / adjunct asymmetry on extraction from weak islands, mentioned above, but also a contrast observed in *wh*-extraction of different types of arguments ((13) is taken from Cresti 1995: 81)[5]:

(13) a. [Which glass of wine] do you wonder [whether I poisoned t_{wh}]?

b. *[How much wine] do you wonder [whether I poisoned t_{wh}]?

[5]Cresti (1995), however, argues against Rizzi's (1990) and Cinque's (1990) use of the term of referentiality from a semantic perspective. Cresti claims that Fodor and Sag's (1982) view of referentiality of indefinites, which explains the widest scope of indefinites, which Cinque (1990) additionally adopts, cannot be applied to *wh*-phrases. Her analysis of *wh*-islands is beyond the scope of this chapter.

According to Rizzi's criteria of referentiality, *which glass of wine* in (13a) is a referential argument, whereas *how much wine* in (b), a *wh*-quantifier of 'amount', is not. The reason why (13b) is ill-formed is because the Ā-chain, created by extraction of the non-referential *wh*-argument, is blocked by an Ā-intervener *whether* in the embedded Spec CP. On the other hand, extraction of the referential *wh*-argument makes use of a binding chain; hence, this operation is not subject to the RM effect in (a). Thus, the traditional notion of argument / adjunct asymmetry is reduced into a new distinction between referentiality and non-referentiality of extractees in Rizzi's theory of Relativized Minimality.

In summary, Rizzi's (1990) proposal with Relativized Minimality (11) introduces two important concepts: (i) island effects on Ā-movement are yielded by RM effects of Ā-intervenors; (ii) only elements marked by referential indices in θ-positions can make use of binding chains, which are not restricted by Relativized Minimality. On the basis of these two concepts, Rizzi accounts for various types of weak islands and more detailed extraction patterns (referential vs. non-referential arguments) like (13) than the traditional argument / adjunct asymmetry.

As pointed out before, however, Rizzi's account has difficulties in explaining the ill-formedness of extraction from adjuncts that do not host potential intervenors in their specifiers. Before we move to Cinque (1990), I would like to briefly introduce Chomsky's (1995) Minimal Link Condition (MLC) in order to argue that this Minimalist version of the Minimality account faces a similar problem with respect to adjunct islands.

Chomsky's (1995) MLC, including concepts of Attract and Shortest Move (see Chapter 2), is a representative Minimalist alternative of Relativized Minimality. The main concept of the MLC is almost identical to Rizzi's Relativized Minimality except for replacement of the technical notions of government and binding by the mechanism of Agree and Attract. As schematically shown in (14), assuming that a functional head X is endowed with the uninterpretable counterpart ($[-u]$) of an interpretable feature ($[+u]$) possessed by Y, Y is Attracted by X and undergoes Ā-movement to Spec XP. Given the MLC, this movement is successful only if there is no Ā-intervenor Z, endowed with the same uninterpretable feature X has, closer to Y:

(14) $X_{[-u]}$ ..... $(^*Z_{[-u]})$ ..... $Y_{[+u]}$

The MLC account forces the same problems as Rizzi in explaining adjunct island effects on *wh*-movement in that, unlike *wh*-islands, adjunct islands do not host Ā-intervenors endowed with uninterpretable *wh*-features in their specifiers. Moreover, the MLC has difficulty in accounting for the selectivity of non-finite adjuncts, especially weak island effects on argument extraction, observed in the experiment, by assuming that an adjunct head is endowed with a certain Ā-intervening feature.[6]

In conclusion, the Minimality approaches in both the GB and the Minimalist frameworks can capture the selectivity of weak islands like *wh*-islands, but they are not suitable to account for the selectivity of adjunct islands as in (6) since adjuncts generally do not host an Ā-intervenor in their specifiers, yielding RM effects, and generally it is not very easy to explain the selectivity of non-finite adjuncts, especially weak restrictions on argument extraction (discussed in Chapter 6), simply according to features / properties of the head of the adjunct.

[6]Starke (2001) proposes Relativized Minimality with a two layered feature system and extends RM to strong islands. He assumes that a dominating node could be an intervenor yielding a RM effect.

Assuming that Ā-movement is triggered by a C-class feature α, this movement is subject to the RM effect yielded by an intervenor endowed with α. Starke also proposes, however, that if extractees are endowed with a SC feature β (eg. specificity), a subclass of α, in addition to α, Ā-movement triggered by $\alpha\beta$ may avoid RM effects of weak islands formed by α. On the other hand, Ā-movement triggered by either α or $\alpha\beta$ is subject to the RM effect of strong islands formed by $\alpha\beta$. Thus, we must know what feature is involved in explaining island effects.

Starke categorizes adjuncts as strong islands in general. To capture the possibility of argument extraction from adjuncts, observed by Cinque (1990), however, Starke mentions that there may be cases where an adjunct serves as a weak island formed by α allowing $\alpha\beta$ movement. To explain the selectivity of adjuncts, Starke needs to provide criteria for which class of adjuncts serve as weak islands and as strong islands, but Starke does not give such a detailed analysis for what kind of adjuncts to exceptionally serve as weak islands. Truswell's (2007; 2011) profile of adjuncts (see Section 3.4) suggests that patterns of extraction from adjuncts are too intricate to be accounted for only by absence or presence of a SC feature β on heads of adjuncts.

3.3.2.2 Cinque (1990): the Ā-dependency approach

As discussed in the previous subsection, the Minimality approaches can account for weak islands but not suggestive for adjunct islands. Cinque (1990) provides a more detailed analysis of the selectivity of adjunct islands, which was observed in (6), than Chomsky (1986) by integrating Rizzi's (1990) Relativized Minimality and the concept of referentiality into Chomsky's Barriers theory.

First, following Rizzi (1990), Cinque (1990) argues that there are two types of Ā-movement chains: (i) binding chains and (ii) government chains. On the basis of Rizzi's concept of referentiality, referential (or D-linked) extractees in θ-positions enter into binding chains and undergo long *wh*-movement, whereas other types of extractees enter into government chains and undergo successive cyclic *wh*-movement. In addition to these two Ā-dependencies, Cinque additionally proposes a third Ā-dependency made use of only by referential NP-arguments. Contrary to the first two Ā-dependencies, leaving movement traces at the launching sites, the third one involves an Ā-bound *pro* as a gap of an NP-argument.[7]

Second, adopting Chomsky's (1986) Barriers theory, Cinque argues that Ā-movement is blocked by barriers. As explained in Section 3.3.1, Chomsky originally assumes that the same type of maximal projections restrict both adjunct and argument extraction as barriers, but that each type of extraction is governed by an additional condition linked with barriers: the ECP and Subjacency, respectively. On the other hand, Cinque assumes that binding and government chains are each restricted by different types of barriers, as stated in (15) and (16), respectively. Ā-pronominal binding chains are subject to neither (15) nor (16):

(15) **Barriers for binding**

Every maximal projection that fails to be (directly or indirectly) selected in the canonical direction by a category nondistinct from [+V] is a barrier for binding.

[7]In addition to these three types of Ā-dependencies, Cinque introduces a fourth type of Ā-dependency active in left dislocation and relative constructions. I ignore this type here as it is unrelated to the topic of this thesis.

(16) **Barriers for government**

Every maximal projection that fails to be directly selected by a category non-distinct from [+V] is a barrier for government.

(Cinque 1990: 55)

Unlike in Chomsky's version of barriers in connection with Subjacency, argument extraction crossing just one barrier for binding gives rise to ill-formedness in Cinque's system. Cinque adopts the distinction between binding and government chains from Rizzi, but his definition of barriers for binding in (15) results in a more restrictive theory than Rizzi's, which assumes that binding chains are not subject to the RM effects.

Cinque's three types of Ā-dependency and two types of barrier in (15) and (16) give rise to the following patterns of Ā-extraction:[8]

(17) a. **Binding** (Referential NP / PP argument extraction)

$*\mathrm{Arg}_{+Ref}\ [_{\beta b}\ t\ \ldots]$

b. **Government** (Adjunct / non-referential argument extraction)

$*\mathrm{Adj}\ /\mathrm{Arg}_{-Ref}\ [_{\beta g}\ t\ \ldots]$

c. **Apparent NP extraction** (Referential NP extraction)

$\mathrm{NP\text{-}Arg}_{+Ref}\ [_{\beta b/\beta g}\ pro\ \ldots]$

Referential NP / PP argument extraction, taking the form of long *wh*-movement, is restricted by a barrier for binding as shown by (17a), whereas adjunct or non-referential argument (e.g. *how many*-NPs) extraction, taking the form of successive cyclic *wh*-movement, is restricted by a barrier for government as shown by (17b). Finally, Cinque assumes that (17c) is a marked option that becomes available for referential NP extraction only if long *wh*-movement via binding (17a) is blocked by a barrier for binding (15). This Ā-*pro* binding route is not subject to barriers for either binding or government.

[8]Abbreviations used in (17) are as follows: Arg = argument, Adj = adjunct, +/-Ref = referential / non-referential, and $\beta g/\beta b$ = barrier for government / for binding.

On the basis of the Ā-extraction patterns in (17), Cinque provides a more fine-grained categorization of islands than the traditional distinction between weak and strong islands (see also Szabolcsi and Den Dikken 2002 and Szabolcsi 2006), as shown in Table 3.1 (I use my own labels for the three types of islands for our purpose.[9]):

Selective weak	**Non-selective weak**	**Strong (absolute)**
wh-islands	Non-finite adjuncts	Finite adjuncts
Negative islands	Complex NP(?)	Subject islands
*Adj, *Arg$_{-\mathrm{Ref}}$, $\surd$Arg$_{+\mathrm{Ref}}$	*Adj, *PP, *NP$_{-\mathrm{Ref}}$, $\surd$NP$_{+\mathrm{Ref}}$	*Adj, *PP, *NP$_{+/-\mathrm{Ref}}$

Table 3.1: Three island classes indicated by Cinque (1990)

First, *wh*-islands and negative islands, which allow both NP and PP argument extraction but disallow adjunct extraction, can be categorized as 'selective' weak islands formed by barriers for government (16) in that they only block adjunct extraction.[10]

Next, the availability of the marked option (17c) for referential NP extraction indicates that the traditional categorization of strong islands should have at least two sub-categorizations: 'non-selective' weak islands and strong (absolute) islands. Both 'non-selective' weak islands and strong islands are formed by maximal projections that are barriers for binding and government, such as adjunct maximal projections, but the former, which includes non-finite adjuncts and complex NP islands differs from the latter including finite adjuncts (see (2))

[9]Cinque (1990) himself does not explicitly endorse this categorization. For Cinque, (17c) is a non-movement operation not constrained by island constraints, so that he still categorizes adjunct islands as strong islands. Szabolcsi (2006), who adopts Cinque's distinction between strong and weak islands, states that weak islands are ones that may permit PP-gaps, while strong islands are ones that can only contain NP-gaps, empty pronouns (see (10) in Szabolcsi 2006).

[10]According to Cinque (1990), and as indicated by (1), *wh*-islands marginally allow NP-extraction. On the other hand, negative islands and other selective weak islands more easily permit NP and PP-extraction. In this respect, *wh*-islands may be stronger than the other selective weak islands. There should also be sub-categorizations for selective weak islands (for example, see Abrusan 2007).

and subject islands (see Kayne 1984), in that the strategy in (17c) is allowed for referential NP-extraction out of the former but not for the latter.

Thus, non-selective weak islands differ from selective weak islands in that they block extraction via either binding (17a) or government (17b), and can be said to be more selective than strong islands because of their allowance of the strategy in (17c) for referential NP-extraction.

Let us now reconsider extraction out of non-finite adjuncts (non-selective weak islands) in light of Cinque's proposals. As a consequence of the definitions in (15) and (16), the maximal projection of an adjunct, which does not satisfy any selectional requirement by categories non-distinct from [+V], is a barrier for both binding and government. Hence, extraction of a referential PP argument (6b), crossing a barrier for binding as shown in (18b), and adjunct extraction (6c), crossing a barrier for government as shown in (18c), are ill-formed. On the other hand, extraction of a referential NP argument in (6a), making use of a pronominal binding chain restricted by neither (15) nor (16), is possible as (18a) shows:

(18) a. He is the person [$_{\text{CP}}$who they left [$_{\text{PP}(\beta\text{g}/\beta\text{b})}$ before speaking to *pro*$_{\text{wh}}$]].

b. ??He is the person [$_{\text{CP}}$ to whom they left [$_{\text{PP}(\beta\text{g}/\beta\text{b})}$ before speaking *t*$_{\text{wh}}$]].

c. *[$_{\text{CP}}$ How did you leave [$_{\text{PP}(\beta\text{g}/\beta\text{b})}$ before fixing the car *t*$_{\text{wh}}$]]?

Thus, Cinque accounts for the difference in acceptability between NP and PP extraction out of non-finite adjuncts like (6), which Chomsky (1986) accounts for by allowing only NP-arguments to adjoin to the adjunct maximal projection, by the option of (17c) for referential NP-extraction.

Finally, unlike non-finite adjuncts like (18), finite adjuncts are categorized as absolute islands in that the strategy in (17c) is unavailable for referential NP-extraction from those. Cinque stipulates the contrast between the two by assuming blocking effects by tensed I on upward percolation of *wh*-features, an operation involved in the Ā-bound *pro* strategy (17c).

Cinque argues that an Ā-bound *pro* can be pied-piped to a non-finite adjunct where it undergoes LF-movement.[11] Pied-piping of an Ā-bound *pro* involves

[11]As evidence for this argument, Cinque (1990) provides Italian data showing that an NP-

upward feature percolation, which is blocked by tensed I. Therefore, an Ā-bound *pro* can be pied-piped to a non-finite adjunct but cannot be pied-piped to a tensed (finite) adjunct. Thus, apparent NP extraction from finite adjuncts is ill-formed contrary to the case of non-finite adjuncts.

However, Cinque leaves the reason why tense blocks feature percolation open. This thesis will not discuss how tense strengthens adjunct island effects, since non-finite adjuncts are the primary focus of the experiment reported in Chapter 4. This is because non-finite adjuncts are non-selective weak islands and therefore allow more testing points than tensed adjuncts.

In summary, Cinque's (1990) Ā-dependency approach with Rizzi's (1990) concept of referentiality introduces three types of Ā-dependencies, which each exhibit different sensitivity to the two types of barriers, as shown in (17). These Ā-extraction patterns indicate that there should be at least three classes of islands as shown in Table 3.1.

Regarding adjunct islands, Cinque argues that the maximal projection of an adjunct forms a barrier for both government and binding. Contrary to finite adjuncts, non-finite adjuncts are categorized as non-selective weak islands in that they allow referential NP-extraction like (6a). As schematically shown in (18), Cinque accounts for the grammatical contrast between PP-argument extraction and referential NP-argument extraction from non-finite adjuncts by assuming that they make use of different Ā-dependencies: (17a) and (17c), respectively.

The strength of Cinque's theory is that the different Ā-dependencies can capture the selectivity of non-finite adjuncts (unaccounted for by Rizzi's RM) as well as the difference between referential and non-referential argument extraction (unaccounted for by Chomsky's Barriers theory). In Chapter 6, I will partly adopt Cinque's conception of Ā-dependencies to account for the weak restrictions of non-finite adjuncts on argument extraction.

However, I would like to point out that Cinque's analysis is problematic when it comes to explaining the pattern of acceptability with QR out of non-finite

gap contained inside two non-finite adjuncts gives rise to unacceptability. He assumes that LF movement of a pied-piped Ā-bound *pro* to the inner island creates a binding chain subject to the barrier yielded by the outer island.

adjuncts. Cinque (1990:8-9) argues that certain types of quantifiers like universals are not referential in that those quantifiers can enter pronominal binding relations only by c-command but not by co-reference. This predicts that quantifiers have to make use of government chains for extraction like (17b), and that extraction of quantifiers out of non-finite adjuncts should be impossible, much like adjunct extraction. As will be reported in Chapter 4, the outcome of the study revealed that QR from non-finite adjuncts is marginally possible unless certain conditions are violated, and therefore, Cinque's analysis makes the wrong predictions for QR.

3.4 The Single Event Grouping Condition: Truswell (2007; 2011)

As outlined in the previous section, contrary to the absolute island view of adjuncts, Chomsky (1986) shows that NP argument extraction out of non-finite adjuncts is in principle allowed. Subsequently, Cinque (1990) argued that only referential NP arguments can be extracted out of non-finite adjuncts, which I categorized as non-selective weak islands (see Table 3.1). However, Truswell (2007; 2011) observes that non-finite adjuncts are indeed more selective than Chomsky and Cinque argued in that NP arguments cannot always be extracted, even if those NP arguments are referential in Rizzi's (1990) and Cinque's sense.

In Truswell (2007; 2011) (see also Borgonovo and Neeleman 2000), the empirical profile of the adjunct island constraint is explored more extensively than Cinque, in that extraction from multiple types of non-finite adjuncts are discussed. First of all, Truswell confirms Chomsky's (1986) claim that *wh*-NP arguments can move out of non-finite adjuncts, while *wh*-adjuncts cannot, in sentences like (19) and (20) (based on Truswell 2011):[12]

[12]Truswell (2007; 2011) focuses on analyzing *wh*-argument extraction from adjuncts, but he does not discuss *wh*-adjunct extraction from adjuncts on the basis of the Single Event Grouping Condition. Therefore, I constructed the examples of *wh*-adjunct extraction in (19b), (20b), and (21b) on the basis of Truswell's (2011) examples of *wh*-argument extraction in (19a), (20a), and (21a) (with some modifications).

(19) a. ?What did John die [thinking about t_{wh} whistfully]?

b. *How did John die [thinking about his unpublished poetry t_{wh}]?

(20) a. ?What did John cut himself [trying to carve t_{wh} with a Japanese knife]?

b. *How did John cut himself [carving the Christmas turkey t_{wh}]?

In addition to extraction from bare participial gerunds in (19) and (20), Truswell extends his investigation to other types of non-finite adjuncts. For example, (21) illustrates extraction from *after*-prepositional gerunds (% indicates that speakers show variations in judgments)[13]. Similarly, as shown in (22), complements of prepositional modifiers can also be extracted:[14]

(21) a. %?Which gardening book did John redesign his garden [after reading t_{wh} with great care]?

b. *How did John redesign his garden [after reading The Gardeners Pocket Bible t_{wh}]?

(22) %?Which boring play did John fall asleep [during t_{wh}]?

The acceptability of the above examples can be accounted for under Cinque's approach on the basis of referentiality and the NP / non-NP distinction, discussed in Section 3.3.2. However, Truswell additionally demonstrates that even referential NP argument extraction from adjuncts is not always possible (contra Cinque). For instance, unlike in (21), where referential NP argument extraction from *after*-prepositional gerunds is marginally possible, the same type of extraction is disallowed in the given context in (23):

[13] The % symbol was used when 60 % of informants accept the sentence, whereas the * symbol was used when 0-20 % of informants accept the sentence (Robert Truswell, p.c.).

[14] In the case of extraction from PPs, we cannot construct a minimal pair, as PPs cannot contain rightward modifiers, and therefore the status of extraction of *wh*-adjuncts from PPs is hard to test.

(23) [Context: John has wanted to redesign his garden for a while, but he also wanted to finish the Raymond Chandler novel that he was reading. So, in the end, he only redesigned his garden after finishing the novel]

*What Raymond Chandler novel did John redesign his garden [after reading t_{wh}]?

Truswell argues that the possibility / impossibility of referential NP argument extraction from a non-finite adjunct in sentences like (21a) and (23), depends on whether a certain event semantic requirement, namely the Single Event Grouping Condition, is satisfied for that extraction to be felicitous, as given in (24) - (26) (cited from Truswell 2011: 157-158):

(24) **The Single Event Grouping Condition**

An instance of *wh*-movement is legitimate only if the minimal constituent containing the head and the foot of the chain can be construed as describing a single event grouping.

(25) **The definition of 'event grouping'**

An *event grouping* E is a set of core events and/or extended events {e_1, ... e_n} such that:

a) Every two events e_1, $e_2 \in$ E overlap spatiotemporally;

b) A maximum of one (maximal) event e $\in$ E is agentive.

(26) An event e is agentive iff:

(i) e is an atomic event, and one of the participants in e is an agent;

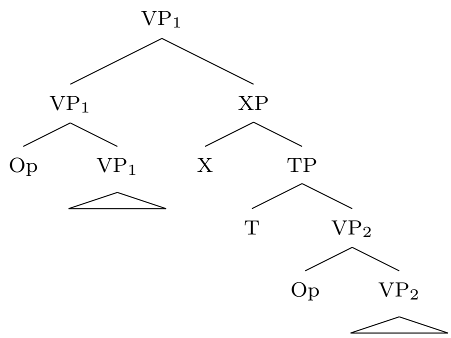
(ii) e consists of subevents e_1, ... e_n, and one of the participants in the initial subevent e_1 is an agent.

In a nutshell, Truswell's proposal is that extraction is possible only if an event described by the matrix VP and an event described by the adjunct can be construed as a single event grouping, as defined in (25). There are two ways in which this can be achieved: spatio-temporal overlapping between the two events (25a); as long as not more than one event is agentive (25b) (see (26) to see how an event can become agentive). Moreover, Truswell also suggests a secondary factor facilitating a single event grouping: a causal relation established between an event described by the adjunct and an event described by the matrix VP (but this factor is not explicitly stated in (25)). If the Single Event Grouping Condition is not satisfied in terms of the definitions in (25), the presence of a causal relation between the two events can help form a single event grouping, as illustrated below.[15]

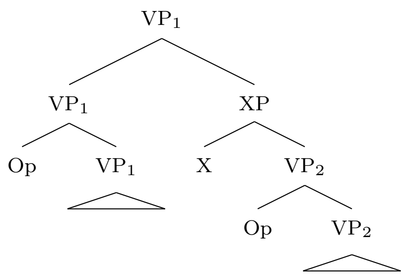
Let us now consider how Truswell's Single Event Grouping Condition (24)

[15] In order to explain the strong islandhood of tensed adjuncts, Truswell (2011) assumes that a tensed adjunct contains its own event operator, which blocks construal with the matrix VP as a single event grouping (see (i)). Non-finite adjuncts do not necessarily have their own event operator; they may do (see (ii)), but their event variable may also be bound parasitically by the matrix operator (see (iii)). In that case, construal as a single event grouping, and therefore extraction, is possible. ((i), (ii), and (iii) are all cited from Truswell 2011: 116-118):

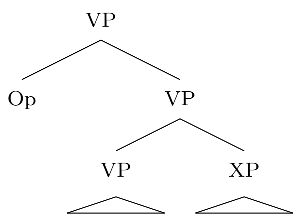
(i).



(ii).



(iii).



For more details, I refer the reader to the original text.

accounts for the grammatical contrast between (21a) and (23). First, in both (21a) and (23), there is no spatio-temporal overlap, as indicated by the temporal preposition *after*, which rather indicates time precedence between two events, so what distinguishes the acceptability of (21a) from that of (23) is presence / absence of a causal relation between the matrix and the adjunct events.[16]

In (21a), extraction is judged as more acceptable if John's reading of the gardening book is interpreted as the cause of his redesigning his garden. On the other hand, the extraction is judged as less acceptable if the reading merely precedes the redesign process (as a matter of chance). On the other hand, this is all the more obvious if the book that John has been reading has nothing to do with gardening like (23), the scenario of which shows that in the absence of both spatio-temporal overlap and a causal relation, extraction out of adjuncts is impossible.

Finally, note that Truswell (2011) discusses the complication of syntacticizing the Single Event Grouping Condition in that the idea that felicitous interpretations of *wh*-questions (i.e. semantic factors) determine syntactic structures does not cohere naturally with the structure of the language faculty standardly as-

[16]In (21a) and (23), the event of reading and the event of redesigning are considered to be agentive; therefore, (25b) is not satisfied, either. This is why presence of a causal relation between the matrix and the adjunct events is required for formation of a single event grouping.

(25b) is more relevant to single event grouping in sentences with bare participial gerunds than those with *after*-prepositional gerunds. As discussed in Truswell (2011), an event described by a bare participial gerund is structurally required to be simultaneous with an event described by a matrix VP, and spatio-temporal overlap (25b) is satisfied between the two events (see Chapter 6 for discussion on this issue). Hence, whether single event grouping can be successfully formed between the event described by a bare participial gerund and the matrix event depends on satisfaction of the agentivity condition (25b). For example, unlike (19a) and (20a), where (25b) is satisfied and then extraction is allowed, extraction is blocked in (i), in which (25b) is violated in that both the dancing event and the screaming event are agentive (cited from Truswell 2011: 159):

(i). *What does John dance [screaming t_{wh}]?

In the main experiment, we used only non-agentive verbs for matrix verbal predicates for the test items to eliminate the agentivity effect, but we did not test it as a factor (see Chapter 4). Therefore, I will not discuss the agentivity condition (25b) further in this thesis.

sumed in generative linguistics. Hence, he ultimately argues that violations of the Single Event Grouping Condition introduce cognitive processing effects or costs (cf. Gibson 2000). In other words, the Single Event Grouping Condition should be in effect at post-syntax; either at the syntax-semantics interface or at semantics. Therefore, Truswell's Single Event Grouping Condition does not compete with syntactic theories of locality, but can work in tandem with them.

We will come back to this issue in Chapter 6, where I will incorporate the Single Event Grouping Condition into my proposal, which was previewed in Chapter 2, as a condition applying to *wh*-movement at the syntax-semantics interface.

In summary, unlike Cinque (1990), who observes that non-finite adjuncts are non-selective weak islands only allowing referential NP argument extraction, Truswell (2007; 2011) argues that the possibility of *wh*-extraction from non-finite adjuncts does not totally depend on the category and referentiality of moving elements but also on whether the whole interrogative sentence felicitously yields a single-event grouping interpretation.

Let us now evaluate Truswell's account of adjunct islands. First, Truswell (2007; 2011) has been a milestone in research on extraction from adjuncts, in that he demonstrates that different classes of non-finite adjuncts allow (referential) NP argument extraction to a different extent on the basis of whether the whole *wh*-question can felicitously form a single event grouping. Truswell's intricate profile of non-finite adjuncts is ideal for examining the locality of QR in that it allows a more diverse range of test cases, and makes more fine-grained predictions compared to other approaches analysing adjuncts as less selective islands.

Therefore, we made use of the three types of non-finite adjuncts Truswell tested: bare participial gerunds, *after*-prepositional gerunds, and *during*-PPs and presence / absence of causal relations between matrix and adjunct events as test conditions of the experimental study examining the parallelism between QR and *wh*-argument extraction. I will report the details of the study in Chapter 4.

Next, Truswell's data, presented from (19) to (23), are difficult to capture using theories of locality that assume that adjuncts simply block movement for syntactic reasons. The CED approaches, for example, cannot predict the possibility of extraction out of non-finite adjuncts at all.

Third, for Cinque's Ā-dependency approach, which assumes that non-finite adjuncts generally constitute barriers for binding, there is no way to explain how NP extraction from bare participial gerunds as in (19a) is more acceptable than NP extraction from *after*-prepositional gerunds, as in (21a). Moreover, the differing acceptability in extraction from *after*-prepositional gerunds between (21a) and (23) indicates that Rizzi's concept of referentiality is just insufficient to capture the (im)possibility of extraction from this type of adjuncts.

Fourth, as discussed by Truswell (2007), Minimality approaches such as Chomsky (1995) might capture the relevant facts by assuming that only a particular head of the adjunct XP that disallows extraction is endowed with an Ā-feature that intervenes in an Agree relation between a probe and a goal. As we have seen in (21a) and (23), however, the acceptability of *wh*-argument extraction even from the same type of non-finite adjuncts, whose head should have the same Ā-intervening feature, is different between the two examples. This indicates that this type of analysis cannot account for why the same non-finite adjuncts marginally allow extraction in some cases but disallow it in others.

On the other hand, Truswell's account, based on the Single Event Grouping Condition (24), must be supplemented by some additional theories of locality. (24) can predict possibility of (referential) NP argument extraction but seems not to predict the impossibility of adjunct extraction. This indicates that his approach is limited to accounting for NP argument extraction out of non-finite adjuncts, which has been explained by the Barriers approaches. In this respect, Truswell's analysis still depends on Cinque's (1990) prediction on the basis of categories of moving elements.

In Chapter 4, the outcome of the study will reveal that Truswell's Single Event Grouping Condition can correctly predict the (im)possibility of *wh*-argument extraction from the the three types of non-finite adjuncts in general, but even extraction from bare participial gerunds, predicted to be well-formed by (24), is subject to degradedness. On the basis of this fact, in Chapter 6, I will argue that *wh*-argument extraction out of an adjunct is always subject to a weak restriction of an adjunct boundary, even if it takes place even in a sentence which obeys the Single Event Grouping Condition. This suggests that Truswell's approach needs to be complemented by a syntactic theory of locality, in order to capture the weak restriction of an adjunct on argument extraction.

In conclusion, this section has introduced Truswell's (2007; 2011) fine-grained profile of *wh*-argument extraction from non-finite adjuncts and explained how the Single Event Grouping Condition (24) predicts that certain non-finite adjuncts allow *wh*-argument extraction. As discussed above, Truswell's profile of extraction from adjuncts enabled us to empirically test the parallelism between QR and *wh*-argument extraction across many different data points. On the other hand, on the basis of the outcome of the study, I pointed out that Truswell's event semantics-based approach needs to be supplemented with a syntactic theory of locality to account for weak effects of non-finite adjuncts on argument extraction.

Among the theories of locality discussed in this chapter, I consider Chomsky's (1986) notion of barriers to be the most similar to the weak effects of adjunct island boundaries in question, in that movement crossing one barrier gives rise to mild degradedness. The main idea of Chomsky's Barriers theory is insightful, but the theory predicts that NP-extraction from an adjunct should always be well-formed by allowing adjunction to that adjunct in order to void the barrier-hood of the adjunct, and additionally its technologies are complicated and no longer used in the Minimalist framework.

In the next section, I introduce Phase theory (Chomsky 2000; 2001; 2008), a Minimalist theory of locality with the potential to explain the locality of non-finite adjuncts with some modifications. I will adopt this theory along with the concept of barriers to account for the weak adjunct island effect on argument extraction in Chapter 6.

3.5 Phase theory: Chomsky (2000; 2001; 2008)

Let us now consider Phase theory (Chomsky 2000; 2001; 2008). The original conception of Phase theory does not predict that non-finite adjunct islands are selective unlike Cinque (1990) and Truswell (2007; 2011). The reasons why I introduce Phase theory here are, however, because this theory (i) allows us to account for the possibility of extraction from adjuncts via successive cyclic movement with some adequate modification and (ii) it is ideal for capturing the locality conditions of QR.

First, Phases are minimal units of locality domains that undergo Spell-Out. Chomsky (2001) originally proposes that phases are vP and CP, but there are several alternative versions of Phase theory assuming that different maximal projections are also phases.[17] The phase-based locality condition is the Phase Impenetrability Condition (PIC) defined as in (27):

(27) **Phase Impenetrability Condition (PIC)**

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

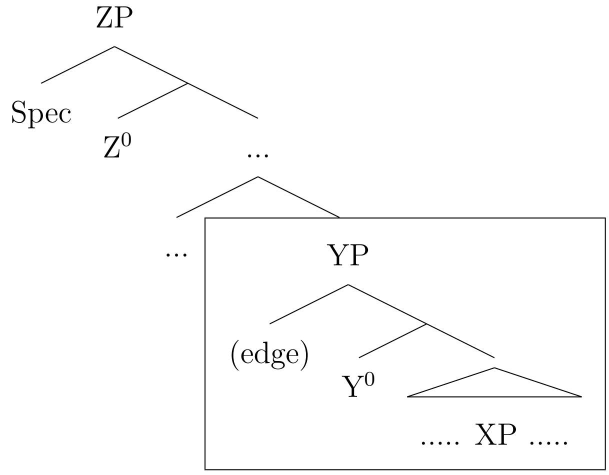
(Chomsky 2000)

Once a phase undergoes Spell-Out, elements contained in a complement of the phase head cannot access to the next phase anymore. In this respect, this theory is similar to Uriagereka's (1999) MSO account (see Section 3.2). However, Phase theory differs from the MSO account in that a phase contains an edge position as an escape hatch accessible to the next phase.

(27) indicates that the PIC requires movement out of a phase to take place successive cyclically using via an edge. In the case of Ā-movement, if the final landing site of a moving element is the next phase, the moving element has to use an edge of the first phase as an intermediate landing site. Then, even after the first phase is Spelled-Out, the moving element on the edge of the first phase is accessible to the next phase and may move to its final destination. For example, in (28), if YP is a phase, XP, in a complement of the phase head Y, has to move to the edge of YP first in order to move to Spec ZP after the phase YP is Spelled-Out:

[17] For example, Müller (2010) argues that every phrase is a phase. See Müller (2010) for other alternative phase theories, which are irrelevant to our purpose.

(28)



Comparing (28) with (3), Phase theory looks similar to the CED and Barriers approaches in that certain maximal projections are local domains for movement. However, Phase theory differs from the others in the following respects. First, Phase theory assumes that these local domains have edges as escape hatches for movement, while the others do not.[18] Second, Phase theory does not assume that a phase-hood (the boundary of a local domain) imposes a restriction on movement from the edge of that phase unlike the CED approaches and Barriers theory, which restrict movement across the local domain's boundary (i.e. a barrier-hood for the latter). Thus, the PIC requires movement to operate successive cyclically via phase-edges and a phase-hood to restrict non-local movement (i.e. movement not making use of an edge). However, it does not define a phase-hood as a restriction on movement from an edge (see Abels 2012 for discussion of this).

To account for the selectivity of extraction from adjunct islands in (6), Phase theory requires some additional assumptions. Phase theory may need to assume that adjunct maximal projections are phases in addition to CPs and vPs to capture the adjunct maximal projections as island boundaries restricting movement. However, this assumption predicts that extraction out of an adjunct is possible only if that movement makes use of an edge of the adjunct phase as an intermediate landing site.

Therefore, the assumption that adjunct maximal projections are phases yields two problems: (i) an adjunct phase-hood does not restrict extraction from an edge of that phase; and (ii) the edge of an adjunct phase is not selective for different

[18] As we have seen in Section 3.3.1, however, Chomsky's (1986) Barriers theory exceptionally allows a NP argument to adjoin to the maximal projection to void barrier-hood of the adjunct.

moving categories. In order to capture the weak effects of adjunct boundaries which always restrict movement out of those adjuncts (one of the findings from the main experiment, as reported in Chapter 4), in Chapter 6, I will propose a phase-based account of the island effects of non-finite adjuncts on QR and *wh*-movement, and integrating insights from Chomsky's (1986) notion of barrier-hoods and Cinque's (1990) theory of Ā-dependencies to resolve the problems (i) and (ii), respectively.

Finally, Phase theory is ideal for explaining the locality of QR, namely the clause-boundness of QR. It is well-known that QR cannot cross finite-clause boundaries (CP). Cecchetto (2004) and Wurmbrand (2013) argue that in conjunction with Fox's (1995, 2000) Scope Economy, the PIC predicts that long-distance QR across a finite-clause boundary is successful only if QR to Spec of the embedded CP, an edge of the phase, gives rise to a new scope interpretation. However, QR to the Spec of an embedded CP such as a *that*-clause does not generally give rise to a new scope interpretation, hence, Phase theory with Scope Economy predicts the clause-boundness of QR.

On the other hand, QR is not amenable to a Spell-Out based account, since QR is an LF operation unlike overt movement. Therefore, to adopt Phase theory for QR, as discussed by Cecchetto (2004), we need to make an additional assumption that LF movement like QR is subject to the PIC even after Spell-Out. We will come back to this issue when I propose the phase-based account in Chapter 6.

In summary, Phase theory has the potential to account for the possibility of extraction from adjunct islands via phase-edge, defined by the PIC (27), if we assume that the maximal projection of an adjunct is a phase. On the other hand, this assumption is not restrictive enough to capture adjunct phase-hoods as island boundaries weakly restricting movement from the edge and the selectivity of extraction out of adjuncts like (6).

However, I argue that these problems can be resolved by augmenting the theory using Chomsky's (1986) barriers and Cinque's (1990) Ā-dependencies, discussed further in Chapter 6, and that because of the good compatibility of Phase theory with QR, it is suitable to adopt Phase theory to account for QR and *wh*-argument extraction out of non-finite adjuncts, which are selective islands rather than absolute islands.

In conclusion, we have discussed the selectivity of non-finite adjuncts, which is unexpected from the strong island view of adjuncts found in the CED approaches, and which class of the existing theories of locality can account for it. We have seen Truswell's (2007; 2011) intricate profile of non-finite adjuncts, demonstrating that those adjuncts are indeed more selective than the Barriers approaches predict, in that even referential NP extraction exhibits some gradation of acceptability. I make use of this profile of non-finite adjuncts, as a test condition in the main experiment, I will report in Chapter 4.

On the other hand, on the basis of the outcome of the study, which has been briefly previewed, I have argued that Truswell's event semantic approach still needs to be supplemented by syntactic theories of locality to explain the weak effects of adjunct boundaries on argument extraction, regardless of whether or not the Single Event Grouping Condition is satisfied. As the theoretical background for Chapter 6, where I will propose a Phase-based account of the weak effects of non-finite adjuncts on QR and *wh*-argument extraction, we have discussed Phase theory, and I have pointed out that Chomsky's (1986) notion of barriers may be required to enable the theory to capture restrictions on movement across adjunct island boundaries.

Chapter 4

The experimental study on the parallelism between QR and *wh*-movement

This chapter reports the results of an experimental study which examined the parallelism between QR and *wh*-movement by making use of Truswell's (2007; 2011) fine-grained profile of non-finite adjuncts (as we discussed in Chapter 3).

The outline of this chapter is as follows. Section 4.1 outlines the hypothesis tested in the study and the predictions of the hypothesis. Afterwards, we take a look at details of the study. From Section 4.2 to Section 4.4, we take a look at the design, the materials, the subjects and the procedures of the study. In Section 4.5, the outcome of the study is reported. In Section 4.6, we theoretically interpret the core findings, and I briefly illustrate questions that arise from the study, which will be discussed in detail in Chapter 5 and 6. Finally, Section 4.7 provides a short summary of findings of the study as a conclusion of this chapter.

4.1 Proposal

4.1.1 Hypothesis

A long-standing hypothesis in Generative Grammar is that the wide-scope reading of a universal quantifier is the result of a movement operation that does not feed the PF interface and is therefore invisible on the surface (May 1977; 1985, Fox 1995; 2000). This movement is known as QR, as explained in Chapter 1 and 2.

The hypothesis that scope-shift is achieved via movement has the consequence that restrictions on scope shift could in principle be reduced to independently motivated restrictions on movement — an appealing prospect. QR was taken to parallel *wh*-movement (Rodman 1976 and much subsequent work) on the basis of parallel sensitivity to constraints on overt movement (so-called island effects, cf. Ross 1967). Just like *wh*-movement, QR was argued to be sensitive to conditions such as the subject island constraint, the adjunct island constraint and the CNPC.

Since those early days, two things have happened that require a re-evaluation of the claim that QR is a covert form of Ā-movement. First, several differences between QR and *wh*-movement have been discovered. For example, QR is often claimed to be clause-bounded (Chapter 5 will report the follow-up study testing the clause-boundness of QR), unlike *wh*-movement, which can span large distances through successive steps of local movement.

Second, developments in movement theory have led to a considerable refinement of island constraints. In particular, it turns out that not all islands restrict movement in the same way, as discussed in Chapter 3. Recall that non-finite adjuncts differ from strong islands like subject islands and from selective weak islands like *wh*-islands. Rather, they are classified as non-selective weak islands, on the basis of the sensitivity of the island constraint to the category of the moved element (e.g. referential / non-referential DP-arguments, PP-arguments, and adjuncts).[1]

These two developments make it necessary to consider whether the hypothesis that QR resembles *wh*-movement stands up to scrutiny when we look at a wider range of data than those considered initially. Therefore, the purpose of the main experiment was to empirically test the movement theory of scope shift (the QR theory) by testing and comparing the relative sensitivity of QR and *wh*-movement to adjunct islands.

[1]See Chapter 3 for the categorization of islands such as non-selective weak islands.

As explained in Chapter 3, in much of the early literature on movement (Huang 1982), adjuncts were treated as absolute islands. In line with this, various proposals have been developed that are intended to rule out movement of both arguments and adjuncts from adjuncts (Huang 1982; Uriagereka 1999). Recall that finite adjuncts like conditional *if*-clauses serve as absolute islands (for the examples of *wh*-extraction and QR out of conditionals, see Chapter 1). As is well known, QR out of conditionals is impossible as well, a fact that can be construed as an argument that extension of quantifier scope requires covert movement (see, for example, Ruys 1992).

In contrast to finite adjuncts, as demonstrated by Chomsky (1986) and Cinque (1990), non-finite adjuncts are rather non-selective weak islands, which allow referential NP argument extraction but block the other types of extraction. Subsequently, the empirical profile of the adjunct island constraint has been explored in depth by Truswell (2007; 2011). Truswell confirms Chomsky's (1986) claim that *wh*-arguments can move out of non-finite adjuncts, while adjuncts cannot. However, Truswell (2011) observes that there is more to be said. It turns out that arguments cannot always be extracted from non-finite adjuncts. Unlike Rizzi (1990) and Cinque (1990), Truswell does not capture this in terms of the (un)availability of referentiality, but argues that this assymmetry is due to the Single Event Grouping Condition, which must be satisfied for the extraction to be felicitous (for the definition of the Single Event Grouping Condition and other details, see Chapter 3).

The intricate empirical profile of the adjunct island constraint provides a good way of testing the movement theory of quantifier scope. If QR is like *wh*-movement, then it should be able to escape from non-finite adjuncts (at the cost of reduced acceptability), as long as the event expressed by the adjunct forms a single event grouping with the event expressed by the matrix verbal predicate. In certain cases, this will require a causal relation between the two events.

In this empirical study, we tested the hypothesis that QR is a covert version of movement restricted by the adjunct island constraint that restricts *wh*-movement. We looked at the three types of adjuncts discussed by Truswell: bare participial gerunds, *after*-prepositional gerunds and *during*-PPs in order to find out as much as we can about the parallelism between QR and *wh*-movement. In addition, we manipulated the availability of a causal relation between the adjunct and the matrix VP, as this appears to be relevant for successful extraction under certain circumstances.

4.1.2 Predictions

Let us now spell out in some more detail what predictions we make and what theoretical assumptions these are based on. One straightforward expectation we have is that acceptability of *wh*-extraction of DP (NP) arguments from non-finite adjuncts will be more acceptable than *wh*-extraction from absolute islands and less acceptable than *wh*-extraction from non-islands. This is because we take non-finite adjuncts to be non-selective weak islands, and extraction from weak islands always leads to reduced acceptability. We also adopted a version of Truswell's Single Event Grouping Condition, according to which extraction from an adjunct requires that the events denoted by the adjunct and the matrix VP must form a single event grouping. Such a grouping requires spatio-temporal overlap. If spatio-temporal overlap is not satisfied, then, a causal relation between the two events must be required.

First of all, let us take a look at a prediction for *wh*-extraction from non-finite adjuncts without considering causality. On the basis of Truswell's (2007; 2011) Single Event Grouping Condition, we predict the ranking in terms of acceptability of the various types of extraction we are interested in, as presented in Figure 4.1:

$$
\begin{tikzcd}
 & & \text{BPG} \arrow[dr] & \\
{*}\text{AB} \arrow[r] & \text{APG} \arrow[ur] \arrow[dr] & & \text{NO} \\
 & & \text{DPP} \arrow[ur] &
\end{tikzcd}
$$

Figure 4.1: Prediction 1 for *wh*-movement
*AB = absolute island, APG = *after*-prepositional gerund, BPG = bare participial gerund, DPP = *during*-PP, and NO = no violation of syntactic constraint. X $\rightarrow$ Y indicates that extraction from Y should be more acceptable than that from X.

In non-causative contexts, extraction from *after*-prepositional gerunds will violate the Single Event Grouping Condition, as *after* explicitly encodes the absence of temporal overlap. By contrast, bare participial gerunds and *during*-PPs require spatio-temporal overlap, so these adjuncts will satisfy the Single Event Grouping Condition even in the absence of causality. This predicts that APG is less acceptable than BPG and DPP as given in Figure 4.1.

When we include causality in our considerations, the prediction becomes a little more involved. In general, causality could be expected to improve the acceptability of a question, as it makes it more obvious why one would want to ask the question in the first place. However, the effect should be more pronounced in the case of *after*-prepositional gerunds, as extraction from these will only be compatible with the Single Event Grouping Condition in the presence of a causal relationship between the adjunct and the matrix VP (see Chapter 3). Thus, we expect the following picture to emerge:

$$\begin{tikzcd}
 & & \mathrm{BPG} \arrow[dr] & \\
{*}\mathrm{AB} \arrow[r] & \mathrm{APG}_1 \arrow[r] \arrow[ur] \arrow[dr] & \mathrm{APG}_2 \arrow[r] & \mathrm{NO} \\
 & & \mathrm{DPP} \arrow[ur] &
\end{tikzcd}$$

Figure 4.2: Prediction 2 for *wh*-movement
APG_1 = *after*-prepositional gerund (causality absent), APG_2 = *after*-prepositional gerund (causality present)

We now turn to QR. The hypothesis that QR is a covert version of *wh*-movement makes the general prediction that the patterns discussed above should extend straightforwardly to it. However, it is widely recognized that there is at least one condition specific to QR, namely Scope Economy (Fox 1995; 2000) (see also Reinhart 2006). Scope Economy is related to the trigger for QR, that is, the fact that this operation is used to extend the scope of quantifiers. Economy in general states that movement must be triggered. If applied to QR, it has the consequence that this operation must generate a new scope interpretation. No application of optional QR that takes place for scope-shift can be semantically vacuous. This implies that there is at least one scope-taking element that the quantifier could not take scope over in its base position but can take scope over after movement. This condition, on Fox's view, holds of every step of optional QR, as outlined in Chapter 2.[2]

In contrast to QR, the trigger for *wh*-movement is different (see Fox 2000). At least in English, it appears to be syntactic in nature (a C endowed with a *wh*-feature must check that feature against a moved *wh*-expression). Following Fox, I take it that as a consequence there is no additional requirement that each step of *wh*-movement creates a new scope reading.

I assume that in the case of extraction from adjuncts, there is an obligatory intermediate landing site at the edge of the adjunct through which movement

[2]As explained in Chapter 2, unlike Reinhart (2006), Fox (1995; 2000) assumes that a non-subject quantifier initially undergoes obligatory QR to resolve a type-mismatch with that quantifier, and that this operation is not subject to Scope Economy.

must pass. This does not cause any particular complication in the case of *wh*-movement, but if does affect QR, given that QR is subject to Scope Economy. Movement to the edge of adverbials introduced by a temporal preposition like *during* or *after* will satisfy Scope Economy, because the universal can scopally interact with the temporal operator hosted in the adjunct. However, movement to the edge of a bare participial gerund will violate Scope Economy, because such adverbials are not introduced by an element that contains an operator with which the quantifier can interact. I therefore expect that the acceptability of QR from bare participial gerunds will be reduced compared to *wh*-movement. In other words, I would expect the following ranking in the results of our test:

$$
\begin{tikzcd}
{*\mathrm{AB}} \arrow[dr] & & & \\
& \mathrm{APG} \arrow[r] & \mathrm{DPP} \arrow[r] & \mathrm{NO} \\
\mathrm{BPG} \arrow[ur] & & &
\end{tikzcd}
$$

Figure 4.3: Prediction 1 for QR

All else being equal, one would expect the Single Event Grouping Condition to be valid for QR as much as it is for *wh*-movement. If so, the presence or absence of causality should play a significant role in extraction from prepositional gerunds introduced by *after*. (*During*-PPs and bare participial gerunds display temporal overlap and hence do not rely on causality to satisfy the condition.) This gives rise to the more detailed predictions depicted below:

$$
\begin{tikzcd}
{*\mathrm{AB}} \arrow[dr] & & & \\
\mathrm{APG}_1 \arrow[r] & \mathrm{APG}_2 \arrow[r] & \mathrm{DPP} \arrow[r] & \mathrm{NO} \\
\mathrm{BPG} \arrow[ur] & & &
\end{tikzcd}
$$

Figure 4.4: Prediction 2 for QR

It remains to be seen whether the more detailed prediction (Figure 4.4) can be tested. Our test must rely on context to force QR for inverse scope. It must also rely on context to force (or at least permit) a causal relationship between an adverbial and the matrix VP. Test items that crucially involve manipulation of two kinds of contextual variables may well impose requirements on subjects that go beyond what is reasonable. On the other hand, the less detailed prediction (Figure 4.3) should be testable in that this does not involve one of the contextual variables: causality. Manipulation of only one contextual variable should be sufficient for the single test.

In summary, if QR parallels *wh*-movement (except the effects of Scope Economy), then at the very least our results should corroborate the predictions in Figure 4.1 and 4.3 for *wh*-movement and QR, respectively. Our case would be strengthened if we were to find the more detailed patterns in Figure 4.2 and 4.4, but it may well be that establishing the pattern in Figure 4.4 goes beyond what can be achieved in a test relying on introspection for the reasons explained above.

Finally, as illustrated above, our predictions from Figure 4.1 to 4.4 are based on causality and temporality, including spatio-temporally overlapping and temporal operators. However, as argued by Truswell (2007; 2011), it is known that *wh*-extraction from adjuncts is also sensitive to verb type. The prime case is agentivity. Presumably, this is to do with the Single Event Grouping Condition, although the details of the effect are not well understood. In order to prevent the agentivity effect of verb types from disturbing our precise measurement of the causality effect and the temporality effect (i.e. the adjunct type effect), we have used non-agentive verbs for all the matrix verbal predicates in test items to pre-control the study.[3]

In order to test the four predictions outlined above, we carried out a questionnaire study in which subjects were asked to judge the acceptability of a test sentence relative to a given context. I will now describe the experimental design, the test materials, the subjects and procedure and, finally, the results of the experiment.

[3]On the other hand, we have also kept track of the verbs used in the experiment as a subfactor to see whether the verb type effect extends from *wh*-movement to QR. If they do, this is compatible with an analysis that treats QR as movement, although the argument must be classed as weak in the absence of a theory.

4.2 Design

The main factors manipulated in the experiment were (i) *Sentence Type* (*wh*-movement versus QR), (ii) *Adjunct Type* (bare participial gerunds versus *after*-prepositional gerunds versus *during*-PPs) and (iii) *Causality* (the presence or absence of a causal relation between the adjunct and the matrix VP).

As explained in Section 4.1, *Causality* and *Adjunct Type* were factors predicted to affect the possibility of a wide scope reading for a universal quantifier contained in an adjunct. First, *Causality* consisted of two levels and was either available or absent. If causality is available between the event described by a matrix VP and the event described by an adjunct, we predicted that it would raise the acceptability of QR/*wh*-extraction out of the adjunct, and that the sentence would be interpreted as natural and acceptable. On the other hand, if a causal relationship is absent between the two events, we predicted that QR/*wh*-extraction out of the adjunct would be unavailable, and that the sentence would be interpreted as unnatural. The former is labeled as N (Natural), whereas the latter is labeled as U (Unnatural).

Second, *Adjunct Type* consisted of three levels: (i) Bare Participial Gerund (P), (ii) *After*-Prepositional Gerund (A), and (iii) *During*-PP (D). Because QR is claimed to be clause-bounded in general (see Reinhart 2006 and others), these three types of adjuncts are ones that do not contain a finite clause. In order to test possibility of successive cyclic QR out of adjuncts by moving across a temporal operator, we chose temporal prepositions for heads of both prepositional gerunds and PPs. Successive cyclic QR was predicted to be available if a universal quantifier is embedded in A or D adjuncts, but not if it is contained in P adjunct. On the other hand, for *wh*-movement, we predicted that *wh*-extraction out of an A adjunct would be worse than out of other adjunct types because one of the requirements of the Single Event Grouping Condition, spatio-temporal overlap, is violated, since *after* introduces a temporal precedence relation.

Third, *Sentence Type* was a two-level factor: (i) QR sentences (labeled as Q) and (ii) *wh*-questions (labeled as W). The comparison between the two types of sentences was required to examine the parallelism in the sensitivity to adjunct islands between them.[4]

This design resulted in 12 test conditions (2 × 2 × 3) as exemplified in (1) and (2).[5] Each of these 12 test conditions were tested by four trials (i.e. by four different matrix verbal predicates). In (1) and (2), test sentences with *burst out laughing* (labelled as 1), one of the matrix VPs we tested, are listed with labels of the test conditions. For the full list of test sentences, see the Appendix A. (1) is a list of *wh*-test sentences containing the matrix VP, whereas (2) is a list of their QR counterparts. See Figure 4.2 and 4.4 for predicted acceptability on each test condition.

(1) a. Which comedy programme did he burst out laughing [listening to t_{WH}]? (WPN1)
b. Which audiobook did she burst out laughing [listening to t_{WH}]? (WPU1)
c. Which student did he burst out laughing [after meeting t_{WH}]? (WAN1)
d. Which professor did she burst out laughing [after meeting t_{WH}]? (WAU1)
e. Which comedy film did Rob burst out laughing [during t_{WH}]? (WDN1)
f. Which war film did he burst out laughing [during t_{WH}]? (WDU1)

[4]In addition to the three main factors, we also manipulated *Matrix Verbal Predicate* as a sub-factor rather than as a main factor in that the Agentivity effect of the Single Event Grouping Condition (see Chapter 3) was pre-controlled by only making use of non-agentive verbs for matrix verbal predicates. Given Truswell's (2011) Single Event Grouping Condition, four different verbal predicates: *burst out laughing* (1), *drop* DP (2), *let out a yelp* (3), and *solve* DP (4) were pre-controlled to be all non-agentive in order to prevent the agentivity effects from interfering with our measurement of *Causality*.

[5]If we include the sub-factor *Matrix Verbal Predicate* as a factor equivalent to the other factors there were 48 test conditions in total (2 × 2 × 3 × 4). However, from now on, we will treat the 12 conditions as the main test conditions.

(2) a. A manager burst out laughing [listening to each comedy programme]. (QPN1)

b. A girl burst out laughing [listening to each boring audiobook]. (QPU1)

c. A professor burst out laughing [after meeting each student]. (QAN1)

d. A girl burst out laughing [after meeting each professor]. (QAU1)

e. One of the guys burst out laughing [during each comedy film]. (QDN1)[6]

f. An academic burst out laughing [during each war film]. (QDU1)

With regard to *Causality*, in each of *wh* and QR test cases, each pair of N and its U counterpart were compared. With regard to *Adjunct Type*, in the QR test we compared P adjuncts, assumed not to locally have a scopal operator in their projections, with the other two adjuncts with scopal operators introduced by their prepositional heads.

Finally, in order to carefully measure a similarity or a difference in *Sentence Type*, as shown in (1) and (2), each QR test sentence and its context formed a minimal pair with its *wh*-counterpart (for example, QPN1 and WPN1 were controlled to form a minimal pair). Both *wh*/QR test sentences were tested via an acceptability judgment task, which required participants to grade how natural /native-speaker-like the test sentence was in a given context by giving one of the numeral grades between 1 (completely unnatural) and 5 (completely natural). This is because if we asked them about the grammaticality for *wh*-questions and acceptability of inverse scope interpretations for QR the results would not be comparable. Acceptability (naturalness / native-speaker likeness) of each test sentence was manipulated as the dependent variable.

4.3 Materials

Each of the 12 main test conditions was tested four times. Each of the four trials was tested with a different matrix verbal predicate from the set of predicates (see Footnote 4). Hence, 48 test sentences were tested in total including the 12

[6] Although we attempted to make all these sentences with an indefinite subject *a / an* NP, we had to use *one of the guys* instead of *a guy* for QDN1 to make the test sentence be matched with its context. Except QDN1, all the other test items were made with *a / an* NPs.

sentences introduced in (1) and (2) (a full list of all the test sentences is provided in Appendix A).

Each pair of a N-sentence (i.e. with a causal relation) and its U (i.e. without a causal relation) counterpart (e.g. QPN1 and QPU1) was controlled to be as a minimal pair as possible. The difference in the presence / absence of a causal relationship was explicitly depicted in written contexts of a N-item and its U-counterpart, respectively.

In addition to the test sentences, the QR test had 21 control sentences, whereas the *wh*-test had 22 control sentences. The purpose of these filler items was to mask any pattern in the test sentences and to break any response pattern.[7]

The types of control sentences for the *wh*-test were sentences containing no restriction, tensed clauses, *wh*-islands, negative islands, finite adjunct islands, the CNPC, infinitival clauses, tensed clauses, and the Coordinate Structure Constraint (CSC), while those for the QR-test were sentences not violating syntactic constraint and containing structural scope freezing (double object constructions), finite clauses, and the CSC.

For each of the QR and *wh*-tests, we prepared for 20 types of differently ordered questionnaires randomly distributed to the subjects to avoid the order effects. Moreover, for each of the differently ordered tests, there were three control items randomly selected as practice items and placed at the beginning of that test.

Each page of the questionnaire contained (i) a picture visually depicting the context, (ii) a written scenario, (iii) a written dialogue between two people containing an underlined test sentence, (iv) a question asking how natural the underlined sentence is, and (v) the fixed numeral scale 1-5 for measurement of the dependent variable, acceptability of the test sentence. For example, here are scenarios and dialogues for the test sentences: WPN1, WPU1, QPN1, and QPU1,

[7]The reason why the control items of the *wh*-test were one sentence more than those of the QR test was because we expected that subjects would complete the *wh*-test more quickly than the QR test, which required the participants to read contexts more carefully to give interpretation-dependent acceptability judgements, compared with grammatical acceptability judgements for the *wh*-questions. Since the *wh*-test and the QR test were conducted in the same place and at the same time, we did not want the subjects taking the QR tests to be influenced by the speed of the others finishing the *wh*-tests and then to speed up to finish the QR tests.

respectively:

(3) **WPN1:**

Mary and Tom are talking about John, their colleague who always listens to the radio in his office at lunch time.

Mary: *At lunch time yesterday, I went to John's office to return his dictionary. When I knocked on the door, I heard him burst out laughing. He was listening to a comedy programme on the radio.*
Tom: *That's odd. Normally John doesn't like comedy. I wonder what he found so funny. Which programme did he burst out laughing listening to? Was it Just a Minute or Cabin Pressure?*
Mary: *I'm not sure.*

(4) **WPU1:**

Two college students are talking about their friend Wendy. Wendy needed to study some audio books for her course on business management. If the weather is good, she usually can be found studying in her favourite spot in the park.

Linda: *When I saw Wendy yesterday, she was sitting on her favourite bench wearing her pink earphones and listening to one of those boring audio books she has on business management. Surprisingly, she burst out laughing, which seemed pretty weird considering what she was listening to. Turns out it wasn't the audio book that made her laugh, though. It was some text message from her boyfriend.*
George: *I need to borrow one of those audio books of Wendy's. I wonder if she has finished with the one I need.*
Which audio book did she burst out laughing listening to?
Linda: *And I'm supposed to know the answer to such a question because...*
George: *You don't always have to be so sarcastic, do you? I was just asking.*

(5) **QPN1:**

Mary and Tom are talking about Ms White and Mr Black, sales managers who always listen to the radio in their offices at lunchtime.

Mary: *At lunchtime yesterday, I went to Ms Whites office to return her umbrella. When I knocked on the door, I heard her burst out laughing. She was listening to Just a Minute on the radio.*
Tom: *What a coincidence! While you were visiting Ms White's office, I went to Mr Black's office to return his dictionary. When I opened the door, I saw him burst out laughing as well. He was also listening to a comedy programme, but it was Cabin Pressure. I know that both Just a Minute and Cabin Pressure are funny enough to make even someone that serious laugh out loud.*
Mary: *Oh, <u>a manager burst out laughing listening to each comedy programme.</u> I didn't know that our bosses are both fans of comedy shows.*

(6) **QPU1:**

Two college students are talking about their friends Wendy and Iris, who had to study some audio books for their course on business management. When the weather was good, they usually could be found studying at their favourite spots in the park.

Oliver: *When I met Wendy the other day, she was sitting on her favourite bench listening to Time Management. She told me that audio book was incredibly boring. Afterwards, I hid behind a tree near her bench and sent her a very funny text message. As soon as she had a look at her mobile phone, she burst out laughing.*
Erin: *Ha-ha, well done! That must have cheered her up. What about Iris? Did you meet her as well?*
Oliver: *Yes, I did. After surprising Wendy, I saw Iris sitting on the grass under a tree. She was listening to The Hypnotic Salesman, and seemed very bored. So, again, I hid behind a tree and sent her a funny message. Like Wendy, my message made her burst out laughing.*
Erin: *<u>A girl burst out laughing listening to each boring audiobook.</u> That must have been a very funny message. Can you send it to me as well?*

First, as you can see from (3) and (5) and from (4) and (6), we used similar stories for each pairing of a QR item with its *wh* counterpart (eg. QPN1 and

WPN1) to make them to form a minimal pair.

Second, we explicitly described causal relations between the events of a matrix VP and an adjunct of a test sentence in scenarios for the N-test items like (3) and (5), while we clearly illustrated absence of causal relations between the two events in scenarios for the U-test items like (4) and (6). For instance, in (3), the adjunct event of John's listening to a comedy programme caused him to burst out laughing, as the matrix event describes. On the other hand, in (4), the U-counterpart of (3), some text message from Wendy's boyfriend made her burst out laughing, and the adjunct event of listening to an audio book is irrelevant to the cause of the matrix event.

On each page of the questionnaire, a scenario and a dialogue like (3) - (6) are preceded by a picture visually helping the participants easily understand the context and followed by a question asking the participants to answer how natural the underlined sentence is by circling one of the numbers (1-5).

4.4 Subjects and procedure

80 native speakers of British English (mono-linguals) participated in the study. The reason why all the subjects were native speakers of British English is because they needed to be able to judge how native-like each sentence was. Different dialects might diverge in an unknown way and therefore this also prevented differences in dialects of English from interfering with the results.

63 subjects out of 80 were recruited from the UCL Psychology Subject Pool, and the other 17 subjects were UCL undergraduates who were recruited by our email. None of the subjects were linguists. The subjects received 12 British pounds cash compensation or 1.5 course credits (this option was available only for psychology undergraduates) for their participation after they finished both the *wh* and QR tests. The following table shows the gender and age groups of this study:

	18-20	**21-30**	**31-40**	**41-50**	**51-**	**Total**
Female	25	15	0	4	3	47
Male	16	8	4	5	0	33
Total	41	23	4	9	3	80

Table 4.1: The number of subjects for each age and gender group in the main experiment

The two-part questionnaire study was run in seminar rooms at the UCL Research Department of Linguistics from September to November in 2012. Half of the subjects took the QR test first, whereas the other half took the *wh*-test first to counterbalance order effects. The subjects took the second test at least two days after the day on which they took the first test to prevent habituations.

At the beginning of each test, the subjects were asked to carefully read a two-page long written instruction. The instructions for the QR test were almost identical to the instructions for the *wh*-test, except for an additional sentence asking subjects to judge whether the meaning of the test sentence was matched with the scenario for the QR test, in order for the subjects not to only pay attention for the grammatical acceptability of the quantified sentence in the QR test. In order to make the test more stimulating for the participants, they were appointed as an MI6 agent, and asked to detect foreign spies by examining tape transcripts (scenarios in the questionnaire).[8] The participants were allowed to ask the experimenter questions if there was anything unclear about the instructions or the test.

After reading the instructions, the subjects were asked to begin. The subjects answered questions by circling appropriate numeral grades (1-5) on the questionnaires with pens we provided. Each subject was asked to spend about 45 mins to complete one test. We did not accept an answer sheet unless the subjects spent at least 30 minutes.

[8]Thanks to William Philip (p.c.) for his suggestion for the spy-game format of the test.

4.5 Results

In both the *wh*-test and the QR test, subjects' responses given as numeral grades between 1 and 5 were analyzed in terms of the mean acceptability of the test sentences in each test condition. We now take a look at the results of the *wh*-test, the results of the QR test, followed by the overall results.

4.5.1 *Wh*-movement test

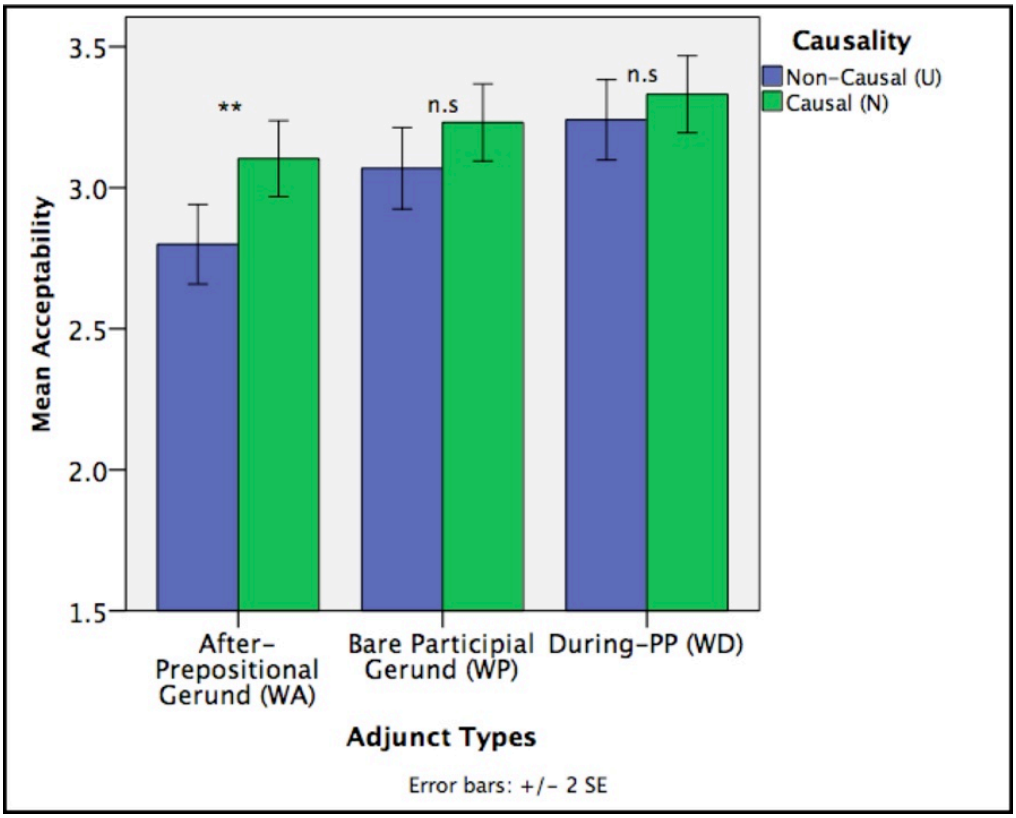


Figure 4.5: Mean acceptability of each *Adjunct Type* by *Causality* in the *wh*-result. Error bars represent standard error for each condition. A significance level of each difference between adjacent conditions is indicated as follows: n.s.= non-significant, * = $p < 0.05$, and ** = $p < 0.01$ (adjustment for multiple comparisons: Bonferroni by SPSS).

First, the mean acceptability of each *Adjunct Type* by *Causality* (six main test conditions: 2×3) in the *wh*-test is displayed in Figure 4.5.

The Linear Mixed Model (LMM) with *Causality*, *Adjunct Type*, and *Matrix Verbal Predicate* as factors on the *wh*-result revealed a main effect of *Causality* (F (1, 1879.66) = 10.904; $p < 0.01$) and a main effect of *Adjunct Type* (F (2, 1247.34) = 11.974; $p < 0.001$).[9] On the other hand, the interaction of *Adjunct Type* and *Causality* was not significant (F (2, 1247.34) = 1.234; $p = 0.291$).

We now analyze the outcome of the F-test above on the basis of the results of post-hoc multiple comparisons made by LMM. SPSS-Bonferroni adjusted p-values for pairwise comparisons are reported below (the conventional level of significance: $p < 0.05$).[10]

The highly significant effect of *Adjunct Type* is due to the fact that the subjects found extraction from *during*-PP (WD) and extraction from bare participial gerunds (WP) much more effortless compared with extraction from *after*-prepositional gerunds (WA) ($p < 0.001$ and $p < 0.05$, respectively). On the other hand, the acceptability of extraction out of *during*-PPs did not differ from extraction out of bare participial gerunds ($p = 0.147$).

Next, the significant effect of Causality was caused by the fact that the subjects were more likely to find *wh*-questions with a causal construal more acceptable than their non-causal counterparts (N vs. U: $p < 0.01$).

The Causality effect is also attributed to the fact that extraction out of an *after*-prepositional gerund was far easier for the subjects if the event described by the matrix VP and the event described by the *after*-prepositional gerund construe

[9] As explained in Footnote 4, *Matrix Verbal Predicate* was manipulated as a sub-factor, but this factor was included in the LMM with the other factors for calculation of the statistics. I will not discuss effects of *Matrix Verbal Predicate* in this thesis because this factor did not exhibit any relevant result for the core of our discussion. For some statistic outcomes related to the sub-factor, I refer the reader to Appendix A.

[10] According to IBM (http://www-01.ibm.com/support/docview.wss?uid=swg21476685), for Bonferroni Correction, SPSS multiplies the raw p-value by the number of pairwise comparisons made. For example, if we make comparisons of three conditions: A, B, and C (A vs. B, A vs. C, and B vs. C) and obtain $p = 0.013$ as a p-value for a pairwise comparison between A and B, SPSS will multiplies the raw p-value by 3 for Bonferroni adjustment ($p = 0.039$). This corrected p-value is lower than the conventional levels of significance ($p < 0.05$). Thus, we can say that the difference between A and B is significant.

a causal relation in the sentence than if no causal relation is available between the two events ($p < 0.01$). Similarly, the subjects were more likely to find extraction from a bare participial gerund or a *during*-PP less difficult if causal construal between the matrix event and the adjunct event was available than if it was not unavailable. However, differences between extraction with causal construal and without it were not significant in both the cases of bare participial gerunds ($p = 0.095$) and *during*-PPs ($p = 0.355$).

Finally, Figure 4.5 visually indicates that the more difficult extraction of *wh*-arguments from non-finite adjuncts was, the more Causality effects were observed, but this effect seems to be statistically too weak to give rise to interaction between *Causality* and *Adjunct Type*.

We now move to Figure 4.6, which shows the mean acceptability of the *wh* test sentences categorized by Adjunct Type as well as that of the control conditions. What is presented in Figure 4.6 corresponds to prediction 1 for *wh*-movement, presented in Figure 4.1. Note that we conducted two-tailed dependent T-tests nine times for making further post-hoc multiple comparisons on the outcome of the *wh*-test including the control conditions (for the full details of the pairwise T-tests, I refer the reader to Table A.7 in Appendix A). This is because LMM only made multiple comparisons of the test conditions, as reported above. Here, we have manually adjusted the level of significance for the multiple paired T-tests by dividing alpha (i.e. 0.05) by the number of pairwise T-tests we made. Thus, Bonferroni-adjusted level of significance used below is $p < 0.0055$ (0.05 / 9). This adjustment differs from SPSS's method of Bonferroni adjustment (See Footnote 10) but is a general method for Bonferroni Correction.

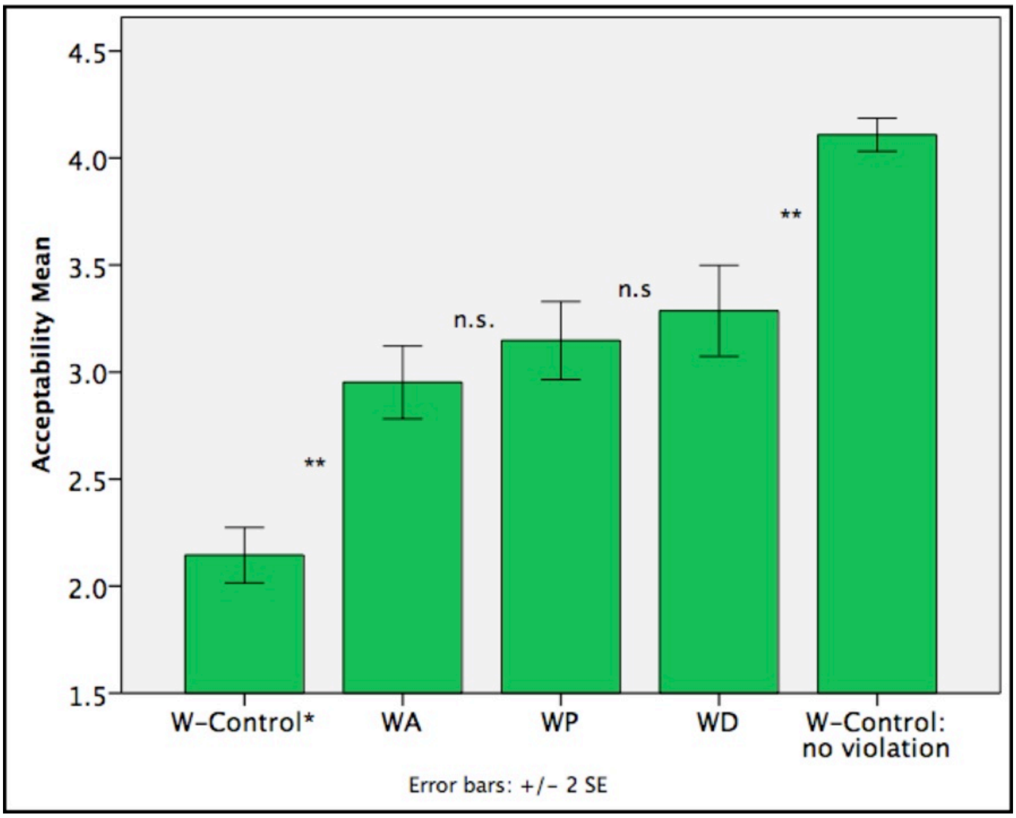


Figure 4.6: Mean acceptability of *wh* test conditions by adjunct type and control conditions. The WA condition is divided by *Causality*. Error bars represent standard error for each condition. A significance level of each difference between adjacent conditions is indicated as follows: n.s.= non-significant, * = $p < 0.0055$ (0.05 / 9: manually adjusted by Bonferroni Correction), and ** = $p < 0.001$.

Here, control conditions are divided into two types: (i) W-control: no violation, which was predicted to be unproblematically acceptable / natural in that it contains no restriction on extraction of *wh*-arguments[11]; (ii) W-Control*, which violates certain locality conditions such as absolute islands, were predicted to be highly unacceptable for the subjects.

Figure 4.6 illustrates that W-control: no-constraint scored the highest, while

[11] A few 'W-control: no violation' sentences contain weak islands: non-finite *wh*-islands and a negative island, but as explained in Chapter 3, these weak islands permit extraction of DP (NP)-arguments.

W-control* scored the lowest, as predicted. This means that these two W-control conditions served as good benchmarks for the test conditions. The subjects found extraction from the non-finite adjuncts much easier than extraction from absolute islands such as complex NPs ($t(79)=7.475$, $p < 0.001$). On the other hand, *wh*-movement from non-restricted environments and from selective weak islands was far more effortless than extraction from non-finite adjuncts ($t(79)=7.119$, $p < 0.001$).

The order among the three non-finite adjuncts was explained before on the basis of Figure 4.5. In contrast to the output of the post-hoc tests made by LMM, however, a two-tailed dependent T-test revealed no significant difference between extraction from bare participial gerunds and extraction from *after*-prepositional gerunds ($t(79)=2.590$, $p = 0.011$), as shown in Figure 4.6. LMM made multiple comparisons of only the test conditions, whereas the dependent T-tests made multiple comparisons of both the main conditions and the control conditions. Thus, the level of significance is much lower in the latter than in the former after Bonferonni Correction, since the more multiple comparisons we conduct, the more conservative the level of significance becomes due to Bonferonni adjustment.

Finally, Figure 4.7 is a bar chart corresponding to prediction 2 for *wh*-movement, illustrated by Figure 4.2.

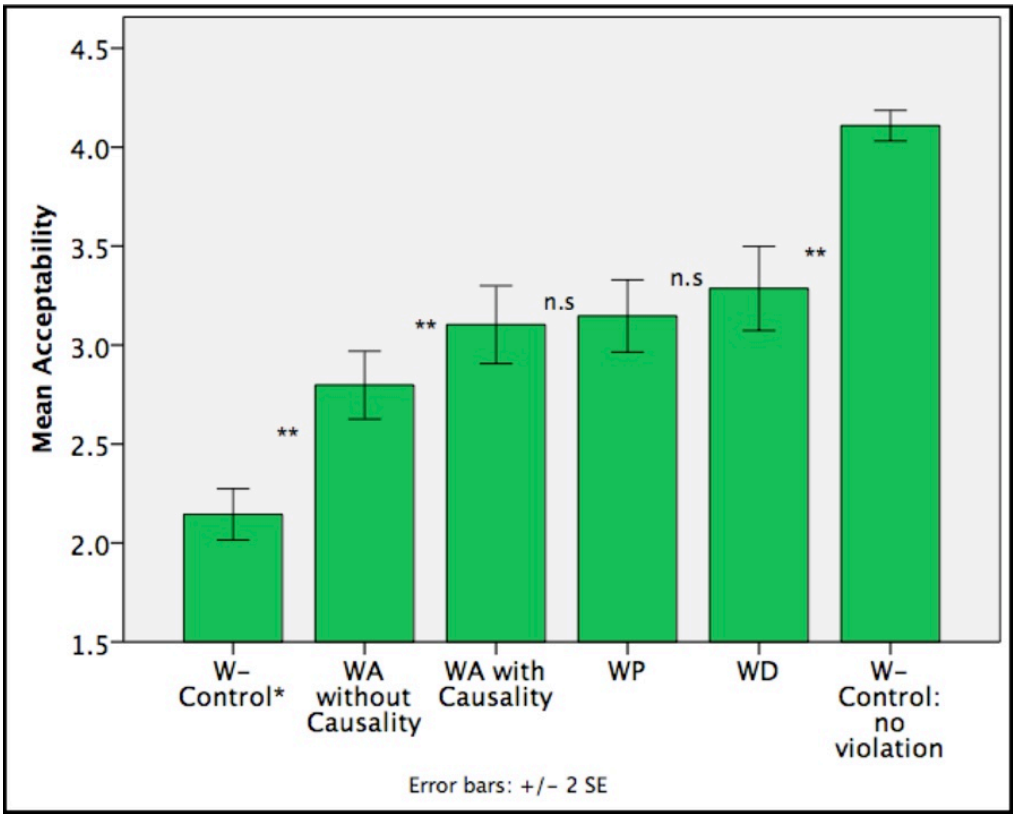


Figure 4.7: Mean acceptability of *wh* test conditions by *Adjunct Type* and control conditions. The WA condition is divided by *Causality.* Error bars represent standard error for each condition. A significance level of each difference between adjacent conditions is indicated as follows: n.s.= non-significant, * = $p < 0.0055$ (0.05 / 9: adjusted by Bonferroni Correction), and ** = $p < 0.001$.

Figure 4.7 differs from Figure 4.6 in that the adjunct condition WA is divided by the presence and the absence of causal construal, whose difference was highly significant as shown in Figure 4.5. A two-tailed dependent T-test revealed that it was much easier for the subjects to extract *wh*-arguments from an *after*-prepositional gerund even if the matrix and adjunct events have no causal relation (i.e. WAU) than from absolute islands ($t(79)$=6.023, $p < 0.001$). On the other hand, the acceptability of extraction out of a bare participial gerund was almost identical to that out of an *after*-prepositional gerund with causal construal with the matrix event (i.e. WAN) ($t(79)$=0.469, $p = 0.64$).

4.5.2 QR test

Let us now turn to the result of the QR test. First, Figure 4.8 presents the mean acceptability of each *Adjunct Type* by *Causality* (3×2: six conditions) in the QR result.

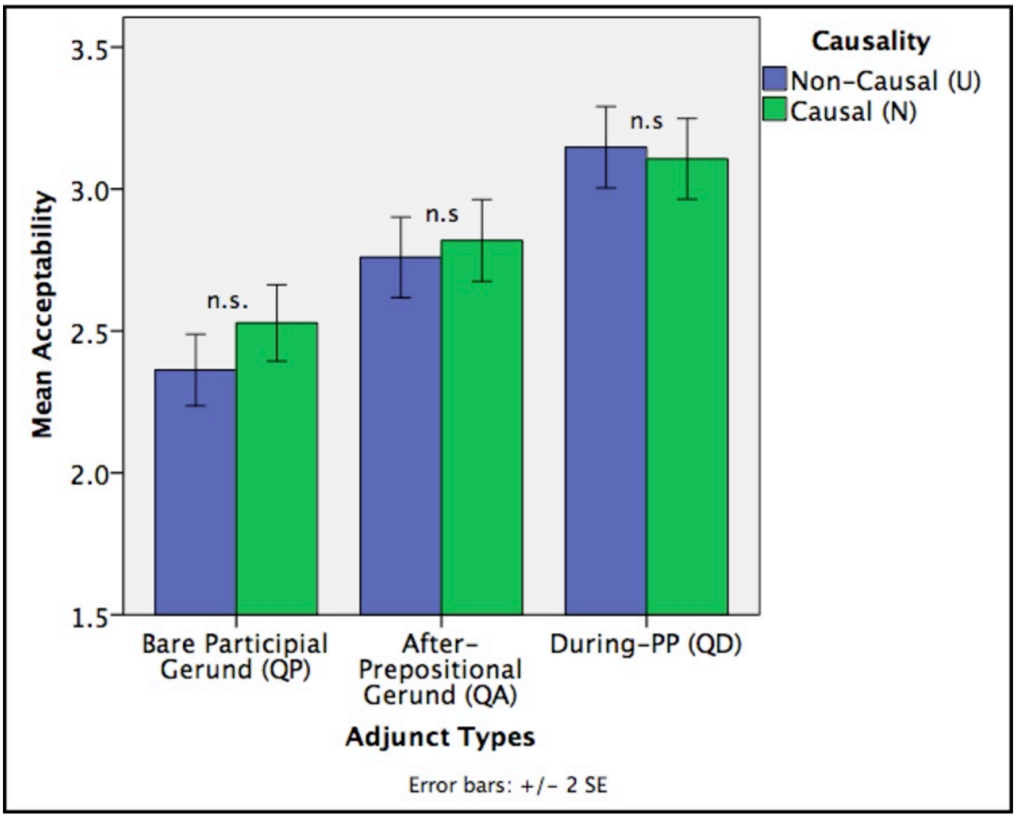


Figure 4.8: Mean acceptability of each *Adjunct Type* by *Causality* in the QR result. Error bars represent standard error for each condition. A significance level of each difference between adjacent conditions is indicated as follows: n.s.= non-significant and * = $p < 0.05$ (adjustment for multiple comparisons: Bonferroni by SPSS).

The LMM with *Causality*, *Adjunct Type*, and *Matrix Verbal Predicate* as factors revealed a main effect of *Adjunct Type* (F (2, 1230.77) = 50.685; $p <$ 0.001) but no reliable effect of *Causality* (F (1, 1857.12)= 1.190; p = 0.275). An interaction of *Causality* and *Adjunct Type* was not observed, either (F (2, 1230.777)=1.166; p = 0.312).

We now take a look at the outcome of the F-test above on the basis of the results of post-hoc multiple comparisons made by LMM. SPSS Bonferroni-adjusted p-values for pairwise comparisons are reported below (the conventional level of significance: $p < 0.05$).

First, the highly significant effect of *Adjunct Type* is due to the fact that it was much easier for the subjects to accept wide scope of a universal out of *during*-PPs (QD) compared with *after*-prepositional gerunds (QA) ($p < 0.001$), additionally, subjects more readily accepted wide scope of a universal out of *after*-prepositional gerunds than bare participial gerunds ($p < 0.001$). Thus, like the *wh*-outcome, *during*-PPs were the most permissive for QR, but unlike the case of *wh*-movement, bare participial gerunds were the most restrictive (QP < QA < QD).

On the other hand, no main effect of *Causality* is attributable to the fact that in contrast to the outcome of the *wh*-test, the acceptability of wide scope of a universal with sentences involving a causal construal did not differ from their non-causal counterparts ($p = 0.275$). The presence of a causal relation between the matrix and adjunct events helped the subjects to interpret inverse scope out of a bare participial gerund more easily, compared with the case in which causal construal was absent, but the difference was just outside the level of significance ($p= 0.072$). Moreover, the presence of causality did not play a role at all in the cases of inverse scope out of an *after*-prepositional gerund ($p = 0.555$) or out of a *during*-PP ($p = 0.681$).

Like Figure 4.5 in the outcome of the *wh*-test, Figure 4.8 indicates that the presence of a causal construal seems to have affected the possibility of inverse scope out of the non-finite adjunct which was most restrictive for QR, a bare participial gerund. However, this effect was much weaker than that in the outcome of the *wh*-test and therefore did not give rise to an interaction between *Causality* and *Adjunct Type*.

Next, we turn to Figure 4.9, which shows the mean acceptability of the QR test sentences categorized by *Adjunct Type* and that of the control conditions. This bar chart corresponds to prediction 1 for QR, illustrated by Figure 4.3. Note that we conducted two-tailed dependent T-tests twelve times for making further post-hoc pairwise comparisons on the outcome of the QR-test including the control conditions (for the full details of the pairwise T-tests, I refer the reader to Table A.14 in Appendix A). Here, a significance level for the pairwise T-tests has been manually adjusted to $p < 0.0038$ (0.05 / 13) by Bonferroni Correction.

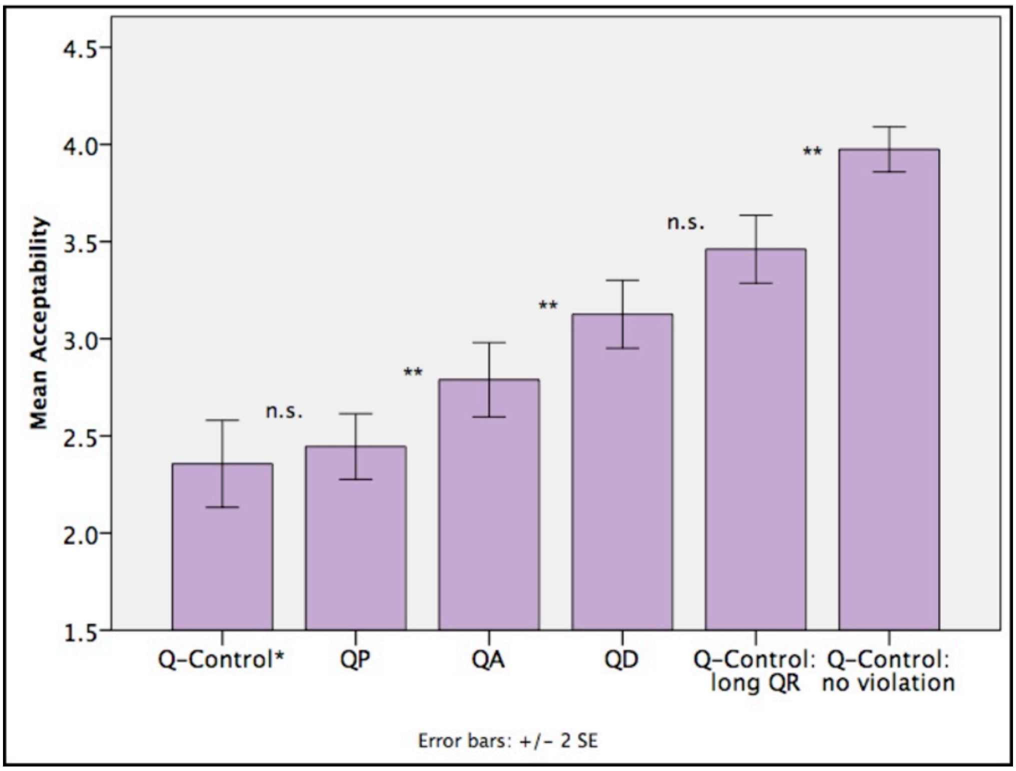


Figure 4.9: Mean acceptability of QR test conditions by *Adjunct Type* and control conditions. Error bars represent standard error for each condition. A significance level of each difference between adjacent conditions is indicated as follows: n.s.= non-significant, * = $p < 0.0038$ (0.05 /13: adjusted by Bonferroni Correction), and ** = $p < 0.001$.

Here, Q-control items are divided into three categories: (i) Q-control: local QR; (ii) Q-control: long-distance (involving long QR across finite-clause boundaries); and (iii) Q-control* with scope island (scope freezing and the CSC).

Inverse scope was most acceptable in cases where QR takes place in non-restricted environment (Q-control: no violation), whereas it was most difficult in case of QR out of scope islands or scope freezing constructions (Q-control* with scope island). In this respect, like the W-control conditions, these Q-control conditions served as good bench marks for the Q-test conditions.

During-PPs were the most permissive non-finite adjuncts for QR, but compared with the case of QR: no violation, they were far more restrictive ($t(79)=$ -7.797, $p < 0.001$). On the other hand, the restrictions of scope islands and scope freezing did not differ from bare participial gerunds, the most restrictive adjunct type for QR ($t(79)=$ -0.656, $p = 0.514$).

Surprisingly, it seems that the subjects were able to accept scope inversion across finite clause boundaries relatively easily. Wide scope of a universal out of finite clauses was easier for the subjects to obtain than that out of *during*-PPs, the most permissive non-finite adjunct type, but the difference between the two failed to reach the accepted level of significance adjusted by Bonferroni ($t(79)$=2.439, $p = 0.017$). Scope-shift of a universal out of finite clauses was more difficult than that out of Q-control: no violation ($t(79)=$ -6.133, $p < 0.001$).

Let us now move to Figure 4.10, which corresponds to prediction 2 for QR, presented in Figure 4.4. Here, the QA condition is divided into QA with causality (QAN) and QA without causality (QAU).

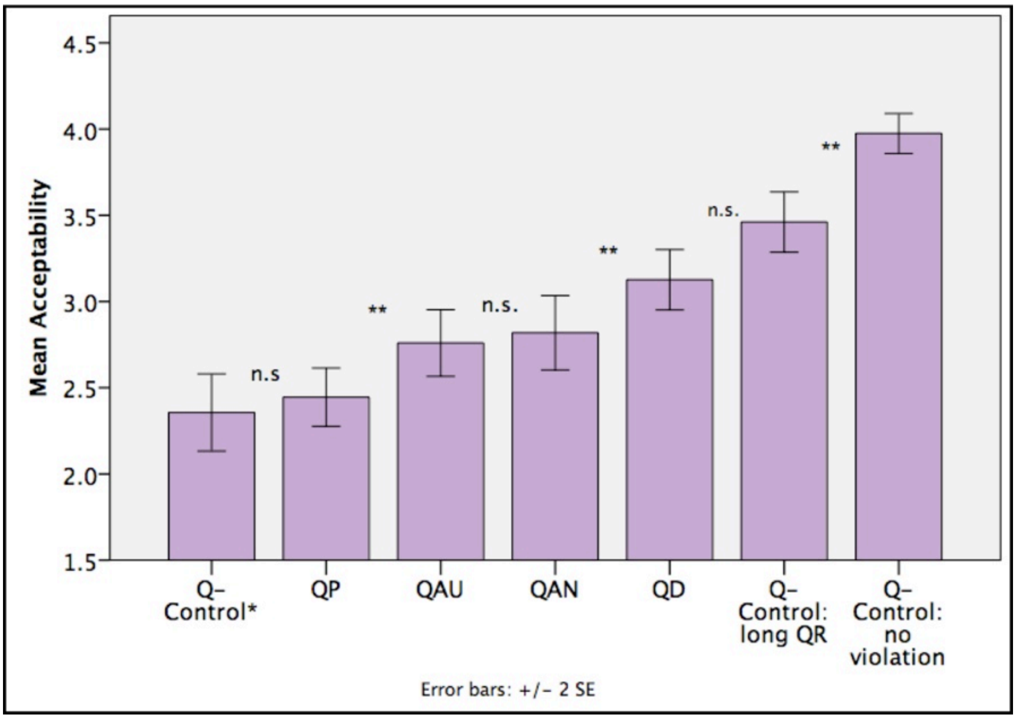


Figure 4.10: Mean acceptability of QR test conditions by *Adjunct Type* and control conditions. The QA condition is divided by *Causality*. Error bars represent standard error for each condition. A significance level of each difference between adjacent conditions is indicated as follows: n.s.= non-significant, * = $p < 0.0038$ (0.05 /13: adjusted by Bonferroni Correction), and ** = $p < 0.001$.

As has been already presented in Figure 4.8, the acceptability of inverse scope out of *after*-prepositional gerunds was not dependent on the presence or the absence of causal construal. Even when causal construal was present between the matrix event and the event described by an *after*-prepositional gerund, island effects of that adjunct type (QAN) were far more robust than those of *during*-PPs ($t(79)$ = -4.022, $p < 0.001$). Similarly, restrictions of *after*-prepositional gerunds without causal construal (QAU) on QR were still weaker than those of bare participial gerunds even with causal construal (QPN), and the difference in acceptability was at the very edge of significance ($t(79)$=2.988, $p = 0.004$).

Moreover, although Figure 4.8 does not distinguish bare participial gerunds with causal construal from those without it, blocking effects of bare participial gerunds with causal construal (QPN) on scope inversion were still similar to scope islands and scope freezing effects ($t(79)=1.205$, $p = 0.232$).

The facts explained above suggest that presence / absence of causal construal between the matrix and adjunct events did not give rise to a change on the fundamental result presented in Figure 4.9. This reflects the unreliable effect of *Causality* on QR, shown in Figure 4.8.

4.5.3 Overall result

The previous subsections explained the outcome for the *wh*-test and the QR-test individually. We now turn to the overall result in order to take a look at the effect of *Sentence Type*, one of the three main factors manipulated in the study.

The LMM with *Causality*, *Adjunct Type*, *Matrix Verbal Predicate*, and *Sentence Type* ($2 \times 3 \times 4 \times 2$) as factors revealed a main effect of *Sentence Type* on the overall result ($F\ (1,\ 3736.52) = 74.238$; $p < 0.001$). However, a highly significant interaction of *Sentence Type* and *Adjunct Type* was observed ($F\ (2,\ 2471.98) = 21.427$; $p < 0.001$)). On the other hand, there was no interaction of *Sentence Type* and *Causality* ($F\ (1,\ 3736.52) = 2.433$; $p = 0.119$).

As we have seen in the previous two subsections, the outcome of the QR-test was similar to that of the *wh*-movement test in that QR / *wh*-extraction from non-finite adjuncts was more acceptable than from absolute / scope islands and less acceptable than local QR / grammatical *wh*-movement. Despite this similarity, because the outcome of the control items was not included for this statistic test, we found a main effect of *Sentence Type*. This suggests that a difference between QR and *wh*-movement must be due to different orders of acceptability of QR / *wh*-extraction from the three type of non-finite adjuncts in each of *Sentence Type*. Indeed, this main effect was qualified by an interaction of *Sentence Type* and *Adjunct Type*.

The significant interaction of *Sentence Type* and *Adjunct Type* was driven by the fact that the order of restrictions of the three adjunct types on *wh*-movement ($D \approx P < A$) was different from that on QR ($D < A < P$) in different blocking effects of bare participial gerunds on the two operations, as presented in Figure

4.5 and Figure 4.8.[12] In other words, the Adjunct effect played a major role in both the cases of *wh*-movement and QR in different ways, so that this made the outcomes of the two tests look different.

On the other hand, no interaction of *Sentence Type* and *Causality* was observed. This was due to the fact that the *wh*-outcome was similar to the QR-outcome in that the Causality effect helped *wh*-extraction or QR out of a non-finite adjunct, but only if that adjunct was the most restrictive one for that particular operation. Although the presence of a causal construal had much more of an effect on *wh*-extraction than QR, this does not seem to have made the two outcomes differ significantly.

4.6 Discussion

4.6.1 The core output of the study

First, the general extraction patterns found in this study are summarized in the rankings below. '≈' indicates a difference in acceptability which is not statistically significant (i.e. A ≈ B indicates that B was more acceptable than A, but the difference between A and B did not achieve conventional levels of statistical significance), '<' indicates a significant difference in acceptability, and '‖' indicates a boundary of acceptability: the categories to the right of ‖ scored more than 3.0 out of 5.0 (note that this is an arbitrary boundary).

[12] The order of restrictions of the three adjunct types on *wh*-movement is based on the outcome of the post-hoc test provided by LMM rather than on the outcome of the multiple paired T-tests (the further post-hoc tests dealing with both the test and the control conditions: see Figure 4.6 and 4.7). This is because the interaction of *Sentence Type* and *Adjunct Type* in question is concerned with the test conditions such as *Adjunct Type* but unrelated to the control conditions. As we have seen in Figure 4.6, however, significance of the difference between WP and WA disappears as a result of the further post-hoc tests involving multiple comparison with the control conditions and Bonferroni Correction.

(7) ***wh*-movement:** Absolute island < *After*-Prepositionnal Gerund ‖ ≈ Bare Participial Gerund ≈ *During*-PP < no violation of syntactic constraint

(8) **QR:** Scope island ≈ Bare Participial Gerund < *After*-Prepositional Gerund ‖< *During*-PP ≈ finite clauses < no violation of a syntactic constraint

Except for the availability of the Causality effect, (7) differs from (8) mainly in that the bare participial gerund condition is demoted from the acceptable level in the *wh*-ranking to the unacceptable level in the QR ranking. Let us now discuss whether the outcome follows the predictions, visually illustrated in Figure 4.1 - 4.4 in Section 4.1.

The general pattern of *wh*-extraction (ignoring the Causality effect in (7)), presented in Figure 4.6, follows prediction 1 for *wh*-movement (Figure 4.1) except that the difference in acceptability between *wh*-extraction out of a bare participial gerund and that out of an *after*-prepositional gerund failed to reach the Bonferroni-adjusted level of significance. This is attributable to the fact that the marginal acceptability of *wh*-extraction out of an *after*-prepositional gerund with causal construal (see Figure 4.7) increased the overall mean acceptability of extraction out of that adjunct.

Figure 4.7 (summarized as the precise version of the ranking of *wh*-movement in (9)), where the condition of *after*-prepositional gerunds is divided by presence or absence of a causal construal, demonstrates that prediction 2 (Figure 4.2) is also correct.

(9) ***wh*-movement:** Absolute island < *After*-Prepositional Gerund without causality ‖< *After*-Prepositional Gerund with causality ≈ Bare Participial Gerund ≈ *During*-PP < no violation of syntactic constraint

As illustrated above, the outcome of the *wh*-test strongly supports the plausibility of Truswell's adjunct island constraint, based on the Single Event Grouping Condition, on extraction of *wh*-arguments, as demonstrated by the correct predictions his theory made as in Figure 4.1 and 4.2. In other words, the outcome of the *wh*-test corroborates Truswell's event semantic version of the adjunct island constraint as an appropriate condition on movement to examine whether scope-shift is movement.

Next, we now turn to predictions 1 and 2 for QR (Figure 4.3 and 4.4, respectively). The QR outcome (8), visually presented in Figure 4.9, suggests that prediction 1 is correct. On the other hand, on the basis of Figure 4.10, prediction 2 is incorrect, in that the presence of a causal construal did not help the subjects in interpreting wide scope of a universal out of an *after*-participial gerund more easily than if the causal construal were absent, or as easily as wide scope out of a *during*-PP. Moreover, even where causal construal between the matrix and adjunct events was absent, QR from an *after*-prepositional gerund was far more effortless compared with QR from a bare participial gerund. Thus, the failure of prediction 2 for QR (Figure 4.4) suggests that the causality effect is unreliable on QR, in contrast to the case of *wh*-extraction, where causality still works as a sub-factor helping extraction.

This study tested the hypothesis that scope-shift is achieved through covert movement, QR, which is subject to adjunct islands restricting extraction of *wh*-arguments, on the basis of Truswell's (2007; 2011) fine-grained profile of adjuncts. The outcome of the QR test mostly confirmed the hypothesis: prediction 1 for QR, which was based on the assumption that QR is restricted by Scope Economy, turned out to be correct. However, we still need to discuss the relatively high acceptability of long-distance QR, which may cast doubt on the restriction of Scope Economy on QR, in the next subsection for further confirmation of the hypothesis.

Let us now compare the rankings of QR (8) and *wh*-extraction (9). First, the rankings are similar in that non-finite adjuncts marginally allow extraction of nominal arguments (DPs and QPs) at maximum acceptability as demonstrated by Chomsky (1986), Cinque (1990) and Szabolcsi (2006), who compare the acceptability of DP-argument extraction from those adjuncts with the ill-formedness of adjunct extraction (see Chapter 3).[13] Moreover, the fact that both *wh*-extraction and QR out of non-finite adjuncts are marginally acceptable at maximum indi-

[13]What we focus on here is that DPs and QPs are syntactically nominal arguments that should be distinguishable from PP-arguments and adjuncts. I realize that DPs and QPs have different semantic categories: $< e >$, and $<< e, t >, t >>$, respectively, but the semantic types are irrelevant here.

cates that even argument extraction is weakly restricted by an adjunct island boundary.

Second, both *wh*-extraction and QR exhibit the gradation of acceptability among the three types of non-finite adjuncts, as shown in (8) and (9). This indicates that in addition to the syntactic selectivity and restriction of non-finite adjuncts, there should be additional constraints that may block even argument extraction if a certain condition is not met. The outcome demonstrates that the Single Event Grouping Condition is indeed an additional restrict on *wh*-extraction. On the other hand, the difference between QR and *wh*-movement in the acceptability of extraction from bare participial gerunds indicates that QR should be restricted by a different constraint, Scope Economy. However, we still need to confirm whether Scope Economy does indeed restrict QR as an additional constraint because of the problem of long-distance QR (in the next subsection, we will come back to the issues of bare participial gerunds and long-distance QR as questions arising from the study).

On the basis of what has been discussed above, the following conclusions can be arrived at. Both *wh*-DP argument extraction and QR out of non-finite adjuncts are permitted only if a certain requirement from an additional constraint is satisfied. However, the two operations are subject to different additional constraints at the syntax-semantics interface. QR is restricted by Scope Economy (this needs further confirmation), whereas *wh*-argument extraction is restricted by the Single Event Grouping Condition. In case QR and *wh*-argument extraction satisfy Scope Economy and the Single Event Grouping Condition, respectively, these operations are still subject to weak restrictions of non-finite adjuncts; hence, QR and *wh*-argument extraction from non-finite adjuncts are marginally acceptable at best.

4.6.2 Questions remaining to be answered

In addition to the consequences explained in the previous subsection, the results of the study also raise three unsolved questions, as listed in (10). These questions will be elaborated on, and answers for them will be discussed in detail in Chapter 5 and 6. Here I briefly illustrate them as a preliminary to the discussion.

(10) a. **Clause-boundness of QR:**
Does Scope Economy indeed restrict QR?

b. **Bare participial gerunds:**
How does the syntactic structure of a bare participial gerund marginally permit *wh*-argument extraction but restrict QR?

c. **Obligatory QR:**
Is the assumption of obligatory QR compatible with the data from the study?

First, the acceptability gradation among the three types of non-finite adjuncts in (8) supports our assumptions that Scope Economy is an additional constraint on QR and that this condition made the acceptability of QR from those three adjuncts be varied. However, the participants were much more likely to accept inverse scope across finite clause boundaries than that out of *after*-prepositional gerunds and bare participial gerunds, although clause-boundedness has been claimed to be a major restriction on QR (but not on *wh*-movement, which can cross a finite clause boundary unproblematically) much like island restrictions (see Ruys 1992, Cecchetto 2004, and others). The relatively high acceptability of long distance QR from finite clauses, which was tested as a control, sheds doubt not only on whether Scope Economy really does restrict QR, as raised as the first question in (10a), but also the methodology used in the study.

This may have resulted from failure to control for the following factors that may help a universal quantifier scope out of a finite clause: (i) illusive scope effects as a result of a non-episodic tense (a present tense) (Fox and Sauerland 1996),[14] (ii) different types of finite clauses (Wurmbrand 2013), and (iii) the syntactic

[14]For example, Fox and Sauerland (1996: (10)) give generic sentences like (i) as examples showing illusive scope effects. Despite a scope-freezing effect yielded by the double-object construction (see Chapter 2), the wide scope interpretation of the universal seems to be possible in (i):

(i). In general, I give [$_{QP1}$ a tourist] [$_{QP2}$ every leaflet] $(\exists > \forall, \forall > \exists)$

Fox and Sauerland claim that this wide scope interpretation of the universal available in (i) is illusive and yielded by the semantics of a generic operator quantifying over situations rather than by scope-shift of the universal. In a generic sentence, *every* is allowed to be trivialized and then its domain is restricted to just one and only entity in a situation.

position of an embedded universal (Farkas and Giannakidou 1996, Kayne 1998).

To re-examine whether Scope Economy indeed restricts QR as an additional constraint, we conducted a follow-up study to test the clause-boundness of QR using more controlled conditions. If we observe that QR across finite clause boundaries becomes difficult in an environment where these factors are controlled, we may be able to establish that relatively high acceptability of the long QR control items was not because of a problem of our experimental method but because of presence of the factors helping QR out of finite clauses. Once this is established, comparison between the two rankings should result in a firmer picture than the one discussed here. I will report the follow-up study in Chapter 5. On the basis of the outcome, we will discuss how the three factors mentioned above could have affected acceptability of long-distance QR in the main experiment (details on the three factors will also be explained there).

The second question (10b) concerns a difference between QR and *wh*-movement from bare participial gerunds in the acceptability, as shown in (8) and (9): how does the syntactic structure of a bare participial gerund marginally permit *wh*-argument extraction but restrict QR?[15]

For example, in (i), in each of the related situation, a tourist is given the single leaflet. This indicates that unlike the universal wide scope over the existential, the leaflets do not vary with the tourists. However, due to an interaction of the existential and a generic operator that inspects each of the related situations, the tourists can be allowed to vary with the situations. As a result, the illusive scope reading yielded by the semantics of the generic operator in (i) looks equivalent to the wide scope reading of the universal, which is indeed unavailable in the sentence. See Fox and Sauerland (1996) for the technical details.

[15]The other piece of evidence illustrating a difference between QR and *wh*-extraction in application of the Single Event Grouping Condition is the presence or absence of the causality effect. In contrast with the case of *wh*-extraction summarized in the ranking in (9), availability of causal construal between the matrix event and the adjunct event does not affect the possibility of QR from an *after*-prepositional gerund, as presented in Figure 4.10. This difference in the causality effect between the two operations may have been yielded by a problem with the experiment: namely, that the QR test involved simply too many contextual variables to process (i.e. the contexts for inverse scope and those describing presence / absence of causal construal, within the single experiment) rather than yielded by possible irrelevance of the Single Event Grouping Condition to QR.

As we have observed in (8) and (9), however, the different orders between bare participial gerunds and *after*-prepositional gerunds (QR: Bare Participial Gerund < *After*-Prepositional Gerund; *wh*: *After*-Prepositional Gerund without causality < *After*-Prepositional Gerund with causality ≈ Bare Participial Gerund) suggest that an additional constraint on *wh*-extraction is indeed different from that on QR.

As will be discussed in detail in Chapter 6, assuming that temporal prepositions yield temporal operators, which serve as scopal operators licensing QR, QR out of temporal adjuncts, namely *during*-PPs and *after*-prepositional gerunds, may be licensed by Scope Economy (Fox 1995; 2000, Reinhart 2006) in a successive cyclic way, whereas QR from bare participial gerunds, which lack such scopal operators, are not licensed by Scope Economy.

Meanwhile, the fact that the precise version of the prediction for *wh*-extraction (Figure 4.2) was correct on the basis of (9) suggests that Truswell's Single Event Grouping Condition is an additional constraint on *wh*-argument extraction out of non-finite adjuncts. The difference between *after*-prepositional gerunds with a causal construal and their non-causal counterparts in (9) is support for Truswell's argument for the Single Event Grouping Condition in that presence of a causal relation between the matrix and adjunct events can complement failure of spatio-temporal overlap of the matrix event and the event described by an *after*-prepositional gerund.

Moreover, the acceptability boundary between bare participial gerunds and *after*-prepositional gerunds without causality in (9) lies on a difference between the two in that the former satisfies the requirement of the Single Event Grouping Condition, namely, spatio-temporal overlap between the matrix event and the adjunct event, whereas the latter is unable to satisfy this requirement due to a temporal relation that the preposition *after* encodes. Therefore, *wh*-extraction out of an *after*-prepositional gerund cannot satisfy the Single Event Grouping Condition without a causal relation between the two events. Thus, the acceptability boundary between *wh*-extraction from bare participial gerunds / *after*-prepositional gerunds with causal construal and that from *after*-prepositional gerunds without causal construal in (9) indicates that possibility of *wh*-extraction from non-finite adjuncts depends on the Single Event Grouping Condition.

One possible answer for this question is, as discussed on the basis of Figure 4.3, that QR and *wh*-argument extraction are subject to different constraints at the syntax-semantics interface: Scope Economy and the Single Event Grouping Condition, respectively. To validate this answer, we need to reconfirm that the restriction of Scope Economy is real by examining the clause-boundness of QR as test conditions in the follow-up study, as raised earlier. If Scope Economy indeed restricts QR, then we also need to closely analyze the structure of a bare participial gerund to investigate how this structure is relevant with respect to the satisfaction of the Single Event Grouping Condition and the violation of Scope Economy.

The two questions raised above are both relevant to Scope Economy. Let us now turn to the third question (10c), which concerns a theoretical issue with the two different versions of Scope Economy: Fox's (1995; 2000) version, which assumes obligatory QR as the first step of QR for resolution of a type-mismatch of a non-subject quantifier, and Reinhart's (2006) version, which only assumes optional QR for scope-shift. Is the idea of obligatory QR compatible with the case of QR from non-finite adjuncts?

In Chapter 2, we briefly discussed the plausibility of obligatory QR, which moves a non-subject quantifier to a clause-denoting node (eg. IP or vP) to avoid a type-mismatch. Among the three adjuncts we tested, adjunct PPs differ from the other verbal adjuncts in that the former do not contain a clause-denoting node. Hence, if obligatory QR always targets at a clause-denoting node to resolve a type-mismatch, it has to cross an island boundary of the adjunct PP not only for the inverse scope but also for the surface scope. If QR is restricted by the locality of the adjunct PP both for the inverse scope and the surface scope, why is inverse scope more degraded than surface scope, which is generally readily available? In other words, if obligatory QR is required for every quantifier in a non-subject position, how can this operation escape from island effects of non-finite adjuncts for the surface scope interpretation?

What follows is a preliminary of Chapters 5 and 6, where we will discuss answers to these questions. First, in Chapter 5, I will report the follow-up study, which re-examined the possibility of long-distance QR from finite clauses, using more carefully controlled conditions, in order to get a better grasp of the locality of QR, and in particular, to test the adequacy of Scope Economy (for an answer to (10a)). The outcome will suggest that Scope Economy does indeed restrict long-distance QR out of a finite clause independently of the factors that could facilitate long-distance QR.

After having experimentally confirmed that QR is indeed restricted by Scope Economy, I will elaborate a theory of QR and *wh*-argument extraction on the basis of the linking hypothesis I propose (see Section 2.4 for the preliminary of this proposal), and I will account for not only the acceptability gradation illustrated in the rankings in (8) and (9) but also the issues raised in (10b) and (10c).

Before moving to the conclusion of this chapter, let us consider one problem with the experimental methodology of the study. The main challenge of this experiment was to test the adjunct island constraint on *wh*-movement and QR in the same way, namely by an acceptability judgment task. Well-formedness of *wh*-movement depends on grammatical acceptance of the sentence regardless of the interpretation. On the other hand, well-formedness of QR depends on its interpretational acceptance on the basis of provided written contexts but not on grammatical acceptability of the sentence. Due to this difference, we had to carefully instruct participants to grade the sentences relative to the inverse scope reading of the embedded universal. Hence, the QR test gave a greater workload to the participants than the *wh*-test, and as a consequence, the former must have been inherently harder than the latter.

Despite our worry that some of the subjects would grade quantified sentences on the basis of grammatical acceptability, they were in fact slightly more likely to give lower grades for Q-Control: no violation, than for W-Control: no violation (for further details of descriptive statistics of control conditions, see Appendix A). This suggests that the participants understood our instructions, and that some of them might have had difficulty even with local QR. On the other hand, they were slightly more likely to accept Q-Control* compared with W-Control*. Since the quantified sentences were grammatically perfect, some of the participants might have hesitated to give very low grades to the control items in which inverse scope readings should be blocked. This may be one of the difficulties of testing interpretational phenomena like QR via acceptability judgment tasks, which normally measure grammatical acceptability of test items.[16]

4.7 Conclusion

In conclusion, the outcome of the main experiment (which has been summarized in the rankings (8) and (9)) confirmed the parallelism between *wh*-argument extraction and QR, in that both were marginally possible at best from non-finite adjuncts. This marginal acceptability reflects the weak restriction of the adjunct island on these movement operations.

Next, the acceptability gradations illustrated in the rankings (8) and (9) suggested that additional constraints restrict *wh*-extraction and QR from non-finite adjuncts. QR and *wh*-argument extraction from a non-finite adjunct is marginally possible if a certain additional constraint is satisfied; otherwise, extraction becomes ill-formed. QR and *wh*-argument extraction behave similarly in that both are subject to an additional constraint at the syntax-semantics interface.

However, as shown in (8) and (9), we also observed some difference between QR and *wh*-argument extraction, which has provided us with the follow-up questions listed in (10). In Chapter 6, I will argue that the difference between (8) and (9) in the acceptability of extraction from bare participial gerunds results from the fact that QR and *wh*-extraction are subject to different constraints at the interface: Scope Economy and the Single Event Grouping Condition, respectively.

[16] To resolve this problem, in the follow-up study, which will be reported in Chapter 5, we modified indefinite subjects of the QR items by *different*. This modification can clarify distributive readings of universal quantifiers and should block the surface scope interpretations. As a consequence, if an inverse scope interpretation is unavailable, the subjects should find the sentence unacceptable and reject it more easily. If modification by *different* works as required, contexts could be rendered shorter than the contexts used in this study since we would not need much effort excluding the possibility of a surface scope interpretation available in the sentence using a long context. This may reduce fatigue and decreasing concentration of the subjects. We will see, however, that this method did not have quite the desired consequences in the follow-up study.

The outcome of the follow-up study, which will be reported in Chapter 5, will experimentally confirm that QR is indeed restricted by Scope Economy and support this claim. I will establish the linking hypothesis-based account for QR and *wh*-extraction from non-finite adjuncts, and I will account for the acceptability gradations illustrated in those rankings and answer the remaining questions.

Chapter 5

Follow-up study: long-distance QR out of finite clauses

As reported in Chapter 4, the result of the main experiment revealed that both QR and *wh*-argument extraction out of adjuncts is marginal at best. This indicates that both the operations are indeed weakly restricted by the adjunct island constraint, and supports the hypothesis that scope-shift involves covert movement (QR). On the other hand, the asymmetry between QR and *wh*-extraction out of a bare participial gerund can be captured by assuming that the two operations are subject to different constraints at the syntax-semantics interface: Scope Economy (Fox 1995; 2000) and the Single Event Grouping Condition (Truswell 2007; 2011) respectively.

However, as discussed in Section 4.6, the outcome of the study has left us with the following questions, listed in (1):

(1) a. **Clause-boundness of QR:**
Does Scope Economy indeed restrict QR?

b. **Bare participial gerunds:**
How does the syntactic structure of a bare participial gerund marginally permit *wh*-argument extraction but restrict QR?

c. **Obligatory QR:**

Is the assumption of obligatory QR compatible with the data from the study?

One of the remaining questions, (1a), concerns the outcome of the control items testing long-distance QR from finite clauses, which were found to be somewhat acceptable despite the well-known claim that QR is clause-bounded. If QR is not clause-bounded, this would be difficult to reconcile with Fox's (1995; 2000) and Reinhart's (2006) arguments in favor of Scope Economy, contrary to the core output of the main experiment. Therefore, to confirm that Scope Economy does indeed restrict QR (in response to the question in (1a)), I conducted a follow-up study, which re-examined the locality of long-distance QR in a more tightly controlled environment.

This chapter reports the follow-up study, which examined the hypothesis that QR is restricted by Scope Economy and is therefore clause-bounded. After a more concrete picture of the locality of QR is obtained from the follow-up study, we will come back to the remaining questions in (1b) and (1c) in Chapter 6.

5.1 Proposal

5.1.1 Hypothesis and theoretical background

As pointed out in Chapter 4, despite well-known claim that QR is clause-bounded, the result of the control items of the previous experiment suggested that inverse scope out of finite clauses was in fact somewhat acceptable for many participants.

In the previous study, there were several issues that may have been responsible for the unexpected results: (i) illusive scope effects (Fox and Sauerland 1996) (for the details, see Footnote 14 in Chapter 4), (ii) a syntactic difference between indicative and subjunctive finite clauses, and (iii) the location of a universally quantified NP in the embedded clause. In the previous literature, it has been argued that all of these factors could aid scope-shift out of a finite clause, but we failed to control for them in the main experiment. In this follow-up study, we tested whether long-distance QR would become less acceptable than in the previous study once the aforementioned factors were properly controlled.

The core hypothesis of the follow-up study is that QR is restricted by Scope Economy and therefore clause-bounded. Fox (1995; 2000) argues that, unlike *wh*-movement, QR is restricted by Scope Economy in addition to standard locality constraints such as Shortest Move (Chomsky 1995, Fox 2000) and phases (Chomsky 2000; 2001). Hence, QR across a finite clause boundary should be possible only if QR to the Spec of the embedded CP creates a new scopal reading, in accordance with Scope Economy. (2a) demonstrates that a finite clause boundary does not block *wh*-movement, whereas the absence of the inverse scope reading in (2b) (cited from Fox 1995: 336) suggests that it does block QR:

(2) a. [$_{\text{CP}}$ Who do you think [$_{\text{CP}}$ t'_{WH} that [$_{\text{IP}}$ she might have been kissing t_{WH}]]]?

b. One girl said [$_{\text{CP}}$ that [$_{\text{IP}}$ John talked to every boy]]. $*\forall > \exists$

In (2b), after obligatory QR to a vP node, optional QR to the lower Spec CP fails to satisfy Scope Economy, since this movement crosses a non-scopal complementiser (*that*), and therefore cannot give rise to a new scope interpretation. Complementizers of finite clauses are often non-scopal elements like *that*. Hence, successive cyclic QR via Spec of the embedded CP is blocked by Scope Economy except in cases where the lower C is occupied by a scopal complementizer like *wh*-phrases. See Fox (1995; 2000) for discussion on possible long-distance QR across a *wh*-complementizer on the basis of an observation by Moltmann and Szabolcsi (1994). The focus of this study was on QR from finite clauses headed by *that*, and so the possibility of long-distance QR out of other clause-types will remain an issue for further study.

Similarly, long QR across the matrix subject, without the use of intermediate landing sites, is disallowed by locality constraints. For example, in conjunction with Uriagareka's (1999) theory of Multiple Spell-Out, Wurmbrand (2013) argues that long QR from the lower vP to the matrix vP should be disallowed, since when the matrix vP is built in the structure, a complement of the phase head C, the embedded IP, has already been Spelled-Out. As a result, a quantifier within the embedded IP is inaccessible to the matrix vP unless that quantifier makes use of the edge of the CP phase as an intermediate landing site. This edge position, however, cannot be used as an escape hatch for QR due to Scope Economy.

Thus, Scope Economy along with locality restrictions predicts the unavailability of the inverse scope reading in (2b). However, as mentioned before, the following three factors could aid QR out of a finite clause independently of the restriction of Scope Economy.

The first factor is an illusive scope effect. Fox and Sauerland (1996) argue that a universal quantifier may illusorily take wide scope if the sentence has a generic tense and a context facilitating a generic interpretation. In order to control for this effect, we made all test sentences have an episodic tense (past tense) and be in an episodic context.

The second factor is a difference in types of finite clauses (labeled as *Clause Type*). It has been argued that QR from subjunctive finite clauses should be easier than QR from indicative finite clauses. Farkas and Giannakidou (1996) and Wurmbrand (2013) report that scope-shift out of subjunctive finite clauses is much more effortless than scope-shift out of indicative clauses in Greek and English, respectively. Similarly, Kayne (1998) reports that in French, overt movement of the quantifier *rien* ('nothing') is possible out of subjunctive finite clauses. In addition to scope-shift, subjunctive clauses have been argued to be relatively transparent for other syntactic dependencies cross-linguistically such as long-distance anaphoric binding, NPI licensing, and A-movement (e.g. subject raising out of subjunctive clauses). See Quer (2006) for details.

Wurmbrand (2013) accounts for the transparency of subjunctive clauses for QR by a requirement of value selection satisfied via Agree between subjunctive verbs and their complements. She assumes that unlike indicative verbs, subjunctive verbs lexically select semantic values such as tense, mood, and modality of the highest projection of their complement, on the basis of examples like (3) (Wurmbrand 2013: (15)):

(3) a. I demand that he listen to this.

b. *I said that he listen to this.

Wurmbrand argues that a tense / mood interpretable unvalued feature of the value-selected complement clause *that he listen to this* in (3), which should be particular to subjunctives, must be selected by an uninterpretable valued feature of the subjunctive verb like (3a). In contrast, an indicative verb like (3b) does not possess such a valued feature, so that it fails to select for the value-selected complement clause. Wurmbrand proposes that value-selections are satisfied by Agree and may circumvent phase-hoods. Unlike an indicative finite clause, when a subjunctive finite clause is built, the complement clause cannot be said to be fully specified for its semantic interpretation in that its interpretable unvalued feature has not yet been selected by the corresponding uninterpretable valued feature of the matrix subjunctive verb. This semantically underspecified complement clause is assumed to be insufficient to form a phase and therefore is transparent for QR.

The aim of this follow-up study was partly to examine whether the transparency of subjunctive clauses had really increased acceptability of sentences involving QR across finite clause boundaries in the main experiment. The specific factors responsible for the transparency of subjunctive clauses is beyond the scope of this thesis, and I will not analyze details of the syntax of subjunctive clauses in the rest of this thesis.

The third factor is the location of the quantifier in the embedded clause (labeled as *Grammatical Function*). Kayne (1998) presents a subject-object asymmetry in the (un)availability of the wide scope readings of negation over a subjunctive matrix verbal predicate, as shown in (4) (Kayne 1998: 128-129).[1]

(4) a. She has requested that they read not a single linguistics book.

request > *not*, *not* > *request*

b. She has requested that not a single student read our book.

request > *not*, ??*not* > *request*

(4a), in which a negated expression *not a single linguistics book* is an object in the lower clause, is scopally ambiguous. The surface scope interpretation of (4a) is that what she has requested is that they read not a single linguistics book, whereas the inverse scope interpretation is that she has made no request for them to read linguistic books. On the other hand, if a negated expression is subject in the embedded clause, as in (4b), the wide scope interpretation of the negated expression becomes highly degraded.

Kayne points out that the subject-object asymmetry found in (4) is similar

[1]Kayne (1998) himself accounts for the subject-object asymmetry by an overt movement analysis rather than by a covert movement one.

to the asymmetry found in overt *wh*-movement; for instance, the case of *that*-trace effects on *wh*-movement of the embedded subject to the matrix Spec CP (see Chomsky 1986). The movement approach to scope inversion predicts that scope-shift of a quantifier in the embedded object position over the matrix subject should be easier than scope-shift of a quantifier in embedded subject position. Due to features of Combinatory Categorial Grammar (CCG), Steedman (2012) also predicts this subject-object asymmetry.

Contrary to the syntactic prediction of the asymmetry, Farkas and Giannakidou (1996) argue that QR of a universal in subject position from a subjunctive finite clause is possible but that QR from an object position is not possible, since their semantic account requires that the embedded universal and matrix indefinite subject be co-arguments of the eventuality described by the matrix predicate for the wide-scope reading to be possible.

Farkas and Giannakidou (1996) assume that the embedded clause denotes an eventuality *e*, an external agent of which is a referent of the matrix indefinite subject, and that it is the embedded subject (but not the embedded object) that serves as an affected argument: a participant of *e* affected by the external agent. They argue that the external agent and the affected argument of *e* serve as co-arguments of a direct semantic relation in terms of the matrix predicate, and that wide scope of the universal out of the embedded clause is possible if this requirement of co-argumenthood is satisfied.

For example, in (5) (Farkas and Giannakidou 1996: 36), a referent of the matrix subject *a student* serves as an external agent of *e* denoted by the matrix subjunctive verb *made sure*, while the embedded subject *every speaker* serves as an affected argument.

(5) A student made sure that every speaker had a ride.

a student > *every speaker*, *every speaker* > *a student*

When a student made sure that every speaker had a ride, it can be said that that speaker is affected by the action of the student and then had a ride. In this way, both *a student* and *every speaker* are involved in 'making sure' event as co-participants of that event. The embedded object cannot be directly affected by the action of the matrix subject in the same way. Thus, Farkas and Giannakidou's account on the basis of semantic co-argumenthood makes a different prediction on the subject-object asymmetry.

In the control items involving long-distance QR in the main experiment, the location of a universal in the embedded clause was not controlled for. In the follow-up study, we also manipulated a subject-object asymmetry on the syntactic position of the embedded universal in order to examine whether this asymmetry plays a role on increasing the possibility of QR across finite clause boundaries, as predicted by the syntactic view or the semantic view explained above. In this study, we adopt the syntactic view and assume that QR of the object should be easier than that of the subject.

To sum up, in order to show empirically which factors made the outcome of the long QR control items be exceptionally high in the previous study, we manipulated two factors: *Clause Type* and *Grammatical Function*. In addition, all the test items were pre-controlled to have an episodic tense and to be provided with a context facilitating an episodic interpretation to avoid illusory scope.

In conjunction with the two factors explained above (i.e. *Clause Type* and *Grammatical Function*), the core hypothesis makes the general prediction that QR out of a finite clause should be marginally acceptable at best, since Scope Economy always restricts long-distance QR independently of the effects of these factors.

However, the *Clause Type* effect and the *Grammatical Function* effect raise the question of whether the locality of QR is a consequence of these two factors, rather than of Scope Economy. If Scope Economy is responsible for the locality of QR, then even QR from an embedded object position in a subjunctive clause like (4a) should be restricted, thus giving rise to a reduction in the acceptability of inverse scope. If it is not, however, QR of a quantifier in the embedded object position and / or out of a subjunctive clause should be permitted.

5.1.2 Predictions

The core hypothesis that QR is restricted by Scope Economy predicts that long-distance QR will be less acceptable than local QR, irrespective of other determining factors. In other words, long-distance QR facilitated by the *Clause*

Type effect and / or the *Grammatical Function* effect should still be marginal at best.

On the basis of this basic prediction illustrated above, we now consider how the hypothesis can make more detailed predictions, presented in Figure 5.1 - 5.4, in connection to *Clause Type* and *Grammatical Function*. In each of the four cases, we predict that the most acceptable case of long-distance QR is still more degraded than local QR, due to the restriction of Scope Economy:

$$\begin{tikzcd}
Ind_{Sb}/_{Ob} \arrow[dr] & \\
& No \\
Sub_{Sb}/_{Ob} \arrow[ur] &
\end{tikzcd}$$

Figure 5.1: Prediction 1: *Clause Type* is absent; *Grammatical Function* is absent $\mathrm{Ind_{Sb}}$ = indicative clause with a universal in subject, $\mathrm{Ind_{Ob}}$ = indicative clause with a universal in object, $\mathrm{Sub_{Sb}}$ = subjunctive clause with a universal in subject, $\mathrm{Sub_{Ob}}$= subjunctive clause with a universal in object, and No = no violation of syntactic constraint. X $\rightarrow$ Y indicates that Y is more acceptable than X.

$$\begin{tikzcd}
& Sub_{Sb} \arrow[dr] & \\
Ind_{Sb}/_{Ob} \arrow[ur] \arrow[dr] & & No \\
& Sub_{Ob} \arrow[ur] &
\end{tikzcd}$$

Figure 5.2: Prediction 2: *Clause Type* is present; *Grammatical Function* is absent

$$\begin{tikzcd}
Ind_{Sb} \arrow[r] & Ind_{Ob} \arrow[dr] & \\
& & No \\
Sub_{Sb} \arrow[r] & Sub_{Ob} \arrow[ur] &
\end{tikzcd}$$

Figure 5.3: Prediction 3: *Clause Type* is absent; *Grammatical Function* is present

$$\begin{tikzcd}
 & Ind_{Ob} \arrow[dr] & & \\
Ind_{Sb} \arrow[ur] \arrow[dr] & & Sub_{Ob} \arrow[r] & No \\
 & Sub_{Sb} \arrow[ur] & &
\end{tikzcd}$$

Figure 5.4: Prediction 4: *Clause Type* is present; *Grammatical Function* is present

First, if both *Clause Type* and *Grammatical Function* effects are absent, the hypothesis makes a prediction identical to the basic prediction, as presented in Figure 5.1. In this case, long-distance QR from either indicative or subjunctive clauses is equally unacceptable. Whether a quantifier undergoes QR from either an embedded subject or object position does not make a difference.

Second, as presented in Figure 5.2, if the *Clause Type* effect is present despite the absence of *Grammatical Function* effect, we predict that QR from a subjunctive clause will be more acceptable than QR from an indicative clause. Here, again, from which position a quantifier undergoes QR does not make a difference.

Figure 5.3 presents prediction 3: QR of a universal from an embedded object position will be more acceptable than QR of a universal from an embedded subject position from either a subjunctive or indicative clause, if only the *Grammatical Function* effect is present.

Finally, Figure 5.4 illustrates prediction 4: in case both *Clause Type* and *Grammatical Function* effects are present, QR from an embedded object position in a subjunctive clause should be easiest, and QR from an embedded subject position in an indicative clause should be the most difficult (among cases of long-distance QR). Meanwhile, QR from an embedded object position in an indicative clause and QR from an embedded subject position in a subjunctive clause are predicted to be intermediate between the other two cases, and the order between these two cannot be predicted.

In summary, if one of the patterns illustrated in Figure 5.1 to 5.4 emerges from our results, the hypothesis will be supported. On the other hand, if this is not the case, the hypothesis will be falsified, in that the best case of long-distance QR is as acceptable as local QR. This outcome may support a view that QR is very much like *wh*-movement.

Suppose, for instance, that QR out of a subjunctive clause is more acceptable than QR out of an indicative clause but more degraded than local QR, as shown by prediction 2 in Figure 5.2. This result would support the hypothesis and the *Clause Type* effect on QR, in that long-distance QR is facilitated by the syntactic transparency of subjunctives but is still constrained by Scope Economy independently from that effect.

On the other hand, if QR out of a subjunctive clause is as acceptable as local QR ($\mathrm{Ind_{Sb}} \approx \mathrm{Ind_{Ob}} < \mathrm{Sub_{Sb}} \approx \mathrm{Sub_{Ob}}$ = Local QR), this would falsify the hypothesis, because Scope Economy would not restrict long-distance QR. In this case, we would conclude that the indicative-subjunctive asymmetry does indeed give rise to the clause-boundness of QR since QR is blocked by non-subjunctive clause boundaries.

Note that the factors that we looked into in the follow-up study (*Clause Type* and *Grammatical Function*) had not been examined in the main experiment. In Chapter 6, we will come back to the *Clause Type* effect on long-distance QR and briefly discuss how my proposal based on the specific linking hypothesis I propose may calculate the acceptability of QR from indicative and subjunctive clauses. *Grammatical Function*, on the other hand, is not relevant to the overall argument in this thesis. Non-finite adjuncts lack overt subject positions that host quantified arguments; therefore, we cannot discuss the presence vs. absence of a subject-object asymmetry on the basis of QR and *wh*-argument extraction from non-finite adjuncts, which is the main focus of this thesis. I will leave further investigations of the *Grammatical Function* effect on QR in other syntactic environments to future research. As explained previously, the main goal of this study was to confirm the restriction of Scope Economy by re-examining claim that QR is clause-bounded. The results will have important implications for Chapter 6.

In order to test the four predictions outlined above, we carried out an online-questionnaire study, the format of which was similar to the previous study. In the following sections, we will report the details and outcome of the follow-up study.

5.2 Design

As explained in the previous section, the main factors manipulated in this study were two within-subjects independent variables: *Clause Type* (indicative vs. subjunctive) and *Grammatical Function* (subject vs. object).

First, *Clause Type* consisted of two-levels and was either indicative (labeled as Ind) or subjunctive finite clauses (labeled as Sub). On the basis of syntactic differences between indicatives and subjunctives, we predicted that QR from a subjunctive finite clause would be easier than that from an indicative finite clause if this factor is effective.

Second, *Grammatical Function* was a two-level factor: (i) embedded subject (labeled as Sb) and (ii) embedded object (labeled as Ob). Contrary to the semantic view by Farkas and Giannakidou (1996), due to the syntactic reasons explained before, we predicted that QR of a universal in an embedded subject position would be harder to get out of a finite clause than QR of a universal in an embedded object position if the *Grammatical Function* effect is available.

The 2 × 2 design resulted in four test conditions, as listed in (6). Each test condition was tested five times by five different indicative or subjunctive matrix verbal predicates. In order to compare Sb and Ob as a minimal pair in each of the Ind and Sub conditions, the same set of five indicative or subjunctive verbs was used to examine both Sb and Ob. The details of the test items will be given in the next subsection about materials. Note that in order to let the subjects clarify the (un)availability of an inverse scope (distributive) interpretation, we modified indefinite subjects with a modifier *different*, as illustrated in (6) (this method is used, for example, in Bruening 2001. See also Footnote 16 in Chapter 4 about the use of *different*).

(6) a. Last year, a different student said that each professor dated Sue. (Ind-Sb)

b. Last year, a different student said that Nancy dated each professor. (Ind-Ob)

c. After the lecture, a different professor suggested that each student talk to Prof Chomsky. (Sub-Sb)

d. After the lecture, a different professor suggested that Prof Dawkins talk to each student. (Sub-Ob)

These four test conditions were examined in two groups of different subjects: Group A versus Group B. In order to reduce the possibility that the choice of embedded verbs could give some unwanted effects on the outcome, in each of the group, we made use of two completely different sets of transitive verbs as embedded verbs. This grouping on the basis of the use of different sets of embedded verbs is an independent within-subjects variable (labelled as *Group*).

Finally, as in the previous study, the test items were tested via an acceptability judgment task, which asked subjects to grade how natural each of the test sentences were relative to a preceding context by assigning it a numeral grade between 1 and 5. Acceptability (naturalness) of each test sentence relative to the availability of the inverse scope reading, which was facilitated by a preceding context, was manipulated as a dependent variable. Acceptability of the four test conditions was compared with the acceptability of short QR and QR restricted by scope freezing and scope islands. These control conditions served as acceptable and unacceptable benchmarks, respectively (the control conditions will be explained in detail in the next subsection about materials of the study). In contrast to the previous study, this study focused on testing the restrictions on QR specifically, but we continued to make use of the same task rather than a truth-value judgement task in order for the outcome to be comparable with the outcome of the previous study.

5.3 Materials

In each of the two groups, each of the four test conditions was tested using five test sentences (i.e. with five different indicative verbs / with five different subjunctive verbs), so that 40 test sentences were examined in total (in each of the groups, there were 20 test sentences tested in total). For a full list of the test sentences, see Appendix B.

For each of ten matrix verbal predicates (five indicatives and five subjunctives), Sb and its Ob counterpart were controlled to form a minimal pair in order to precisely measure a difference depending on the location of an embedded quantifier, as exemplified in (6). For ten pairs of test items in each group, we used a completely different set of ten embedded verbs in order to prevent a fixed set of embedded verbs from affecting the outcome of the study.

In addition to the test sentences, there were twenty control items. The same set of twenty control items was used for both Group A and Group B. Half of the control items involved local QR taking place without a constraint, whereas the other half involved universal quantifiers contained in constructions restricting scope-shift; for example, scope islands, including a negative island, the Complex NP Constraint (CNPC), and the Coordinate Structure Constraint (CSC), and scope freezing constructions, such as double object and spray-load constructions (see Bruening 2001), and verbs that lexically give rise to scope freezing such as *contain* (see Neeleman and Van de Koot 2012). The former is labeled as CG (Control Good), which was predicted to be graded high, whereas the latter is labeled as CB (Control Bad), which was predicted to be graded low on the basis of the outcome of the controls in the main experiment. For a full list of the control items, see Appendix B.

In all of these control items, QR takes place clause-internally. In order to mask a difference on the surface between the test items involving long-distance QR and the control items involving clause-internal QR, each of the control items involved clause-internal QR within an embedded finite clause, as shown in (7).

(7) a. Henry told me that a different girl kissed each dancer. (CG)

b. James said that Mary gave a different student each French novel last week. (CB: scope freezing)

The purposes of these control items were to mask any pattern in the test sentences and to break a response pattern by making two benchmarks with CG predicted to be graded high and CB predicted to be graded low on the basis of the outcome of the control items in the previous study.

Each test and control sentence was preceded by two to three line written contexts intended to facilitate an inverse scope interpretation.[2] Contexts used

[2]In contrast to the main experiment conducted, which was conducted at a University, we were not able to have the subjects do the test in a controlled environment in the online study.

for the test items in (6) are listed in (8):

(8) a. **Ind-Sb**: *Sue is an attractive post-doc. There are five male professors in the department. Rumours fly. At least one PhD student of each of the professors started one at some point...*

b. **Ind-Ob**: *Nancy is an attractive post-doc. There are five male professors in the department. Rumours fly. At least one PhD student of each of the professors started one at some point...*

c. **Sub-Sb**: *Prof Chomsky visited the department last week. In the department, there are three professors, each supervising one PhD student. Each professor came up with an idea of arranging for their PhD student to meet with Prof Chomsky...*

d. **Sub-Ob**: *Prof Dawkins visited the department last week. In the department, there are three professors, each supervising one PhD student. Each of the professors had an idea of asking Prof Dawkins to meet with their PhD student...*

The dependent variable was measured by asking the subjects to answer how acceptable a sentence was on the basis of its context by clicking one of the numbers in the scale 1 (completely unacceptable) - 5 (completely acceptable).

5.4 Subjects and Procedure

The online questionnaire study was run in September 2013. We made use of *Opinio* to create the online survey forms and to conduct the study.

We sent an email advertising this study to all undergraduates and postgraduates at UCL in order to recruit participants. The email contains two URL links, which allow volunteers to enter the study. We asked people whose birthday's first digit was an odd number to use the first URL for Group A and others whose birthday's first digit was an even number to use the second URL for Group B. Thus, the participants for each group were randomly chosen in this way. The

We shortened the contexts compared with the previous study to prevent the subjects losing concentration or feeling fatigued with reading contexts. This is to control for the fact that participants can quit the online study more easily than the walk-in questionnaire study.

email explicitly explained that only native speakers of British English aged 18 or over were eligible.

There were 294 subjects in total who completed the study by answering all the questions (158 subjects for Group A; 136 subjects for Group B); however, we excluded those subjects that spent less than 15 minutes completing the study and those that spent more than 55 minutes finishing it. As a result, we were left with 207 subjects in total: 110 subjects for Group A, and 97 subjects for Group B. The following table shows the gender and age groups of the participants:

		18-20	21-30	31-40	41-50	51-	Total
Group A	**Female**	18	30	11	2	2	63
	Male	18	20	5	1	3	47
	Total	36	50	16	3	5	110
Group B	**Female**	19	38	2	1	1	61
	Male	15	16	3	1	1	36
	Total	34	54	5	2	2	97
Total		70	104	21	5	7	207

Table 5.1: The number of subjects for each age and gender group in the follow-up study

9 out of the 207 subjects were students who had studied linguistics (6 in Group A; 3 in Group B) as part of their program of study. 7 out of the 207 subjects were bilingual or multilingual people whose first language was British English. Because the populations of linguists and bilingual / multilingual speakers were not big enough to affect statistical tests, we did not exclude these groups from the outcome.

The 207 participants were all entered into a prize draw to win a £200 Amazon voucher, and one of them who was chosen by lot won the prize.

Once the subjects accessed the online questionnaire forms via one of the URLs in the email, a brief introduction about the study was provided to the subjects, and eligibility of the subjects for the study was reconfirmed by asking a yes-no question. Only the subjects who confirmed their eligibility for the study by clicking *yes* proceeded to the next step.

Next, before the QR test, we asked the subjects about themselves: age, gender, student status, a linguist or not, a multilingual speaker or not, and frequency of their use of British English at home, at university, and with friends. We also asked them to provide their email addresses only for the purposes of the prize draw. Each of these questions was answered by clicking one of multiple-choice answers, and the subjects were sometimes asked to provide written answers as a supplement to some of the multiple-choice questions. After completing this part, the subjects proceeded to the QR test.

At the beginning of the QR test, the subjects were asked to read written instructions carefully explaining how to judge each sentence on the basis of its short context and asking them to answer each question by clicking one of the numerical grades between 1 and 5. The participants were also allowed to ask the experimenter questions by email if there was anything unclear about the test (this was explicitly stated in the advertising email).

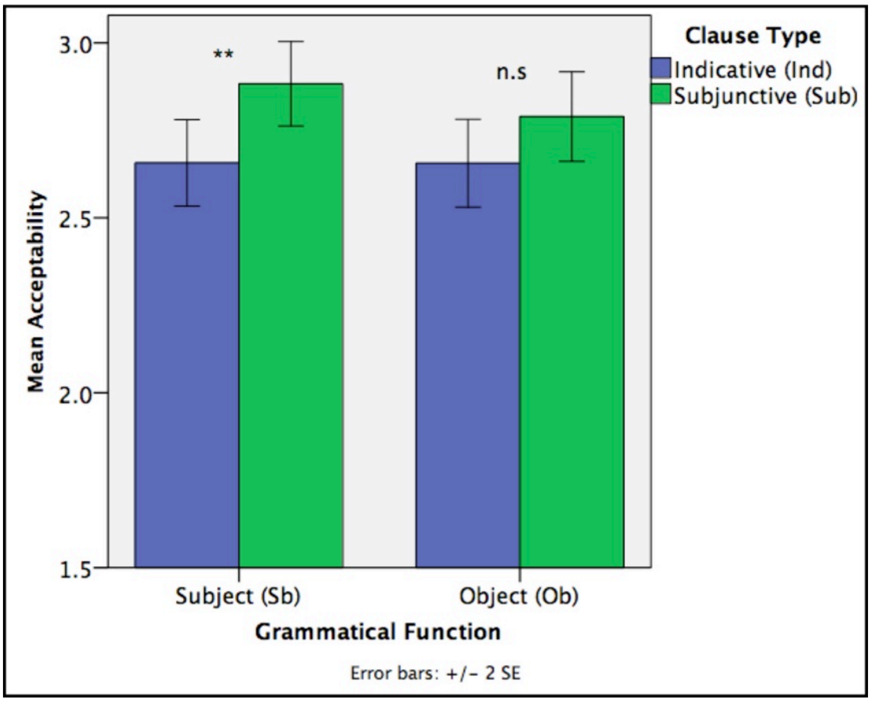
After reading the instructions, the participants were allowed to start the test. For each of the subjects, the ordering of 40 questions was completely randomized via *Opinio* system. The purpose of randomization was to eliminate any order effects.

The subjects graded how natural each sentence was in a given context by clicking one of the numeral grades, following that sentence. Each subject was asked to spend about 25 mins to complete the test. The *Opinio* system did not allow the subjects to complete the study unless they answered all of the questions.

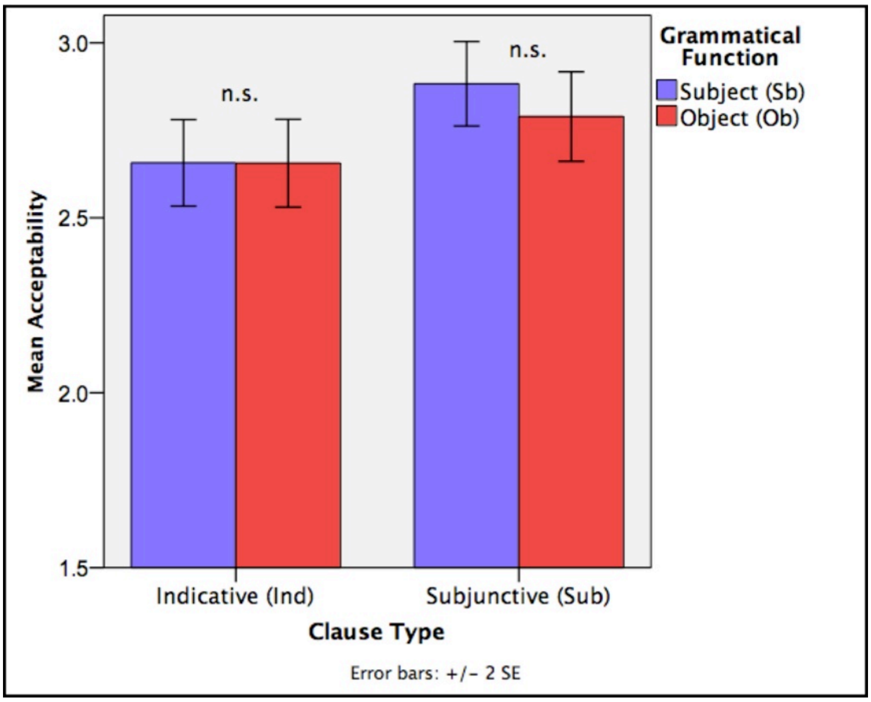
5.5 Results

Like the previous study, subjects' responses given as numeral grades between 1 and 5 were analyzed in terms of the mean acceptability of the test sentences in each test condition.

Figure 5.5a and 5.5b display the overall test condition means (i.e. including the two groups).



(a) Indicative vs. Subjunctive



(b) Subject vs. Object

Figure 5.5: Test condition means (error bars represent standard error for each condition). A significance level of each difference between adjacent conditions is indicated as follows: n.s.= non-significant, * = $p < 0.05$, and ** = $p < 0.01$ (adjustment for multiple comparisons: Bonferroni by SPSS).

LMM with *Clause Type*, *Grammatical Function*, and *Group* as factors (2 × 2 × 2) revealed a significant main effect of *Clause Type* ($F(1, 800.632)=8.303$; $p < 0.01$), no reliable effect of *Grammatical Function* ($F(1, 800.632)=0.566$; $p= 0.452$), and no reliable effect of *Group* ($F(1, 800.632)=0.404$; $p= 0.525$). No interaction of *Clause Type* and *Grammatical Function* ($F(1, 800.632)=0.609$; $p= 0.435$), no interaction of *Group* and *Clause Type* ($F(1, 800.632)=0.018$; $p= 0.893$), and no interaction of *Group* and *Grammatical Function* ($F(1, 800.632)=0.006$; $p= 0.939$) was observed.

We now analyze the result of the F-test above on the basis of post-hoc multiple comparisons made by LMM. SPSS Bonferroni-adjusted p-values for pairwise comparisons are reported below (the conventional level of significance: $p < 0.05$).

First, the lack of reliable effect of *Group* suggests that the different sets of embedded verbs used for each of the groups did not give rise to different response patterns. Hence, we will mainly take a look at the overall mean acceptability rather than the group means (for further details of the group means, see Appendix B).

The main effect of *Clause Type* is due to the fact that it was easier for the subjects to interpret inverse scope of a universal out of a subjunctive finite clause than out of an indicative clause ($p < 0.01$). The lack of interaction between *Group* and *Clause Type* resulted from the fact that QR from subjunctive clauses was easier than QR from indicative clauses for both Group A ($p< 0.05$) and Group B ($p< 0.05$).

In contrast with the effect of *Clause Type*, the lack of reliable effect of *Grammatical Function* suggests that the acceptability of QR from the embedded subject position did not differ from that of QR from the embedded object position ($p = 0.452$). The lack of interaction between *Group* and *Grammatical Function* is due to the fact that whether a universal NP was in subject or object position in the embedded clause did not give rise to different patterns of QR from finite clauses between Group A ($p = 0.542$) and Group B ($p = 0.646$).

As illustrated visually in Figure 5.5a, inverse scope out of a subjunctive clause was much more likely to be accepted by the subjects than inverse scope out of an indicative clause in Sb *Grammatical Function* condition ($p < 0.01$). The subjects were also able to interpret inverse scope out of a subjunctive clause more easily than that out of an indicative clause in Ob condition, but the difference fell somewhat short of significance ($p = 0.145$) due to Bonferroni Correction.

Figure 5.5a indicates that the effect of a subjunctive clause might become stronger when a universal occupies the embedded subject position than when a universal occupies the embedded object position, but this was too weak to give rise to an interaction between *Clause Type* and *Grammatical Function*. As illustrated by Figure 5.5b, the subjects were indeed more likely to obtain an inverse scope reading out of a subjunctive when a universal occupied the embedded subject position than when a universal occupied the embedded object position. However, this difference did not reach statistical significance after Bonferroni Correction (p= 0.279). Similarly, the location of a universal did not play a role at all in ease of inverse scope out of an indicative clause (p= 0.984). These facts resulted in the lack of the interaction between *Clause Type* and *Grammatical Function*.

Thus, the overall result of the test conditions suggests that it was easier for the subjects to interpret the wide scope of a universal out of a subjunctive finite clause than out of an indicative clause. In contrast with the effect of finite clause types, the syntactic position of the universal in the finite clause did not affect the possibility of QR across finite clause boundaries.

Finally, let us compare the acceptability of the test conditions with that of the control conditions. Figure 5.6 displays the overall result showing the mean acceptability of each of the test and control conditions. Note that we conducted two-tailed dependent T-tests twelve times for making further post-hoc multiple comparisons on the outcome including the control conditions (for the full details of the pairwise T-tests, I refer the reader to Table B.11 in Appendix B). Therefore, the level of significance for the multiple paired T-tests has been manually adjusted to $p < 0.004$ (0.05 / 12) by Bonferroni Correction.

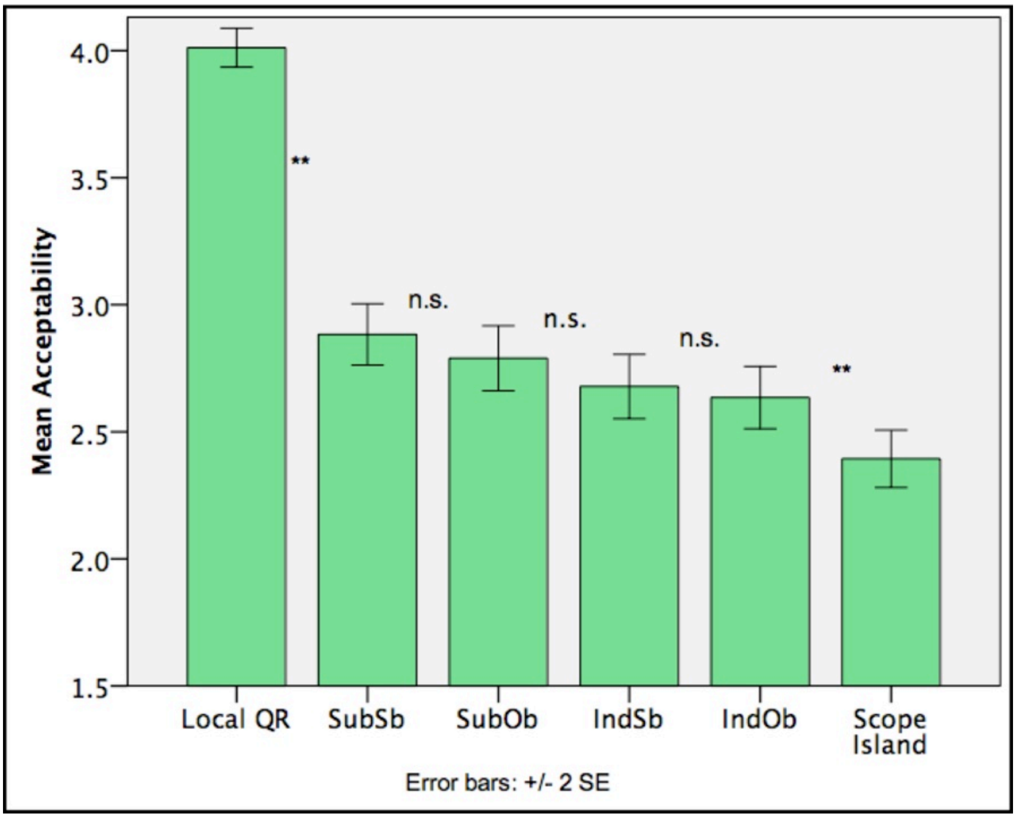


Figure 5.6: Follow-up study test and control condition means (error bars represent standard error for each condition). A significance level of each difference between adjacent conditions is indicated as follows: n.s.= non-significant, * = $p < 0.004$ (0.05 / 12: adjusted by Bonferroni Correction), and ** = $p < 0.001$. The mean acceptability of Scope Freezing involved in the CB control items is excluded and not presented here.

The post-hoc multiple comparisons of the test conditions were provided by LMM and explained before on the basis of Figure 5.5. However, LMM did not run pairwise comparisons between SubOb and IndSb and between SubSb and IndOb. A two-tailed dependent T-test revealed that it was much easier for the subjects to accept scope-shift of a universal from an embedded subject position in a subjunctive clause than from an embedded object position in an indicative clause (SubSb versus IndOb: $t(206) = 4.603$, $p < 0.001$). The subjects were more likely to accept scope-shift of a universal from an embedded object position in a subjunctive clause than that from an embedded subject position in an indicative clause, but as shown in Figure 5.6, the difference failed to reach the Bonferroni-adjusted level of significance (SubOb versus IndSb: $t(206) = 2.116$, $p = 0.036$).[3]

Next, as displayed by Figure 5.6, CG control items involving non-restricted local QR and the CB control items involving QR out of a scope island function as good benchmarks for the acceptability of the test conditions.

A T-test revealed that the subjects were more able to obtain inverse scope interpretations if scope shift is a local operation not subject to any restriction, than if the universal is embedded in a finite clause (Local QR versus SubSb: $t(206) = 17.915$, $p < 0.001$). On the other hand, it was much harder for the subjects to scope the universal out of a scope island than out of a finite clause (Scope Island versus IndOb: $t(206) = -3.834$, $p < 0.001$).

However, surprisingly, the score of Scope Freezing was much higher compared with the scope freezing items in the main experiment (involved in Q-Control*), where double object constructions restricted scope inversion just like scope islands (see Chapter 4). In the follow-up study, scope islands blocked the wide scope of a universal much more strictly than scope freezing environments ($t(206) = -8.273$, $p < 0.001$). Blocking effects of scope freezing environments were weaker compared with scope islands but comparable with SubSb ($t(206) = 1.106$, $p = 0.270$).

In the main experiment, we only tested two Scope Freezing control items, each

[3]In order to properly adjust the levels of significance by Bonferroni Correction for the multiple comparisons of the test conditions and the control conditions, we repeated the pairwise comparisons of the test conditions by two-tailed dependent T-tests. The outcome of the pairwise T-tests mostly follows the overview provided by the LMM post-hoc multiple comparisons, as follows: SubSb versus SubOb: $t(206) = 2.024$, $p = 0.044$, IndSb versus IndOb: $t(206) = 0.929$, $p = 0.345$, and SubSb versus IndSb: $t(206) = 3.856$, $p < 0.001$ (see Appendix B).

However, unlike the outcome of the previous post-hoc test, the T-test revealed that the difference in acceptability between QR from an embedded object position in a subjunctive clause and QR from an embedded object position in an indicative clause reached the Bonferroni-adjusted level of significance: SubOb versus IndOb: $t(206) = 2.965$, $p < 0.004$. The Bonferonni adjustment that we manually applied to the conventional level of significance for the pairwise T-tests here differs from SPSSs way of making Bonferroni adjustment (See Footnote 10 in Chapter 4). I consider these different methods of Bonferroni Correction to result in the different outputs of the pairwise comparison between SubOb and IndOb.

of which involved a double object construction with the verbs *gave* and *showed* (see Appendix A), whereas six Scope Freezing items were tested in the follow-up study: four of them involved structural scope freezing; three double object constructions (with *gave*, *showed*, and *awarded*) and one spray-load construction (with *drape*) (Bruening 2001), and two of them involved lexical scope freezing, which certain lexical verbs like *contained* and *received* give rise to (see Neeleman and Van de Koot 2012 for further details).

The means of the Scope Freezing items were higher in the follow-up study than in the main experiment, because the follow-up study examined two lexical scope freezing items in addition to the structural ones. As shown in Appendix B, the structure of the two lexical scope freezing items (CB1 and CB5) is the same as that of the local QR items (CG) except that the embedded verbs in the former case gave rise to scope freezing effects. The similarity in the constructions could have allowed the subjects to more generously accept the inverse scope with the lexical scope freezing items compared with the structural scope freezing items ($t(206) = 3.398$, $p < 0.004$) and increased the overall mean of Scope Freezing items. Meanwhile, a difference between the mean acceptability of local QR items and the lexical scope freezing items suggests that the scope freezing effect associated with verbs could be detected in comparison with local QR ($t(206) = -9.967$, $p < 0.001$).

Moreover, the relatively high acceptability of the Scope Freezing items is also attributable to the fact that inverse scope was more readily available with two structural scope freezing items with the verbs which had not been tested in the previous study (*drape* and *awarded*) than with the other two items with the verbs which had been tested in the previous study (*gave* and *showed*). For further details of the outcomes for structural scope freezing items, see Table B.15 in Appendix B.

To sum up, finite clause boundaries certainly restricted QR, as demonstrated by the comparison with non-restricted local QR. Moreover, the mean acceptability of all of the test conditions was lower than that of the long-distance QR items in the previous study, and than 3.0, our minimal cut-off point for a sentence to be classed as acceptable. On the other hand, compared with scope island effects, the clause-boundedness of QR was a less severe restriction. The outcome also revealed that scope freezing effects on QR are statistically indistinguishable from the restriction of subjunctive clauses on QR of a universal in the embedded subject position (SubSb), the most permissive test condition.

5.6 Discussion

The purpose of the follow-up study was to re-examine long-distance QR across finite clause boundaries using more tightly controlled conditions and to investigate the factors responsible for the long-distance QR control items to be unexpectedly permissive for the subjects in the main experiment. First, the fact that the overall mean of the long-distance QR items got lower in this study than in the previous study and below the cut-off point (3.0) indicates that our pre-control on illusive scope effects was effective. In other words, there must have been some illusive scope effects on long-distance QR in the previous study. The fact that the best case of long-distance QR (i.e. QR from an embedded subject position in a subjunctive clause) was more degraded than local QR supports the hypothesis that QR is restricted by Scope Economy.

Next, we observed a main effect of *Clause Type*. The fact that it was easier for the subjects to interpret the wide scope of a universal out of a subjunctive finite clause than out of an indicative clause confirms that the transparency of subjunctives for syntactic dependencies extends to QR. Hence, the finite clause effect must have been available and played a role in long-distance QR be easier in some of the control items in the main experiment.

On the other hand, the lack of reliable effect of *Grammatical Function* suggests that a reliable subject-object asymmetry in long-distance QR was not observed despite a prediction from the view of syntax (Kayne 1998), in which long-distance QR from the embedded object position is allowed but is degraded from an embedded subject position. On the other hand, the prediction from the semantics (Farkas and Giannakidou 1996), in which it is assumed that semantic co-argumenthood allows long-distance QR of the embedded subject in a subjunctive clause but of the embedded object seems to be somewhat supported by the significant difference between SubSb and SubOb (see Figure 5.5a). Because we did not find an interaction of *Grammatical Function* and *Clause Type*, this may not be sufficient evidence to argue for Farkas and Giannakidou (1996).

Prediction 2 (Figure 5.2) mostly follows the overall outcome, except that QR of the embedded subject in a subjunctive clause was more acceptable than QR of the embedded object in a subjunctive clause, as predicted by Farkas and Giannakidou (1996).

Thus, the outcome of the study confirms that Scope Economy (Fox 1995; 2000) does indeed restrict long-distance QR out of a finite clause, as demonstrated by the comparison with local QR. Critically, as predicted by the core hypothesis, QR from a subjunctive clause was at best marginal, since Scope Economy independently restricts QR even when the operation is facilitated by the syntactic transparency of subjunctives.

However, the fact that the clause-boundedness of QR was a less severe restriction compared with scope island effects indicates that Scope Economy does not perfectively block QR and therefore must be a weaker restriction on QR than scope islands. We currently do not have an account of this difference in acceptability between QR out of a finite clause and QR out of a scope island. In Chapter 6, on the basis of the specific linking hypothesis I will propose, I will explain that the degradedness of long-distance QR should be compatible with Scope Economy, as long as violations of this constraint lead to a reduction in acceptability rather than to absolute ungrammaticality.

Moreover, the fact that QR from a finite clause is more acceptable than QR from a scope island and at best marginal where a finite clause is subjunctive and where illusive scope effects are controlled for suggests that the relatively high acceptability of long-distance QR in the previous study was due to illusive scope effects that were not controlled for and differences in finite clause types.

Before concluding this section, let us discuss potential problems with the follow-up study. First, as discussed previously, we did not find a reliable effect of *Grammatical Function*. If the observed lack of the subject-object asymmetry is genuine, this may be another difference between *wh*-movement and QR in addition to the ones found in the main experiment. The lack of the subject-object asymmetry in long-distance QR could be construed as evidence against the movement theory of scope-shift in that movement from the embedded subject position should be syntactically more constrained than movement from the embedded object position, as discussed in Kayne (1998).

However, it is the *that*-trace effect that creates the subject-object asymmetry for *wh*-movement. Aoun et al. (1987) argue that the ECP may be split into two different requirements for empty categories at PF and LF, and that the *that*-trace effect is a PF phenomenon that should be restricted by the PF part of the ECP.

The same conclusion is reached by Ackema and Neeleman (2004), who base their argument on the fact that the *that*-trace effect disappears when an adverbial intervenes between *that* and a subject-trace, as originally noted by Culicover (1993):

(9) Robin met the man {Op$_i$ that / who$_i$} Leslie said that *(for all intents and purposes) t_i was the mayor of the city. (Culicover 1993: 557)

If these works are on the right track, it is actually predicted that QR, an LF phenomenon, should not display the *that*-trace effect and therefore should not exhibit the syntactic subject-object asymmetry yielded by that PF phenomenon. The focus of this thesis is the locality of QR and the evidence from adjunct islands; hence, I will not pursue the unavailability of the subject-object asymmetry in this thesis, although this asymmetry could be one of the key factors of the locality of QR.

Before ending this section, I would like to note that both the main experiment and the follow-up study seem to have suffered from the same problem, in that the subjects assigned a grade greater than *2* to all items, including the scope island items. This is probably a problem with using an acceptability judgment task for the QR test. Because quantified sentences are grammatically acceptable, the subjects were probably hesitant to give the lowest grade *1* any of the items, to even the control items involving scope islands, despite the instructions asking them to grade the items relative to a given interpretation.

The method of modifying indefinite subjects with *different* in order to make the distributive interpretation salient was adopted in the follow-up study to resolve the problem we had in the previous study, but this does not seem to make a difference (for the details of how modification by *different* was expected to work, see Footnote 16 in Chapter 4). If it were not necessary to compare the outcome of the QR test with the test involving *wh*-movement, it may have been better to adopt a truth-value judgement task for testing interpretation-based operations such as QR. I will leave this issue for future study.

5.7 Reconsidering the locality of QR

Let us now consider the revised ranking of QR (10), reflecting the outcome of the follow-up study:[4]

(10) **QR:** Scope island $\approx$ Bare Participial Gerund$_{2.44}$ $<$ (Indicative Clause$_{2.65}$ $<$ *After*-Prepositional Gerund$_{2.78}$ $<$ Subjunctive Clause$_{2.83}$) $\| <$ *During*-PP$_{3.12}$ $<$ no violation of syntactic constraint

In the main experiment, long-distance QR out of a finite clause was somewhat acceptable, in that the mean acceptability of the operation was higher than the abstract cut-off point (3.0) (see Chapter 4). As a result of pre-controlling illusive scope effects in the follow-up study; however, QR from finite clauses became difficult, and in all four test conditions scored lower than the cut-off point. Even in the case of QR from subjunctive clauses, which was predicted to be easier than QR from indicative clauses, the acceptability was at best marginal. On the other hand, compared with QR from scope islands, long-distance QR from finite clauses was less degraded.

In conclusion, the facts obtained from the follow-up study suggest a clearer overview of the locality of QR. First, as argued in the previous literature, in contrast with *wh*-movement, QR out of finite clauses is restricted due to Scope Economy. However, the study revealed that violations of this constraint give

[4] The numerical subscript under each locality type is the mean acceptability of QR out of such an environment. Since in the follow-up study, the subjects were independent from the subjects of the main experiment (see Chapter 4) and QR from adjuncts was not tested, the mean acceptability of indicative clauses, *after*-prepositional gerunds and subjunctive clauses cannot be compared using a dependent T-test. Therefore, $<$ in parentheses does not indicate a significant difference between an indicative / subjunctive clause and an *after*-prepositional gerund.

rise to a reduction in acceptability rather than absolute unacceptability. Second, scope islands are more restrictive than finite clause boundaries. Alongside the fact that the syntactic transparency of subjunctives enables long-distance QR more readily, this indicates that Scope Economy, which cannot perfectively block QR, may be less restrictive compared with structural constraints. Finally, the absence of the subject-object asymmetry with long-distance QR indicates that the LF operation seems not to be subject to restrictions on PF phenomena, assuming that the *that*-trace effect can be classified as a PF-phenomenon restricted by the PF-part of the ECP (Aoun et al. 1987).

In the next chapter, I will formulate my proposal based on the linking-hypothesis, which will be shown to account for the experimental data of QR and *wh*-argument extraction from non-finite adjuncts. Finally, we will discuss the remaining questions in (1b) and (1c).

Chapter 6

QR and *wh*-movement out of adjuncts and the linking hypothesis

The aim of this chapter is to construct an account of QR and *wh*-movement out of non-finite adjuncts. My account will be framed in terms of the linking hypothesis between the grammar and psycholinguistic judgements previewed in Chapter 1 and 2. On the basis of discussion in this chapter, I will argue for a syntactic parallelism between QR and *wh*-movement, in the sense that both are subject to the same locality constraint. I will also explain why the acceptability of QR from bare participial gerunds diverges from *wh*-extraction from the same environment despite the parallelism is because the two operations are subject to two different constraints at the syntax-semantics interface: Scope Economy (Fox 1995; 2000) and the Single Event Grouping Condition (Truswell 2007; 2011), respectively. I will demonstrate how the proposal can account for the fine-grained pattern of acceptability judgements obtained from the experimental studies, which existing theories of locality are unable to fully explain.

In Chapter 5, the outcome of the follow-up study confirmed that Scope Economy indeed constraints QR; therefore, we have answered one of the three questions raised by the outcome of the main experiment (see Chapter 4).

In Section 6.1, we recap remaining two questions raised by the outcome of the main experiment. The first concerns bare participial gerunds, while the other concerns obligatory QR. In addition to these two questions, I will also introduce an additional question concerning scopal parallelism between bare participial gerunds and *while*-prepositional gerunds. These questions will be answered in subsequent sections of this chapter, in the light of the core proposal of this thesis established from Section 6.2 to 6.4.

My proposal will be elaborated as follows: First, Section 6.2 illustrates structural differences between the three types of non-finite adjunct. Second, Section 6.3 outlines that syntactic and interface constraints that QR and *wh*-movement are subject to. Third, Section 6.4 establishes the specific linking hypothesis between the grammar and psycholinguistic judgements, which was the subject of a preliminary discussion in Chapter 1 and 2. On the basis of structural differences between non-finite adjuncts, syntactic and interface constraints, and the linking hypothesis, I will demonstrate how my proposal captures the experimental data: namely the acceptability of QR and *wh*-movement from non-finite adjuncts, and provides an answer to the open question concerning bare participial gerunds. Likewise, Section 6.5 discusses the question concerning obligatory QR on the basis of the established proposal.

Section 6.6 discusses the additional question concerning *while*-prepositional gerunds. I argue that *while*-prepositional gerunds and bare participial gerunds share syntactic properties absent from *after*-prepositional gerunds, on the basis of Larson (1990) and Williams (1994), and argue that this syntactic similarity may account for the similarity between QR from *while*-prepositional gerunds and bare participial gerunds.

Finally, Section 6.7 summarizes the chapter and concludes by providing the overview of the parallelism between QR and *wh*-movement.

6.1 Remaining questions

As reported in Chapter 5, the outcome of the follow-up study confirmed that QR is indeed restricted by Scope Economy. This section recaps the remaining questions which the results of the main experiment gave rise to, briefly discussed in Section 4.6.2. These questions are repeated in (1a) and (1b), newly labelled as Question 1 and Question 2, respectively:

(1) a. **Question 1: Bare participial gerunds**
How does the syntactic structure of a bare participial gerund marginally permit *wh*-argument extraction but restrict QR?

b. **Question 2: Obligatory QR**
Is the assumption of obligatory QR (Fox 1995; 2000) compatible with the data from the study?

Question 1 (1a) concerns a difference in the possibility of *wh*-argument extraction and QR out of bare participial gerunds. As shown in the rankings of QR (2) and *wh*-movement (3), which were based on the outcome of the main experiment and the follow-up study, *wh*-extraction from bare participial gerunds is marginally permitted, whereas QR from this type of adjunct is as difficult as from a scope island:

(2) [1] **QR:** Scope island ≈ Bare Participial Gerund$_{2.44}$ < (Indicative Clause$_{2.65}$ <*After*-Prepositional Gerund$_{2.78}$ < Subjunctive Clause$_{2.83}$) ‖< *During*-PP$_{3.12}$ < no violation of syntactic constraint

(3) ***wh*-movement:** Absolute island < *After*-Prepositional Gerund without causality ‖< *After*-Prepositional Gerund with causality ≈ Bare Participial Gerund ≈ *During*-PP < no violation of syntactic constraint

As discussed in Chapter 4, the difference between QR and *wh*-movement with respect to extraction from bare participial gerunds can be accounted for if the structure of a bare participial gerund leads to satisfaction of the Single Event Grouping but to violation of Scope Economy. The follow-up study supported Scope Economy as a valid restriction on QR; the next step is to take a look at the structure of a bare participial gerund vs. the structure of a temporal adjunct.

In an answer for Question 1, I will schematically illustrate the structural difference among the three types of adjuncts in Section 6.2. Here is a preliminary of the core argument of Section 6.2. Unlike the other temporal adjuncts, I will assume that the time interval of the event described by a bare participial gerund is required to spatio-temporally overlap with the the time interval of the matrix

[1]For the subscript number indicated in each locality type, see Section 5.7.

event, by adopting Rothstein's (2003) analysis of secondary predication by TP-CONNECT (I will give this definition later). From this analysis it will follow that bare participial gerunds lack a temporal operator, unlike the other temporal adjuncts, and this may aid satisfaction of the Single Event Grouping Condition for successful *wh*-argument extraction. I will argue that the absence of a temporal operator within the structure of a bare participial gerund also predicts that QR out of this adjunct should violate Scope Economy, unlike QR out of temporal adjuncts, which satisfies Scope Economy due to the presence of a temporal operator.

Before moving to Question 2 in (1b), in connection with Question 1, I will introduce that bare participial gerunds exhibit some similarities with *while*-prepositional gerunds, which were not examined in the study. For example, the sentence with a bare participial gerund in (4a) is truth-conditionally equivalent to (4b), in which the bare participial gerund is replaced with a *while*-prepositional gerund. My informants did not find a significant difference between (4a) and (4b) with respect to the possibility of an inverse scope interpretation:

(4) a. A detective solved the case [reading each mystery]. (?? $\forall > \exists$)

b. A detective solved the case [while reading each mystery]. (?? $\forall > \exists$)

As discussed previously, I will account for the difference between QR from a bare participial gerund and an *after*-prepositional gerund in the acceptability via the absence vs. presence respectively of a temporal operator. This account may be optimistic however, since bare participial gerunds lack temporal prepositions but nonetheless convey a temporal interpretation along the same lines as *while*-prepositional gerunds. Thus, the similarity between (4a) and (4b) could be taken to weaken the assumption that scopal operators enable QR out of adjuncts to be licensed by Scope Economy, in that *while*-prepositional gerunds should have temporal operators like *after*-prepositional gerunds.

The new question that the data in (4) give rise to is stated explicitly in (5). Because we did not test *while*-prepositional gerunds in the main experiment, I deal with (5) as an additional puzzle to the two questions in (1). This additional question will be discussed in Section 6.6:

(5) **Additional question: bare participial gerunds and *while*-prepositional gerunds**

What distinguishes *after*-prepositional gerunds from the minimal pair of bare participial gerunds and *while*-prepositional gerunds?

We now turn to Question 2 in (1b), which concerns obligatory QR (Fox 1995; 2000, Heim and Kratzer 1998 and others). As discussed in Chapter 2, Fox (1995; 2000) argues that a non-subject quantifier initially undergoes obligatory QR to a clause-denoting node (t) in order to resolve a type-mismatch, whereas Reinhart (2006) argues that QR only takes place optionally for the purposes of scope-shift.

In Section 6.5, I will argue that QR from *during*-PPs and inverse linking pose problems for obligatory QR. For instance, let us consider QR from a *during*-PP, as in (6a), in which the wide scope reading of a universal quantifier is marginally acceptable (see (2)). If a non-subject quantifier obligatorily undergoes QR to a clause-denoting node (i.e. the matrix vP) to resolve a type-mismatch as proposed by Fox, a universal NP contained in a *during*-PP needs to cross the adjunct-PP boundary even for surface scope, as (6b) shows:

(6) a. A girl let out a yelp [$_{\text{PP}}$ during each rugby match]

b. [$_{\text{TP}}$ $\exists$ [$_{\text{vP}}$ $\forall$ [$_{\text{vP}}$ $t_{\exists}$ let out a yelp [$_{\text{PP}}$ Op during $t_{\forall}$]]]]

c. [$_{\text{TP}}$ $\forall$ [$_{\text{TP}}$ $\exists$ [$_{\text{vP}}$ $t'_{\forall}$ [$_{\text{vP}}$ $t_{\exists}$ let out a yelp [$_{\text{PP}}$ Op during $t_{\forall}$]]]]

(6b) incorrectly predicts that the surface scope reading of (6a) comes with some degradedness resulting from the weak restriction of the adjunct boundary (discussed in Section 6.3), contrary to the fact:

Similarly, for inverse scope, the universal quantifier must undergo obligatory QR to adjoin to vP as in (6b) and then undergo further optional QR to adjoin to TP, in order to scope over the existential subject as in (6c), under Fox's approach. Fox's version of Scope Economy (see Chapter 2) licenses this optional application of QR, which gives rise to scope-shift. If so, Fox's proposal must fail to explain a difference in the acceptability of the surface and inverse scope, since QR is only restricted by the adjunct island boundary in both (6b) and (6c).

One possible answer is that obligatory QR has to adjoin to the *during*-PP to obey the requirement by the locality of that adjunct (in Section 6.3, I will argue that both QR and *wh*-movement obey the Phase Impenetrability Condition (PIC) (Chomsky 2000; 2001, and see also Chapter 3) and assume that adjuncts are phases), as shown in (7). However, at the intermediate landing site, obligatory QR yields another type-mismatch since the adjoined site of the PP is not a clause-denoting node:

(7) A girl let out a yelp $[_{\text{PP}}$ $[_{\text{QP}}$ each rugby match$]$ $[_{\text{PP}}$ during t_{QP} $]]$

To resolve the type-mismatch resulting from obligatory QR, an additional repair operation such as type-shifting would be required. This analysis would however undermine the motivation for positing obligatory QR in the first place, since here it fails to resolve a type-mismatch.

In Section 6.5, we will discuss these problems of obligatory QR in more detail. We will also discuss a problem common to both Reinhart's and my proposal (i.e. QR takes place only for giving rise to scope shift). Namely, how a type-mismatch with a non-subject quantifier can be resolved without applications of obligatory QR.

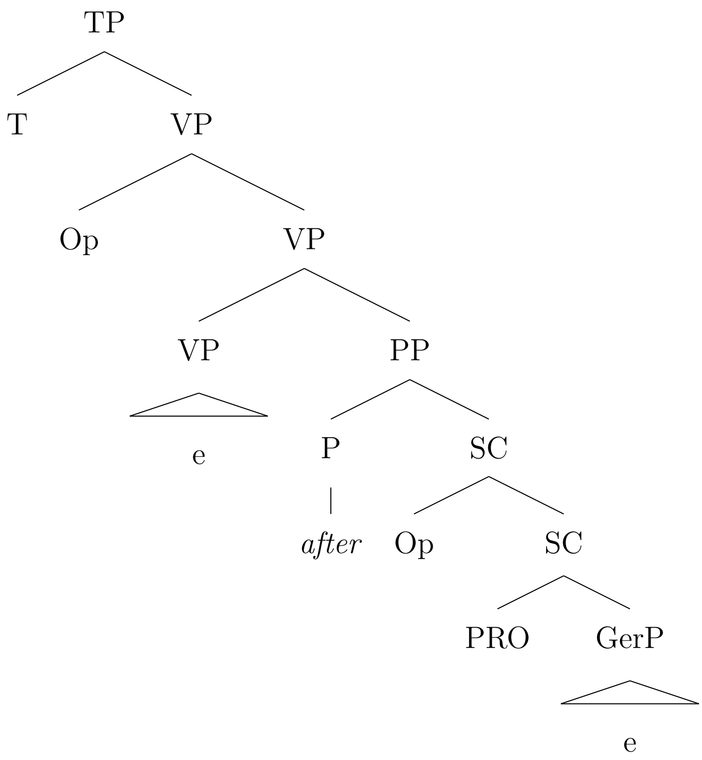
In this section, I have discussed the two remaining questions in (1a) and (1b) and an additional question concerning *while*-prepositional gerunds in (5). On the basis of my core proposal, which will be established in the following sections, we will provide answers to these questions in Section 6.4, 6.5 and 6.6, respectively.

6.2 The syntactic structures of non-finite adjuncts

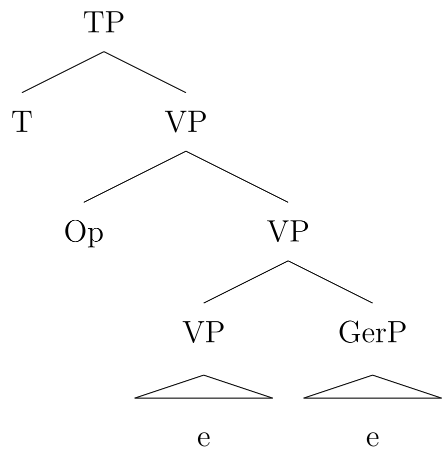
This section discusses the syntactic structures of three types of non-finite adjuncts, which bear directly on Question 1 (1a). I will argue that bare participial gerunds differ structurally from the other adjuncts.

I assume that the structure of an *after*-prepositional gerund and the structure of a bare participial gerund are different, as in (8) and (9) respectively (Op is a temporal operator, and e is an event variable bound by that operator):

(8)



(9)



After-prepositional gerunds are clausal and contain PRO as their structural subjects like Small Clauses (SC) (Stowell 1981) in (10b). On the other hand, the structures of bare participial gerunds are like subject-oriented secondary predication (Rothstein 2001a; 2003), in which an adjunct predicate is absorbed into the matrix predicate, and these predicates share the matrix subject as their syntactic subject, in (10c) (see also Williams 1980; 1983, Neeleman and Van de Koot 2002 for a similar analysis of adjunct predication).

(10) a. John broke the window drunk.

b. John_{i} [$_{\text{VP}}$ broke the window] [$_{\text{SC}}$ PRO_{i} drunk]

c. John [$_{\text{VP}}$[$_{\text{VP}}$ broke the window] drunk]

Note that (10b) and (10c) are different analyses of the adjunct predicate *drunk* in (10a). Following Rothstein (2001a; 2003), I assume that (10c) is the right construction for (10a). I also adopt Rothstein's absorbed predication analysis in (10c) for the structure of a bare participial gerund (9), contrary to the structure of an *after*-prepositional gerund (8) with a SC as in (10).[2]

The structural similarities between (8) and (10b) and between (9) and (10c) make the following predictions: (i) the structure of a bare participial gerund (9) is syntactically smaller than that of an *after*-prepositional gerund (8); and (ii) the structure of a bare participial gerund (9) requires spatio-temporal overlap between the matrix event and the adjunct event like the structure of a subject-oriented secondary predication (10c), in which the matrix event is required to be simultaneous with the adjunct event as defined in terms of TPCONNECT by Rothstein (2003: 568). For example, in (10c), TPCONNECT (11) requires the matrix event of breaking the window to share the run time of the adjunct event of being drunk, and for these two events to share the same participant *John*:[3]

[2]Note that Williams' and Rothstein's predication theories allow SCs but do not demand them.

[3]Rothstein (2003) notes that in the previous work (Rothstein 2000; 2001b), the symmetric relation given in (11-i) was analysed rather as an asymmetric relation (i.e. the run time of the one event is part of the run time of the other event). However, she argues that (11) can still capture cases in which two events do not occur totally simultaneously via the same participant shared by these two events. For example, one possible interpretation of (10c) is that John broke the window just after he had got drunk. In this case, the event of breaking the window and the event of being drunk are inseparable in that these events form a sum of events that share the same participant *John* involved in both the events at the same time. See Rothstein (2003) for the detail of her argument for (11).

(11) **TPCONNECT ($\mathbf{e_1}$, $\mathbf{e_2}$, y)** iff:

i. $\tau(e_1) = \tau(e_2)$ (i.e. the run time of e_1 is the same as the run time of e_2);

ii. e_1 and e_2 share a participant y

The first prediction follows Truswell's (2007; 2011) argument accounting for the acceptability contrast between *wh*-argument extraction from an *after*-prepositional gerund and that from a bare participial gerund. The second prediction follows both Truswell's argument for the Single Event Grouping Condition on non-finite adjuncts and Rothstein's analysis of adjunct predication. Note that Truswell's (2007; 2011) spatio-temporal overlap in the Single Event Grouping Condition is similar to TPCONNECT but is a condition on extraction. TPCONNECT, however, requires spatio-temporal overlap as a structural requirement on bare participial gerunds, which the Single Event Grouping Condition requires in order to explain the possibility of extraction from those adjuncts.

The two predictions suggest that *after*-prepositional gerunds differ from bare participial gerunds with respect to how the temporal interpretation of the adjunct relates to T in the matrix clause. I propose that there is a temporal operator, Op, that takes reference time of an event by binding an event variable of that event and transfers the temporal interpretation of that event to the matrix T, which c-commands that operator, by variable binding. An *after*-prepositional gerund contains a temporal operator selected by *after*, whereas a bare participial gerund does not, as schematically shown in (8) and (9).

In (8), a temporal operator that takes the reference time of the matrix event is generated in the specifier of the matrix VP and c-commanded and selected by T. On the other hand, Op that takes the reference time of the adjunct event is generated in Spec of the adjunct maximal projection taken as a complement by *after*, and the operator is c-commanded and selected by that preposition. In this case, the temporal operator can link with the matrix T via variable binding.

Let us now consider why a bare participial gerund does not contain a temporal operator, unlike an *after*-prepositional gerund, as shown in (9). In the case of the *after*-prepositional gerund in (8), the temporal prepositional head *after*, which expresses a precedence relation between the reference of the adjunct event and the reference time of the matrix event ($t_m > t_a$), indicates that the adjunct has its own run time independently from the matrix clause.

Due to the interpretation of *after*, we shall assume that *after* yields a temporal operator, which takes the reference time of that adjunct, and that the operator can link with the matrix T via variable binding. The fact that the structure of an *after*-prepositional gerund is larger compared with the structure of a bare participial gerund should be sufficient to accommodate such a temporal operator in the adjunct construction.

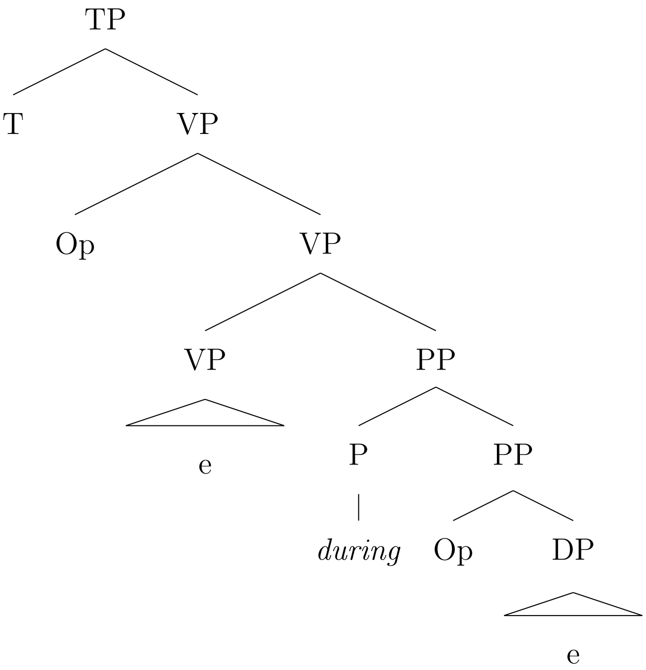
On the other hand, in the case of bare participial gerunds in (9), the event described by the adjunct is structurally required to run simultaneously with the matrix event ($t_m \subseteq\ t_a$) due to TPCONNECT (11). Because the matrix event and the adjunct event have to share the same run time, it can be assumed that the matrix temporal operator takes both reference time of the bare participial gerund and that of the matrix VP.

In other words, unlike an *after*-prepositional gerund, the adjunct projection of a bare participial gerund should not have its own temporal operator because of the lack of a temporal preposition requiring the presence of the independent time of an adjunct and because of the structural requirement of simultaneity between the matrix time and the adjunct time.

The difference in the presence / absence of a temporal operator within that adjunct between (8) and (9) is crucial for discussion in the next section, where we will consider how QR of a universal quantifier contained in each of those adjuncts takes place. Before we move to the next section, let us consider the structure of a *during*-PP. I assume that like *after*-prepositional gerunds, temporal prepositional heads of *during*-PPs yield temporal operators taking reference time of those adjuncts. Thus, the structure of a *during*-PP should be like (12):[4]

[4]One might wonder whether a complement DP of *during* contains an event variable (e) like VP. I assume that a complement of *during* is used predicatively and has R (the external argument of the complement) in its argument structure. For the detail of R, see Williams (1981).

(12)



Note that the temporal preposition *during* expresses a simultaneity relationship between the matrix event and the adjunct event ($t_m \subseteq t_a$), so the interpretation is much like that of a bare participial gerund. The difference between the two cases is that simultaneity of the matrix time and the reference time of a bare participial gerund is a structural requirement of that adjunct, whereas simultaneity of the matrix time and the reference time of a *during*-PP is semantically enforced by the preposition *during*. I assume that a temporal operator is generated in an adjunct only if a temporal preposition like *during* and *after* requires the reference time of that adjunct to be available independently of the matrix time. This does not apply to bare participial gerunds, since the simultaneity of the matrix and adjunct time is required by the syntactic structure because of TPCONNECT (11).

In sum, I have argued in this subsection that bare participial gerunds are non-clausal adjuncts absorbed into the matrix VP like subject-oriented secondary predicates in (9), while *after*-prepositional gerunds are clausal adjuncts like small clauses in (8).

Because of TPCONNECT (11), I assume that the structure of a bare participial gerund (9) requires the reference time of that adjunct to be taken together with that of the matrix VP by a temporal operator in Spec VP, selected by the matrix T; therefore, the structure (9) lacks a position hosting a temporal operator. On the other hand, the semantic denotations of an *after*-prepositional gerund and a *during*-PP indicate that the reference time of that adjunct should be taken by a temporal operator in Spec PP, selected by its temporal head, independently from that of the matrix VP taken by an operator selected by T (see (8) and (12)).

This difference in the presence or absence of a temporal operator in an adjunct construction between the temporal adjuncts and the bare participial gerund will be a clue to an answer to Question 1 (1a), which will be discussed in Section 6.4.

6.3 Successive cyclicity and constraints on movement

6.3.1 Successive cyclicity

Let us now consider how QR out of the three types of adjuncts can be allowed or blocked by each of the three constructions, which were discussed in the previous section. To account for this difference between QR from a bare participial gerund and the other adjuncts, I make the following assumptions:

(13) a. **Assumption 1: Successive cyclicity with the PIC**
QR and *wh*-movement obey the PIC.

b. **Assumption 2: Adjunct phase**
An adjunct is a phase.

(14) **Phase Impenetrability Condition (PIC)**
The domain of a head H of a phase HP is not accessible to operations outside of HP. Only H and its edge domain are accessible to such operations.

(Chomsky 2000: 108)

On the basis of the two assumptions in (13), I argue that because of the PIC (14), both QR and *wh*-movement have to move successive cyclically and make use of an edge of an adjunct phase as an intermediate landing site. Moreover, for QR, (13a) indicates that we follow the assumptions of Cecchetto (2004) and Wurmbrand (2013) that QR is phase-bound but depart from Fox (1995; 2000), who argues that the length of each step of QR is restricted by Shortest Move.

Note that an explanation of the PIC based on Spell-Out (Chomsky 2000; 2001; 2008: see also Chapter 3) is incompatible with the hypothesis that covert movement like QR is subject to the PIC since if QR is an LF operation, it presumably takes place post-Spell-Out. Here are three possible options we may take to adopt (14) for QR. One option is assuming that Spell-Out has nothing to do with the PIC. This assumption deals with the PIC just as a locality condition on movement. Another option is that QR is a covert version of movement and therefore should be subject to the same locality condition that restricts overt movement. We may stipulate that even after Spell-Out, the locality requirement (i.e. to move successive cyclically via an edge) is still visible at LF, and that QR has to keep track movement steps the PIC requires overt movement to follow (see Footnote 17 in Chapter 2). The other option is adopting the so-called phonological theory of QR and assuming that QR takes place at overt syntax like *wh*-movement before Spell-Out, as argued for by Fox and Nissenbaum (1999) and others. In this account, QR is recognized as covert movement only if its Spelled-Out trace at the foot of the chain is pronounced at PF. See also Cecchetto (2004) for a detailed discussion of how covert movement can be argued to be restricted by the PIC. Due to space limitations, I will leave this issue as an open question.

Assuming that QR obeys the PIC, QR should be checked by Scope Economy at an edge of each phase. This phase-based version of Scope Economy is given in (15):

(15) **Scope Economy (revised)**

A sequence of scope-shifting operations within a phase cannot be semantically vacuous.

Next, (16) and (17) schematically show how *wh*-movement and QR may move out of an adjunct on the basis of (13). I argue that (i) both *wh*-argument extraction and QR from an edge of the adjunct phase are subject to a weak effect of the adjunct phase boundary (as indicated by *phase), and that (ii) QR to the edge of the adjunct phase can be licensed by Scope Economy if the movement crosses a temporal operator (Op) (as indicated by *SE):

(16) $[_{\mathrm{vP}}$ WH … $[_{\mathrm{XP}}$ t'_{WH} … t_{WH}]]]]

*phase

(17) $[_{\text{TP}}\ \exists\ \ [_{\text{vP}}\ \forall\ \ [_{\text{vP}}\ t_{\exists} \ldots [_{\text{XP}}\ t'_{\forall}\ (\text{Op}) \ldots\ t_{\forall}\ ]]]]]$

*SE

*phase

We will come back to the weak effect of adjunct boundaries on both QR and *wh*-movement in the next subsection. Let us consider why (13) is important to account for the acceptability of QR from non-finite adjuncts by Scope Economy as a preliminary of Section 6.4. In Section 6.2, I argued that temporal adjuncts host temporal operators in their specifiers, as shown in (8) and (12), whereas bare participial gerunds do not as shown in (9). On the basis of (13) and the assumption that these non-finite adjuncts differ structurally, I claim that what distinguishes QR from a bare participial gerund from QR from the other two adjuncts under consideration is whether or not QR to the edge of the adjunct crosses a scopal element, thereby satisfying Scope Economy.

QR to the edge of a bare participial gerund violates Scope Economy, since it does not cross any scopal element, whereas QR to the edge of a temporal adjunct may give rise to a new scope relation, since it crosses a scopal element (the temporal operator), and therefore is licensed by Scope Economy. This provides a clue to Question 1 (1a), which concerns why QR from bare participial gerunds is less acceptable than *wh*-extraction.

In sum, the assumptions in (13), discussed here, are essential for capturing the syntactic restriction (i) on movement from an edge of an adjunct and the interface restriction (Scope Economy) (ii) on QR to an edge of an adjunct. In the following subsections, we will discuss these syntactic and interface constraints in more detail.

6.3.2 Syntactic restrictions of adjunct island boundaries

I argue that successive cyclic *wh*-argument extraction and QR are subject to constraints at two different levels of the grammar: at the syntax and the syntax-semantics interface. In this subsection we shall examine a syntactic constraint on movement out of a non-finite adjunct in more detail.

As discussed in Chapter 4, the outcome of the main experiment indicated that QR and *wh*-argument extraction from a non-finite adjunct are marginally acceptable at best.[5] Therefore, I assume that adjunct island boundaries give rise to a weak restriction on QR and *wh*-argument extraction from edges of adjunct phases. As discussed previously, I adopt Phase theory (Chomsky 2000; 2001; 2008). Successive cyclicity falls out as a consequence of the PIC (14). However, as Abels (2012) points out, Phase theory does not predict which movement is allowed or disallowed from an edge. The PIC does not itself place any restrictions on movement from a phase edge. Thus, the lack of constraint on movement from the edge is an apparent problem of Phase theory. Therefore, what we need for the proposal is to capture the weak restriction on movement from the edge of a non-finite adjunct as something like Chomsky's (1986) notion of a barrier-effect.

To resolve the problem of Phase theory, here, I adopt a notion of barriers from Chomsky (1986) and integrate it with Phase theory.[6] I propose two different restrictions yielded by the identical phase: cyclicity and barrier-hood, as given in (18). The former restriction follows from the PIC, whereas the latter derives the weak restriction on movement from the edge of an adjunct phase by classifying it as a barrier:

[5]See Chapter 3 for why the CED approaches (Huang 1982, Uriagereka 1999) and the Minimality approaches (Rizzi 1990, Chomsky 1995, Starke 2001) fail to explain the marginal possibility of argument extraction from non-finite adjuncts.

[6]Chomsky's (1986) Barriers theory by itself fails to account for the weak syntactic restriction of a non-finite adjunct on NP-argument extraction. See Chapter 3 for his assumption that adjoining to the maximal projection of an adjunct may eliminate a barrier-hood of the adjunct an IP-barrier for inheritance.

(18) **Restrictions of phases**

a. **Cyclicity**

An adjunct is a phase. Movement out of an adjunct must be via an edge of that adjunct because of the PIC.

b. **Barrier-hood**

A phase-hood of a phase HP_1 gives rise to a barrier-effect on movement of a DP / QP argument from the edge of H_1 to the edge of a head H_2 of a phase HP_2, only if HP_1 is merged into a non-complement position in the domain of H_2.

Under the standard version of Phase theory with the PIC, the boundary of the previous phase is transparent for syntactic operations that take place in the current phase. I assume, however, that the previous phase boundary gives rise to a barrier-effect only if the maximal projection of that phase is merged into a non-complement position that gives rise to an inherent barrier, as defined in (18b). This indicates that every phase requires movement obey the PIC, but a phase-hood does not always have a barrier-effect because it only gives rise to a barrier effect if the phase is merged into a non-complement position.

As illustrated in (16) and (17), movement from the edge of the adjunct phase to the edge of the vP phase is restricted by (18b) (indicated as *phase). (18b) is not strong enough to block movement from the edge of the adjunct phase completely, but rather mildly restricts argument extraction like crossing one barrier in that Subjacency is violated by crossing more than one barriers (see Chomsky 1986 and Chapter 3 for details of Barriers theory). Meanwhile, (18b) indicates that extraction from adjuncts always reduce acceptability.

(18b) is part of the linking hypothesis, which I will expand upon in the next section. This weak restriction of an adjunct phase-hood helps us to capture the intricate pattern of acceptability of QR and *wh*-extraction from non-finite adjuncts (i.e. we can make more fine-grained predictions than simple binary judgements: acceptable or unacceptable). My linking hypothesis proposal is very much in the spirit of Chomsky's Barriers theory, in which the mild degradation associated with argument extraction from certain environments is captured via movement across a single barrier.

Above, I have argued that QR and *wh*-argument extraction from a non-finite adjunct is restricted by those two types of restrictions of a phase: requirement of successive cyclicity and a barrier-effect on movement from an edge, as given in (18). Let us now discuss how my proposal captures the asymmetry between argument and adjunct extraction out of a non-finite adjunct. There are two possible approaches to capturing the argument / adjunct asymmetry: (i) selective phase heads, and (ii) different kinds of Ā-dependencies.

Under the first approach, phase heads are selective in that they agree with and attract arguments but not adjuncts, as schematically shown in (19). Under the second approach, which is compatible with (18b), argument and adjunct extraction are different types of Ā-movement: $\bar{A}_\alpha$-movement and $\bar{A}_\beta$-movement, respectively, with variable sensitivity to the barrier-hood of the adjunct phase, as illustrated in (20):

Agree

(19) a. ? Arg [$_{XP}$ *t'* [X ... *t* ...]]

*Agree

b. * [$_{XP}$ Adj [X ... *t* ...]]

×

?

(20) a. ? Arg [$_{XP}$ *t* ...] ($\bar{A}_\alpha$-movement)

×

b. * Adj [$_{XP}$ *t* ...] ($\bar{A}_\beta$-movement)

Here, I argue that the second analysis (20) for different sensitivity of two types of Ā-movement to the phase-hood is superior to the first analysis (19) involving selective phase heads and compatible with (18b).

The selective phase heads analysis can be implemented using standard Minimalist technology: Agree and Attract (Chomsky 1995) by a phase head endowed with an edge feature (Chomsky 2008). As an example of how this works, Dutch and German do not generally allow preposition stranding, but so-called 'R-pronouns' (locatives) may exceptionally be stranded, as originally discussed by Van Riemsdijk (1978a;b)[7]. This can be taken to show that the head of a PP

[7]'R-pronoun' is Van Riemsdijk's (1978a, 1978b) term. Abels (2012) refers to them as 'R-

is morphologically selective, and therefore that heads endowed with selectional properties do indeed exist.[8]

To account for the argument / adjunct asymmetry, as illustrated in (19), we need to assume that the phase head of a non-finite adjunct is endowed with more artificial selectional properties than the case of prepositional stranding in Dutch and German, in which involved selectional properties are apparently related to morphology. We could posit edge features that only Agree with and Attract arguments (including QPs) as in (19a) but not adjuncts like (19b). However, this would not be sufficient for capturing the fine-grained profile of argument extraction from weak islands, presented by Cinque (1990). As discussed in Chapter 3, PP-argument / non-referential DP-argument extraction out of weak islands is harder than referential DP-argument extraction. To account for this, Rizzi (1990) proposes the notion of referentiality, which Cinque (1990) adopts. The system using edge features for argument extractees becomes increasingly complex if we attempt to include this additional property into these features.

The second approach, which recall involved different types of Ā-dependency (20), may be more successful in accounting for the weak restriction on extraction from adjuncts. The two types of Ā-movement: $\bar{A}_\alpha$-movement in (20a) and $\bar{A}_\beta$-movement (20b) can be assumed to exhibit variable sensitivity to the adjunct phase-boundary. Thus, the Ā-dependencies approach can explain the weak restriction on movement from the edge of the adjunct, which is problematic under the selective phase heads approach.

As discussed above, the Ā-dependency approach has an advantage over the selective head approach, in that the former can more naturally account for the weak restriction on argument extraction from the edge position of the adjunct phase.

The Ā-dependencies approach (20) is based on Cinque (1990). Cinque's ap-

words', arguing that they are not in fact pronouns.

[8]To account for the fact, Abels (2012) argues that R-words undergo movement to Spec PP due to selectional properties of the P-head required to be satisfied by those R-words. For the details, see Abels (2012). The selectional properties of the P-head, which require movement of the R-words to Spec PP, are morphological in the sense that this movement gives rise to morphological alternation.

proach is appealing in that his theory accounts for a more comprehensive profile of extraction than the simple asymmetry between arguments and adjuncts (see Chapter 3).[9] As far as I know, no syntactic approach has been able to fully recapture Cinque's Barriers approach of different kinds of $\bar{\text{A}}$-dependencies within the Minimalist framework. See Williams (2003), Abels (2007) and Neeleman and Van de Koot (2010), however, for Minimalist approaches for interaction between different types of $\bar{\text{A}}$-movement (and A-movement).[10]

In sum, I have first argued that the maximal projection of an adjunct is a phase, and therefore extraction from out of a non-finite adjunct is subject to the following restrictions: cyclicity (which follows from the PIC) and barrier-hood, as given in (18). The PIC forces movement to operate successive cyclically via the edge of a phase, as given in (18a), whereas the barrier-hood of an adjunct phase gives rise to a weak barrier-effect on extraction, as stated in (18b).

Second, I argued that argument extraction (including QR) and adjunct extraction are different types of $\bar{\text{A}}$-movement, like Cinque's (1990) theory of $\bar{\text{A}}$-dependency. Both QPs and referential *wh*-arguments may undergo $\bar{\text{A}}_\alpha$-movement,

[9]Some aspects of Cinque's theory are not straightforwardly compatible with our proposal. First, as pointed out by Abels (2012), Cinque deals with locality constraints independently of successive cyclicity, contra Chomsky (1986), who argues that successive cyclic movement via adjunction to an adjunct may void the barrier-hood of the adjunct. For Cinque, successive cyclic movement is used for adjunct extraction and non-referential argument extraction and is sensitive to both strong and weak islands. For our purposes, argument extraction from a non-finite adjunct must be successive cyclic, and must be subject to a barrier-effect of crossing the phase boundary to capture mild degradedness of argument extraction.

Second, Cinque argues that only referential NP-arguments can be extracted out of non-finite adjuncts via a non-movement relation which makes use of $\bar{\text{A}}$-bound *pro*. Contrary to Cinque, we argue that even QPs, not referential in the sense of Cinque (and Rizzi 1990), can be also extracted out of an adjunct.

[10]How the different $\bar{\text{A}}$-dependencies may interact with the two restrictions of an adjunct phase-hood in (18) and capture not only *wh*-argument extraction / QR but also adjunct extraction out of non-finite adjuncts must be an interesting topic. For instance, in addition to the weak restriction on movement from the edge position, the adjunct phase-hood may also ban the presence of an intermediate trace of the $\bar{\text{A}}$-chain created by adjunct extraction in the edge of the first phase at the time of Spell-Out of a complement of the next phase head (vP). I will leave this unsolved issue for my further research.

which is sensitive to weakly sensitive to the adjunct boundary, whereas $\bar{A}_\beta$-movement is open to all categories and strongly sensitive to the adjunct boundary. The two types of Ā-movement exhibit variable sensitivity to the adjunct phase-hood, as illustrated in (20).

6.3.3 Constraints at the syntax-semantics interface

In this section, I argue that in addition to the syntactic constraints discussed in the previous section, *wh*-argument extraction and QR are subject to additional constraints at the syntax-semantics interface: the Single Event Grouping Condition (21) and Scope Economy (15), respectively.

(21) **The Single Event Grouping Condition** (Truswell 2011)

An instance of *wh*-movement is legitimate only if the minimal constituent containing the head and the foot of the chain can be construed as describing a single event grouping.[11]

Both (15) and (21) are the constraints at the syntax-semantics interface, but I assume that the former is computed globally (i.e. (21) applies to the whole interrogative), whereas the latter is computed locally, namely, at an edge of each phase as briefly discussed in Section 6.3.1.

In the next section, we will discuss how the weak restriction of an adjunct phase-hood and violations of (15) or (21) reduce the acceptability of QR and *wh*-movement on the basis of the linking hypothesis I propose. First, let us consider the formulation of Scope Economy (15) in more detail. (15) is ambiguous as to whether Scope Economy only licenses QR for scope-shift or licenses QR for either scope-shift or resolution of a type-mismatch. Fox's version of Scope Economy only checks optional QR for scope-shifting (see Chapter 2), but I alternatively

[11]Truswell's (2011) definition of event grouping is repeated below (see Chapter 3 for the details of the Single Event Grouping Condition):

i. **The definition of 'event grouping'**

An event grouping E is a set of core events and/or extended events $\{e_1, \ldots e_n\}$ such that:

a) Every two events $e_1, e_2 \in E$ overlap spatiotemporally;

b) A maximum of one (maximal) event $e \in E$ is agentive.

propose the revised version of Scope Economy as given in (22), and assume that this condition applies to every step of QR, including the initial step:

(22) **Scope Economy (revised)**

a. Every QR-chain must create a new scope possibility.

b. Every link in a QR chain must be licensed by:

(i) potential scope-shift

(ii) resolution of type-mismatches

First, as (22a) indicates, I assume, following Reinhart (2006) and contra Fox (1995; 2000), that QR may only take place as a scope-shifting operation. I assume that non-subject quantifiers do not undergo QR purely for the purpose of resolving a type-mismatch.

This revised version of Scope Economy licenses QR only if the operation (i) gives rise to a new scope possibility or (ii) resolves a type-mismatch with a non-subject quantifier in course of successive cyclic QR for scope-shift (we will come back to discuss obligatory QR and the issue of how type-mismatches can be resolved in case QR does not undergo scope-shift for surface scope in Section 6.5).

Why do we need this version of Scope Economy (22)? For our current purpose, the main reason is that if the first instance of QR is obligatory and Scope Economy is irrelevant as Fox assumes, the condition is blind to the illicitness of QR to the edge of a bare participial gerund, which does not cross any scopal element. As a result, we would not be able to capture the difference in the acceptability between QR from bare participial gerunds and the temporal adjuncts under consideration. In the next section, we will see how (22) can correctly account for the acceptability gradations among QR from these adjuncts.

6.4 The linking hypothesis

In this section, I elaborate on the linking hypothesis between the grammar and psycholinguistic judgments (see Chapter 1 and 2 for a preliminary discussion). On the basis of this hypothesis, we discuss what the fine-grained set of outcomes of the experimental studies might mean for the grammar.

In Section 6.3, I have argued that QR and *wh*-movement are subject to constraints at the syntax and the syntax-semantics interface. Here, on the basis of the linking hypothesis I propose, I propose that these restrictions give rise to processing costs, which reduce the acceptability of QR and *wh*-movement. The more constraints at the syntax and the syntax-semantics interface QR and *wh*-movement are subject to, the less acceptable the inverse scope interpretations and *wh*-questions will be. I call this system the reduction mechanism, as defined in (23):

(23) **Reduction mechanism**

a. QR / *wh*-argument extraction out of an adjunct comes with a reduction in acceptability due to (18b). (-1.0 reduction)

b. If QR / a *wh*-question does not satisfy Scope Economy (22) / the Single Event Grouping Condition (21), the acceptability of the given scope interpretation / the *wh*-question comes with a reduction. (-1.0 reduction)

c. Every instance of QR comes with a reduction in acceptability. (-0.5 reduction)

As given in (23a) and (23b), each time QR and *wh*-movement cross an adjunct phase boundary or violate an additional constraint at the interface (i.e. Scope Economy (22) and the Single Event Grouping Condition (21), respectively), the acceptability of the sentence is reduced (-1.0 reduction) by the reduction mechanism.

In addition to the reduction rules which apply to both operations, as given in (23a) and (23b), I assume that each instance of QR lightly imposes a processing cost (-0.5 reduction), as given in (23c). This assumption is based on Reinhart's (2006) argument that QR is a reference-set computation that takes place only if it is required by the syntax-semantics interface (see Chapter 2).[12] (23c) indicates that the more steps QR takes, the lower the acceptability of an inverse scope

[12] As explained in Chapter 2, Reinhart (2006) assumes that reference-set computations are extentions of syntactic operations; therefore, QR is subject to constraints at the syntax like (18b) in addition to Scope Economy, which is a constraint at the interface keeping watch on reference set computations.

interpretation it gives rise to. Meanwhile, (23c) also suggests that QR always leads to more reduced acceptability, compared to *wh*-movement.

First, in order to see how (23) accounts for the ranking of *wh*-movement (3), let us consider the derivation of *wh*-argument extraction from a bare participial gerund in (24), an *after*-prepositional gerund in (25), and a *during*-PP in (26) on the basis of the structures discussed in Section 6.2:[13]

[13]The reduction associated with *wh*-movement (and later QR) is given as a number with a coded subscript: 1_{a} indicates that this operation comes with -1.0 reduction due to (23a); 1_{b} = -1.0 reduction due to (23b); and -0.5_{c} = 0.5 reduction due to (23c).

(24) ***Wh*-argument extraction from a bare participial gerund (-1.0 reduction)**

$[_{\text{CP}}$ WH $[_{\text{TP}}$ Sub ... $[_{\text{vP}}$ $t”_{\text{WH}}$... $[_{\text{GerP}}$ $t’_{\text{WH}}$ $[_{\text{VP}}$ ... t_{WH} $]]]]]$

1_a

(25) ***Wh*-argument extraction from an *after*-prepositional gerund (-2.0 reduction including -1$_b$)**

1_a

$[_{\text{CP}}$ WH $[_{\text{TP}}$ Sub ... $[_{\text{vP}}$ $t”_{\text{WH}}$... $[_{\text{PP}}$ $t”_{\text{WH}}$ $[_{\text{PP}}$ Op $[_{\text{P}'}$ *after* $[_{\text{SC}}$ $t’_{\text{WH}}$ $[_{\text{SC}}$ PRO $[_{\text{VP}}$ ... t_{WH} $]]]]$

(26) ***Wh*-argument extraction from a *during*-PP (-1.0 reduction)**

$[_{\text{CP}}$ WH $[_{\text{TP}}$ Sub ... $[_{\text{vP}}$ $t”_{\text{WH}}$... $[_{\text{PP}}$ $t’_{\text{WH}}$ $[_{\text{PP}}$ Op $[_{\text{P}'}$ *during* t_{WH} $]]]]]]$

1_a

Let us go through the derivations of (24) - (26) to see how (23) calculates the acceptability of each case of *wh*-argument extraction.

First, in each of (24) - (26), a *wh*-argument moves successive cyclically via edges of the vP and adjunct phases to Spec CP as a consequence of the PIC. Movement from the edge of each of the adjuncts is restricted by a weak effect of the adjunct phase-hood; therefore, this comes with -1.0 reduction due to (23a). Moreover, the *wh*-question formed by *wh*-movement is subject to the Single Event Grouping Condition (21). As explained in Section 6.2, because of TPCONNECT (11), the structure of a bare participial gerund requires a spatio-temporal overlap with the matrix event and thus satisfies (21). The temporal preposition *during* indicates a spatio-temporal overlap between the matrix and the adjunct events but *after* does not. Therefore, (25) violates (21) and comes with -1.0 reduction because of (23b), unless there is a causal construal between the two events.

In sum, (24) and (26) come with -1.0 reduction because of (23a), while (25) comes with -2.0 reduction because of (23a) and (23b) (if there is causal construal between the two events, (25) only comes with -1.0 reduction because of (23a)). Thus, (23) can explain the acceptability gradation shown in the ranking of *wh*-movement out of adjuncts (3).

Let us now move on to consider QR from non-finite adjuncts in (27) - (29). Like *wh*-argument extraction, QR from the edge of each of the adjuncts is restricted by the adjunct phase-hood and therefore comes with -1.0 reduction because of (23a). On the other hand, unlike *wh*-movement, QR needs to be checked against Scope Economy at each phase (if it fails to satisfy Scope Economy, QR comes with -1.0 reduction because of (23b)). Each step of QR additionally yields a small processing cost and therefore comes with -0.5 reduction, as given in (23c):

(27) **QR from a bare participial gerund (-3.5 reduction)**

0.5_c $\qquad$ 0.5_c+1_b

$[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ [_{\text{vP}}\ t''_{\forall}\ [_{\text{vP}}\ t_{\exists} \dots [_{\text{GerP}}\ t'_{\forall}\ [_{\text{VP}} \dots t_{\forall}\ ]]]]]]$

0.5_c+1_a

(28) **QR from an *after*-prepositional gerund (-3.0 reduction)**

0.5_c+1_a $\qquad$ 0.5_c

$[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ [_{\text{vP}}\ t'''_{\forall}\ [_{\text{vP}}\ t_{\exists} \dots [_{\text{PP}}\ t''_{\forall}\ [_{\text{PP}}\ \text{Op}\ [_{\text{P}'}\ \textit{after}\ [_{\text{SC}}\ t'_{\forall}\ [_{\text{SC}}\ \text{PRO}\ [_{\text{VP}} \dots t_{\forall}\ ]]]]]]$

0.5_c $\qquad$ 0.5_c

(29) **QR from a *during*-PP (-2.5 reduction)**

0.5_c $\qquad$ 0.5_c

$[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ [_{\text{vP}}\ t''_{\forall}\ [_{\text{vP}}\ t_{\exists} \dots [_{\text{PP}}\ t'_{\forall}\ [_{\text{PP}}\ \text{Op}\ [_{\text{P}'}\ \textit{during}\ t_{\forall}\ ]]]]]]$

0.5_c+1_a

First, in (27), there are three steps of QR (-1.5 reduction). The first step of QR violates (22) (-1.0 reduction) because the operation does not cross any scopal element and yield a new scope and because the type-mismatch of the non-subject quantifier may not be resolved at the non-clause denoting node, the edge of the bare participial gerund. The type-mismatch is instead resolved by the second step of QR, which adjoins to vP. This second instance of QR satisfies (22), but is restricted by the weak effect of the adjunct phase-hood (-1.0 reduction). The third step of QR crosses the existentially quantified subject and thus satisfies (22). As a result, (27) gives rise to -3.5 reduction.

Next, in (28), the LF structure for inverse scope requires four steps of QR (-2.0 reduction). The first step of QR to the SC node resolves a type-mismatch of the quantifier and thus satisfies (22). The second step of QR to the edge of the *after*-prepositional gerund takes scope over a temporal operator and thus satisfies (22). However, this operation is subject to a weak restriction of the adjunct phase-hood (-1.0 reduction). The third step of QR, adjoining to vP, crosses an A-trace of the existential subject. This does not give rise to a new scope interpretation but it does give rise to a new scope possibility since the existential subject may reconstruct; therefore, I assume that this operation satisfies (22).[14] The fourth of QR across the existential subject in Spec TP gives rise to scope-shift and then satisfies (22). Hence, (28) comes with -3.0 reduction.

Third, in (29), there are three steps of QR (-1.5 reduction). The first step of QR to the edge of the *during*-PP crosses a temporal operator in Spec PP and therefore satisfies Scope Economy. The second step of QR to the higher adjoined site of vP resolves a type-mismatch of the quantifier and therefore satisfies (22), but is subject to a weak effect of the adjunct phase-hood (-1.0 reduction). The third step of QR crosses the existential subject and therefore satisfies (22). Thus,

[14] As shown below, if the indefinite subject undergoes reconstruction to the vP-internal subject position, the universal quantifier can take scope over that indefinite at the landing site of the third step of QR (the adjoined site to vP) in (28). Hence, I assume that the third step of QR yields a new scope possibility ($\forall > \exists$) and satisfies Scope Economy (22).

i. $[_{\text{TP}}\ \exists\ [_{\text{vP}}\ \forall\ \ [_{\text{vP}}\ t_{\exists}\ \ldots\ [_{\text{PP}}\ t''_{\forall}\ [_{\text{PP}}\ \text{Op}\ [_{\text{P}'}\ \textit{after}\ [_{\text{SC}}\ t'_{\forall}\ [_{\text{SC}}\ \text{PRO}\ [_{\text{VP}}\ \ldots\ t_{\forall}\ ]]]]]$

(29) comes with -2.5 reduction.

As illustrated above, I have demonstrated that the reduction mechanism outlined in (23) accounts for both the rankings of QR (2) and *wh*-extraction (3) from the three types of adjuncts.

Let us now turn to Question 1 (1a), which concerns bare participial gerunds. Consider (24) vs. (27): both QR and *wh*-extraction are weakly restricted by the phase-hood of the bare participial gerund and thus come with -1.0 reduction (23a), but at the syntax-semantics interface, the first step of QR additionally violates Scope Economy (22) and gives rise to -1.0 reduction (23b), while *wh*-extraction satisfies the Single Event Grouping Condition (21) and therefore does not come with a further reduction.

As explained in Section 6.2, the *wh*-question with a bare participial gerund satisfies (21), in that the subject-oriented secondary predicate-like structure of a bare participial gerund (9) requires spatio-temporal overlap between the matrix and adjunct events due to TPCONNECT (11). Thus, (24) only comes with marginality due to the weak restriction of the adjunct phase. On the other hand, (9) induces a violation of (22) by the first step of QR to the edge of the adjunct phase that lacks a temporal operator. The first step of QR does not resolve a type-mismatch since the size of (9) is smaller than the structure of an *after*-prepositional gerund (8) and does not contain a clausal-denoting node. Thus, (27) is further reduced compared with (28) and (29), because of the violation of Scope Economy by QR to the edge of a bare participial gerund.

In sum, my answer to (1a) is that the structure of a bare participial gerund (9) helps a *wh*-question satisfy (21) because its secondary predicate-like structure requires spatio-temporal overlap due to TPCONNECT (11). On the other hand, (9) lacks a clause-denoting node and a temporal operator; therefore, the first step of QR to the edge of the adjunct phase violates (22). Thus, the satisfaction and violation of the constraints at the syntax-semantics interface differentiate between the acceptability of (24) and (27). In other words, the same factor (i.e. presence / absence of a temporal operator within an adjunct construction) accounts for the difference in the acceptability between QR and *wh*-argument extraction from bare participial gerunds.

Finally, before moving to Question 2 (1b), let us now consider how the reduction mechanism (23) can correctly account for the acceptability of long distance QR from subjunctive and indicative finite clauses (see (2)), as schematically shown in (30) and (31), respectively:[15]

[15]The precise ranking among QR from subjunctives, *after*-prepositional gerunds, and indicatives (2) was not tested in the study (see Chapter 5), but the rankings suggest that their acceptability falls within a similar range.

(30) **Subjunctive clause (3.0 reduction)**

0.5_c 0.5_c

$[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ [_{\text{vP}}\ t'''_{\forall}\ [_{\text{vP}}\ t'_{\exists}\ [_{\text{VP}}\ \text{predicted}\ [_{\text{CP}}\ t''_{\forall}\ [_{\text{C}'}\ \text{that} \ldots [_{\text{vP}}\ t'_{\forall}\ [_{\text{vP}}\ \text{Sub} \ldots t_{\forall}\ ]]]]]]]$

0.5_c $0.5_c{+}1_b$

(31) **Indicative clause (3.0 reduction)**

0.5_c 0.5_c

$[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ [_{\text{vP}}\ t'''_{\forall}\ [_{\text{vP}}\ t'_{\exists}\ [_{\text{VP}}\ \text{said}\ [_{\text{CP}}\ t''_{\forall}\ [_{\text{C}'}\ \text{that} \ldots [_{\text{vP}}\ t'_{\forall}\ [_{\text{vP}}\ \text{Sub} \ldots t_{\forall}\ ]]]]]]]$

0.5_c $0.5_c{+}1_b$

In both (30) and (31), there are four steps of QR (-2.0 reduction). The first step to the embedded vP resolves a type-mismatch and satisfies Scope Economy (22). The second step of QR to the embedded CP, however, does not yield a new scope possibility and therefore violates (22) (-1.0 reduction). The third step of QR to the matrix vP crosses an A-trace of the existential subject. So, this operation gives rise to a new scope possibility and thereby satisfies (22). The fourth step of QR across the existential subject in Spec TP gives rise to scope-shift and thus satisfies (22). Hence, (30) and (31) give rise to the same reduction (-3.0 reduction) as QR from an *after*-prepositional gerund. Thus, the reduction mechanism makes accurate predictions for QR from finite clauses in (30) and (31) as well.

However, Chapter 5 reported a significant difference in acceptability between QR from a subjunctive vs. an indicative clause was significant, as shown by the follow-up study. I explained there that this difference must be due to the syntactic transparency of a subjunctive clause.

Here is one possible analysis for the difference in the acceptability between the two types of finite clauses. If subjunctives are semantically incomplete complement clauses and are therefore insufficient to form phases, as claimed by Wurmbrand (2013) (see Chapter 5 for details), QR from a subjunctive clause would take fewer steps (i.e. three steps) than QR from an indicative clause. If so, the second step of QR targets the matrix vP and crosses an A-trace of the existential subject, as shown in (32). This operation yields a new scope possibility and thus satisfies (22) in (32). As a result, (32) comes with -1.5 reduction in total.

(32) **Subjunctive clause (revised: 1.5 reduction)**

0.5_c 0.5_c

$$[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ [_{\text{vP}}\ t''_{\forall}\ [_{\text{vP}}\ t_{\exists}\ [_{\text{VP}}\ \text{predicted}\ [_{\text{CP}}\ \text{that} \ldots [_{\text{vP}}\ t'_{\forall}\ [_{\text{vP}}\ \text{Sub} \ldots t_{\forall}\ ]]]]]]]$$

0.5_c

Under this approach, we can account for the significant difference in the acceptability between (31) and (32), but we fail to explain why QR from subjunctives is less acceptable than QR from *during*-PPs (see (2)). In order to accurately compare the acceptability of QR from subjunctives with that of QR from adjuncts, however, it is necessary to examine these conditions in a single experiment to compare differences in the acceptability more precisely.

In this section, I have demonstrated how the reduction mechanism (23) explains the rankings of QR and *wh*-movement in (2) and (3), respectively. The linking hypothesis on which the reduction mechanism is based can capture the processing costs imposed by the movement operations (i.e. at the narrow syntax and outside of the syntax). Then, the linking hypothesis associates these processing costs with the fined-grained pattern of acceptability of QR and *wh*-movement. Thus, the proposal developed here can explain the experimental data more effectively than many other theories of locality, which simply predict whether a sentence under consideration is grammatical or ungrammatical.

6.5 Obligatory QR

Let us now discuss Question 2 (1b), which concerns obligatory QR. The goal of this section is to demonstrate that QR from *during*-PPs and inverse linking are incompatible with Fox's (1995; 2000) notion of obligatory QR. As a consequence of the revised version of Scope Economy (repeated as in (33)), I make the following arguments in (34):

(33) **Scope Economy (revised)** (repeated from (22))

a. Every QR-chain must create a new scope possibility.

b. Every link in a QR chain must be licensed by:

(i) potential scope-shift

(ii) resolution of type-mismatches

(34) a. Quantifier scope must be encoded syntactically (by c-command):

i. QR takes place only for yielding a LF structure that gives rise to scope-shift.

ii. QR can give rise to scope-shift.

iii. Type-shifting cannot give rise to scope-shift.

b. A type-mismatch can be resolved:

i. by QR in course of its successive cyclic operation, but only if that operation is triggered independently for scope-shift.

ii. by type-shifting where movement is unavailable.

First, following Reinhart's (2006) view of QR, I argue for (34a-i) on the basis of the assumption that quantifier scope is required to be encoded syntactically. As a consequence, there is no QR that takes place only for repairing a type-mismatch with a non-subject quantifier. For surface scope, it is assumed that a non-subject quantifier remains in situ and does not undergo QR. This diverges from Fox's (1995; 2000) account, where non-subject quantifiers undergo obligatory QR.

I agree with Fox that QR can resolve a type-mismatch, but I depart from him in that I dispute that it can be triggered by a type-mismatch (i.e. obligatory QR). Unlike Reinhart, who considers that QR does not resolve a type-mismatch (see Chapter 2), I assume that a type-mismatch can be resolved by QR to a clause-denoting node in the course of successive cyclic QR giving rise to scope-shift, as given in (34b-i). Even if another type-mismatch is yielded at an irregular intermediate landing site of successive cyclic QR (e.g. a non-clause-denoting node like the edge of an adjunct PP), QR may resolve that mismatch by undergoing a further step of QR, as discussed later.

Type-shifting (Hendriks 1993 and others) does not take place where movement is available, but movement is unavailable if it does not give rise to scope-shift, due to Scope Economy. As given in (34a-iii) and (34b-ii), type-shifting is triggered by a type-mismatch as a repair operation where successive cyclic QR is unavailable as a strategy for resolving the type-mismatch, in the following circumstances, as listed in (35):

(35) a. A non-subject quantifier remains in situ for surface scope.

b. A non-subject quantifier yields another type-mismatch at an intermediate landing site in course of successive cyclic QR AND that type-mismatch cannot be resolved by a further step of QR.

I assume that there is a limited set of type-shifting rules, which are constrained such that they much only resolve a type-mismatch, and not give rise to scope-shift. I discuss this in more depth later in the section.

In sum, I claim that QR is always triggered by scope-shift, and that this scope-shifting movement may resolve a type-mismatch as a by-product in course of successive cyclic QR. Additionally, I argue that type-shifting takes place as a complement to QR where the option of (34b-i) is unavailable (e.g. (35a) and (35b)). Thus, in this strategy, the role of Fox's obligatory QR is divided into two modules: (i) successive cyclic QR for scope-shift and (ii) type-shifting.

We now discuss how the analysis in (34) is superior to Fox's proposal that obligatory QR of a non-subject quantifier is available to resolve a type-mismatch. The main problem with Fox's theory is that it cannot explain the very strong effect that surface scope is much better than inverse scope if the lower quantifier is contained in an adjunct, but only marginally better if it is not contained in an adjunct. The reason that Fox's theory does not explain this is that in both cases the quantifier must leave the island.

Let us first consider QR from a *during*-PP. As shown in (36b), if QR obeys the PIC (see (13a)) under my proposal, the initial landing site for QR of the universal is the edge of the PP (see (29) for the full derivation and the acceptability of QR from this adjunct):

(36) a. A girl let out a yelp [$_{\text{PP}}$ during each rugby match]

b. A girl let out a yelp [$_{\text{PP}}$ [$_{\text{QP}}$ each rugby match] [$_{\text{PP}}$ during t_{QP}]]

(36) is problematic if we follow Fox in assuming obligatory QR. If obligatory QR directly moves to the closest clause-denoting node (vP) as Fox assumes, this violates the PIC since the universal quantifier is only accessible from the launching site to the vP phase if it first moves to the edge of the PP, as illustrated by (37):

(37) [$_{\text{TP}}$ $\exists$ [$_{\text{vP}}$ $\forall$ [$_{\text{vP}}$ $t_\exists$ let out a yelp [$_{\text{PP}}$ Op during $t_\forall$]]]]

The fact that obligatory QR should be unavailable in (37) raises the puzzle of accounting for surface scope in these cases. If QR to vP is required to take place to resolve a type-mismatch even at the LF structure for surface scope, the surface scope reading should be degraded because QR is subject to the weak restriction of the adjunct phase boundary in (18b), contrary to fact. In my account, the reduction mechanism (23) predicts that obligatory QR in this instance comes with a 1.5 reduction, as illustrated by (38):

$1.0_a + 0.5_c$

(38) $[_{\text{TP}}\ \exists\ \ [_{\text{vP}}\ \forall\ \ [_{\text{vP}}\ t_{\exists} \ldots [_{\text{PP}}\ \text{Op}\ \textit{during}\ \ t_{\forall}\ ]]]]]$

Moreover, Fox's approach could be taken to incorrectly predict that there is no difference in the acceptability of the inverse scope vs. surface scope interpretations. If the universal undergoes optional QR to take scope over the existential subject in (37), this operation satisfies Fox's formulation of Scope Economy (see Chapter 2). Hence, both the surface and the inverse scope interpretations are predicted to be mildly degraded to the same extent since obligatory QR is restricted by the adjunct PP boundary.

One might argue that an adjunct PP is not a phase and therefore does not give rise to any syntactic constraint on obligatory QR to the vP node in (38) (if so, the single operation of QR just comes with 0.5 reduction). If an adjunct PP is not a phase, however, we cannot account for the reduced acceptability of QR from all adjunct islands or the contrast between (36) and (39). The unavailability of the inverse scope reading in (39) indicates that a *despite*-PP disallows the universal to get out of that PP unlike a *during*-PP:

(39) A lecturer expected to get in $[_{\text{PP}}$ despite every picket line].

$(\exists > \forall;\ {*}\forall > \exists)$

The difference in acceptability of the inverse scope reading between (36) and (39) can be accounted for by assuming that: (i) QR is only available for scope-shift, (see (34a)); (ii) an adjunct PP is a phase; and (iii) even the first step of QR is checked by Scope Economy in (33). In (39), a *despite*-PP does not contain a scope bearing element unlike a *during*-PP in (36).[16] Hence, I assume that QR to the edge of the PP violates Scope Economy like QR to the edge of a bare participial gerund. In addition, the second step of QR from the phase edge across the existential subject is subject to the weak restriction of the adjunct phase-hood. Consequently, under my proposal, (23) correctly predicts that the

[16]The most salient reading of (i) is a wide scope reading of the universal over *during*: for every film, there was a time interval during which that film was shown, and John left during that time interval. This indicates that QR of the universal to the edge of the adjunct PP, where it takes scope over the temporal operator, is obligatory.

i. John left $[_{\text{PP}}$ Op during every film].

inverse scope reading in (39) is more difficult to obtain than in (36), as shown in (40) and (29), respectively:

0.5_c $\qquad\qquad\qquad\qquad$ 0.5_c+1_b

(40) $[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ \ [_{\text{vP}}\ t''_{\forall}\ \ [_{\text{vP}}\ t_{\exists}\ \ldots\ [_{\text{PP}}\ t'_{\forall}\ [_{\text{PP}}\ \textit{despite}\ \ t_{\forall}\ ]]]]]$

0.5_c+1_a

Moreover, like (38), obligatory QR to the closest clause-denoting node in (41) should mean that the surface scope reading is degraded (-1.5 reduction) contrary to the fact.

(41) $[_{\text{TP}}\ \exists\ [_{\text{vP}}\ \forall\ \ [_{\text{vP}}\ t_{\exists}\ \ldots\ \ [_{\text{PP}}\ \text{despite}\ \ t_{\forall}\ ]]]]$

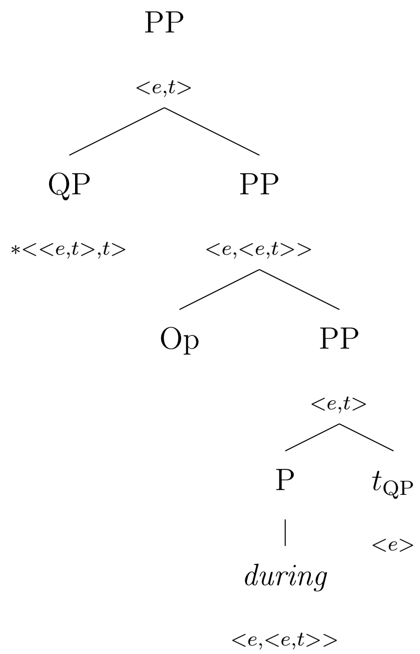
$1.0_a\ +\ 0.5_c$

In both (36a) and (39), to prevent obligatory QR from being subject to the weak restriction of an adjunct boundary in the course of the surface scope derivation, one might assume that obligatory QR may land at an edge of the adjunct PP as in (36b). At this landing site, however, obligatory QR yields another type-mismatch since PP is not a clause-denoting node. We motivate this assumption later in this section. This indicates that an additional operation such as type-shifting is required to repair this type-mismatch. If so, the argument for obligatory QR — resolution of a type-mismatch with a non-subject quantifier via QR (without application of type-shifting) — is weakened.

Let us now consider how the type-mismatch with a universal quantifier in (29) can be resolved without obligatory QR under my proposal. As schematised in (42), the first step of successive cyclic QR for scope-shift (i.e. the derivation for the inverse scope interpretation) lands at an edge of the adjunct PP and yields an additional type-mismatch.[17] A universal quantifier cannot take the λ-abstracted PP as its argument; hence, this yields another type-mismatch:

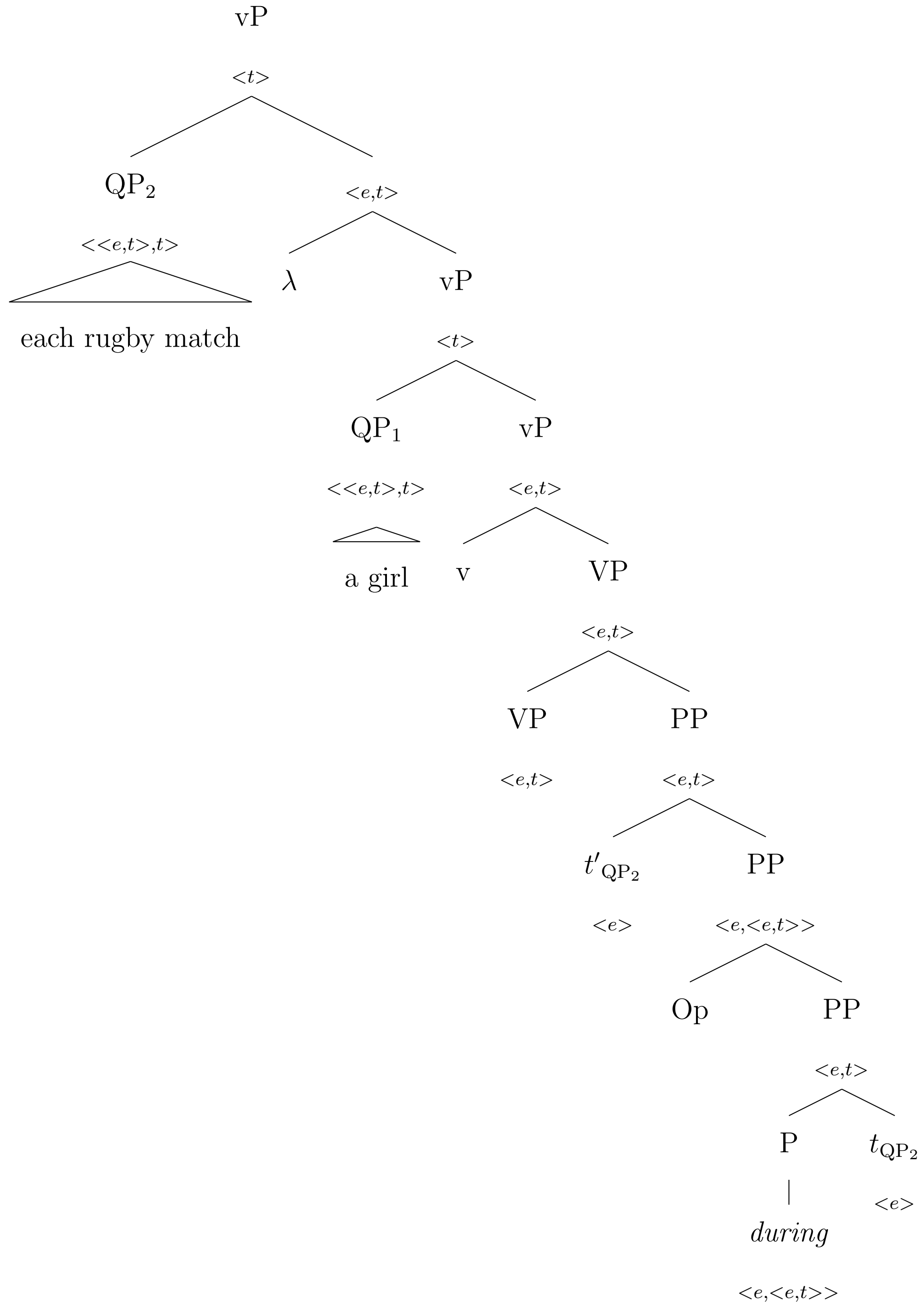
[17] In (42), for the current purpose, I assume that a temporal operator (Op) λ-abstracts over the PP, such that the universal can QR and adjoin to the PP. Op has nothing to do with type-resolution because Op quantifies over time intervals (of type i) (see Artstein 2005 and Chapter 2) and therefore binds variables of type i or events rather than variables of type e like traces of QR. A detailed analysis of Op is beyond the scope of this thesis, I leave this issue to future research.

(42)



Under my proposal, it is assumed that the type-mismatch at the edge in (42) may be resolved by a further step of QR in course of successive cyclic QR for scope-shift, as given in (34b-i). As shown in (43), once the second step of QR to the matrix vP leaves an intermediate trace that denotes a variable over entities $<e>$, the type-mismatch is resolved. Note that in the standard case of QR for type-resolution, the trace of the moved quantifier is the internal argument of a predicate. In (43), however, the λ-abstracted PP $<e, <e, t>>$ non-standardly takes an intermediate trace of the universal $<e>$ in the PP adjoined site (i.e. a non-complement position of P) as its internal argument:

(43)



Thus, (43) indicates that successive cyclic QR out of a *during*-PP can resolve a type-mismatch as a by-product of scope-shift in (29).[18] Type-shifting is not

[18]See also Heim and Kratzer (1998) for their solution for the problem of QR for scope-shift to a non-clausal node. They assume that a non-clausal node like an adjunct PP node can be artificially converted into a clause-denoting node (t) by stipulating a semantically vacuous PRO in the subject position of that non-clausal node and QR of the PRO. I do not adopt this option because the availability of PRO is syntactically undesirable.

required here as QR does resolve the type-mismatch (i.e. in case of neither (35a) nor (35b)).

We can repeat the same argument on the basis of inverse linking in (44). First, as shown in (44b), to obtain the scope interpretation (44a-i), the universal contained in a PP undergoes QR to adjoin to the existential DP containing that PP and takes scope over the existential (see May 1985 and others). As given in (44c), however, the unavailability of the scope interpretation (44a-iii) indicates that QR of the universal out of the containing DP to scope over the matrix numeral subject is blocked in that DP is a scope island.[19]

(44) a. Two policemen spy on someone from every city. (Larson 1985)

(i) $2 > \forall > \exists$; (ii) $\forall > \exists > 2$; (iii)*$\forall > 2 > \exists$

b. (For (a-i))

Two policemen spy on [$_{\text{DP}}$ [$_{\text{QP}_2}$ every city] [$_{\text{DP}}$ [$_{\text{QP}_1}$ someone] [$_{\text{PP}}$ from t_{QP2}]]]

c. (For (a-iii))

*[$_{\text{IP}}$ [$_{\text{QP}_2}$ every city] [$_{\text{IP}}$ [$_{\text{QP}_3}$ two policemen] [$_{\text{vP}}$ t'_{QP2} [$_{\text{vP}}$ t_{QP3} spy on [$_{\text{DP}}$ [$_{\text{QP}_1}$ someone] [$_{\text{PP}}$ from t_{QP2}]]]]]]

Similar to the problem of QR out of a *during*-PP, if the universal contained in the existential DP undergoes obligatory QR directly to vP as shown in (45), this should be subject to an effect of the DP island, as in (44c) for the inverse scope reading, as in (44a-iii):

(45) *[$_{\text{vP}}$ $\forall$ [$_{\text{vP}}$ [$_{\text{QP}}$ two policemen] spy on [$_{\textbf{DP}}$ $\exists$ [$_{\text{PP}}$ from $t_{\forall}$]]]]

[19]Sauerland (2005) has cast doubt on the view of DP as a scope island by arguing that intensional verbs and negation can take scope between the quantifier and the indefinite DP in which the quantifier originates. However, as discussed by Neeleman and Van de Koot (2012), Sauerland's claims have been challenged successfully by Charlow (2010). Because this thesis focuses on the possibility of wide scope of universal quantifiers, Sauerland's counterexamples are irreverent for the purpose of our discussion.

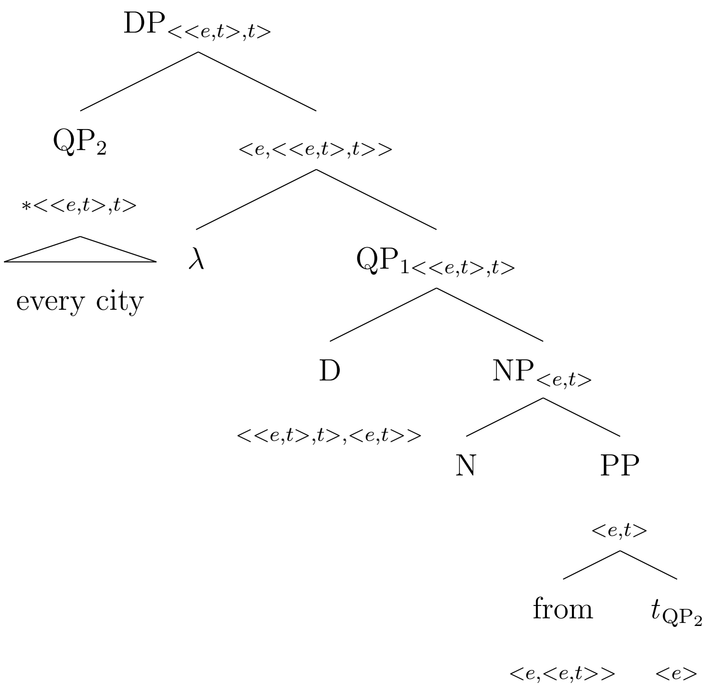
Note that the surface scope reading for (44a) is unavailable due to world knowledge. It is difficult to imagine that there was a particular person who was from every city due to pragmatic oddness. In (46), however, the surface scope reading, which indicates that every employee of the director's company is shown in a single picture that the director has, is easily allowed:

(46) The director has $[_{\mathrm{DP}}$ $[_{\mathrm{QP1}}$ a picture$]$ $[_{\mathrm{PP}}$ of $[_{\mathrm{QP2}}$ every employee$]]]$ on his desk.

If obligatory QR of the universal targets vP, as Fox standardly assumes, this movement operation should be subject to both the PIC and the DP-island. The possibility of the surface scope reading suggests that obligatory QR is problematic. Under my account, the surface scope of (46) is a case of (35a), followed by type-shifting to resolve a type-mismatch with the in-situ universal. This repair operation is restricted by neither the PIC nor the DP-island since it does not involve movement; therefore, my proposal in (34) avoids the issues faced by Fox's account.

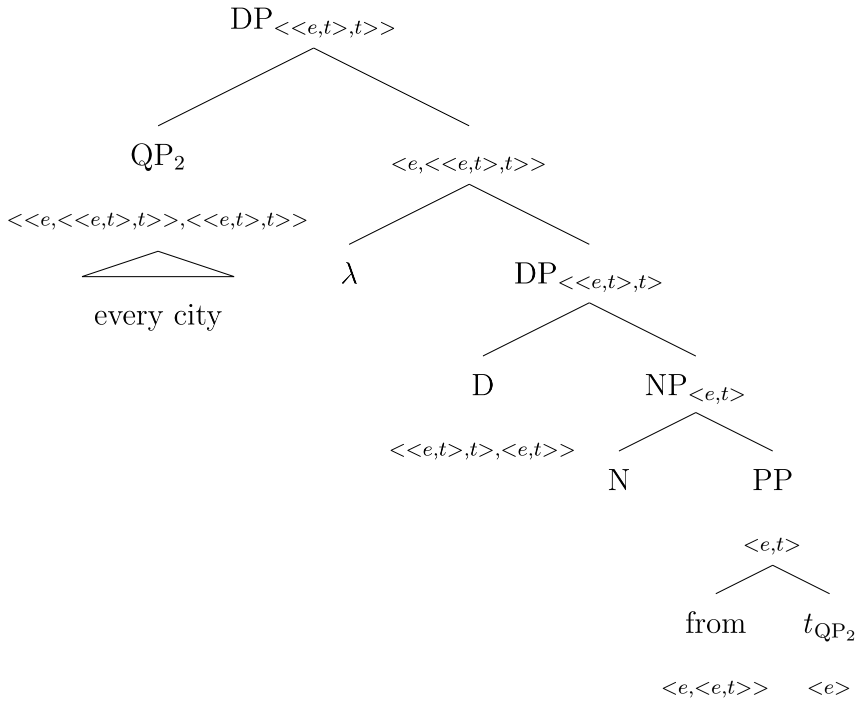
Let us next consider how a type-mismatch with the universal can be repaired if that universal undergoes QR to scope over the existential, as shown in (44b). As schematically shown in (47), QR adjoining to the existential DP gives rise to a type-mismatch:

(47)



Unlike the case of successive cyclic QR from a *during*-PP in (43), a further step of QR is blocked by the scope island constituted by the existential containing that universal; therefore, the option of type-resolution by QR (34b-i) is unavailable in (47). Hence, as a repair operation, type-shifting takes place to resolve the type-mismatch, as in (35b). As discussed in Heim and Kratzer (1998), to resolve a type-mismatch in (47), type-shifting of either the QR-ed quantifier or the DP-adjoined site is required as a repair operation. In (48), the moved universal NP is flexibly type-lifted from $<<e,t>,t>>$ to $<<e,<<e,t>,t>>,<<e,t>,t>>$ to resolve the type-mismatch (see Heim and Kratzer 1998: 231):

(48)



As illustrated above, like QR from adjunct PPs, inverse linking similarly demonstrates the problem of obligatory QR. I argue that Fox's obligatory QR does not always resolve a type-mismatch. Similarly, if the type-mismatch resulting from a non-subject quantifier is always resolved by flexible type-shifting (Hendriks 1993), this may allow type-shifting anywhere unless specific rules regulate the availability of type-shifting; for example, to account for island restrictions (see Chapter 2).

Fox's and Hendriks' approaches are extremes in that both scope-shift and resolution of a type-mismatch are handled by the same module: QR or type-shifting. Unlike their approaches, I propose that scope-shift must be encoded by

QR, whereas resolution of a type-mismatch may be organized by two different modules (i.e. QR and type-shifting). QR may resolve a type-mismatch with a non-subject quantifier only as a by-product of successive cyclic QR giving rise to scope-shift. On the other hand, type-shifting is an additional repair operation required to take place only in the limited occasions where successive cyclic QR does not repair a type-mismatch. The module of type-shifting is a supplement to the module of QR in that the former comes into effect at the semantics only if the latter does not resolve a type-mismatch at the level of the syntax. Thus, the idea is that two simple modules can give rise to intricate effects through their interaction. If this can capture the data, it is to be preferred over one highly complex module. This, in fact, is the standard argument for modularity.

In connection with my proposal based on the linking hypothesis, let us consider whether the reduction mechanism (23) applies to these type-shifting operations. I assume that type-shifting is an additional operation required by the semantics; therefore, it is natural to assume that this imposes a processing cost. On the other hand, on the basis of the fact that the surface scope interpretations and interpretations resulting from inverse linking are easily obtained in general, processing costs of type-shifting should be cheaper than (23a) and (23b) but may be as light as (23c) (i.e. -0.5 reduction). In order to formally define how much reduction type-shifting for type-resolution gives rise to, however, I will need to experimentally test the acceptability of surface scope and inverse linking interpretations as I did for inverse scope interpretations. I leave this as an issue for further research.

Finally, it is not technically easy to provide rules that prevent type-shifting from giving rise to scope-shift and that allow that operation to take place only to repair a type-mismatch in either (35a) or (35b). However, here is an attempt to make a type-shifting rule for (35a):[20]

[20]Thanks to Nathan Klinedinst (p.c.) for suggesting the idea of this rule.

(49) Any quantifier (i.e. any expression denoting a function Q of type type $<< e, t >, t >$) can shift to the function Q of type $<< e, \ldots t >, < \ldots t >>$ such that, for any function P of type $< e, \ldots t >$, i.e. of the form $[\lambda A_0 \ldots A_n.T]$ (note: A_0 is the first argument, the one of type e, A_n is the final one yielding T of type t):

Q'(P) $= \lambda A_1 \ldots \lambda A_n.$ Q$([\lambda x.P(x)(A_1)(\ldots)(A_n)])$[21]

Here is a brief illustration of how (49) works. As shown in (50c), (49) allows the type-shifted universal NP (Q'), given in (50a), to take the predicate (P), given in (50b), as its argument in situ:

(50) a. Let Q $=$ $[\![$every boy$]\!]$ $= \lambda R_{<e,t>}.\forall z[\text{boy(z)} \rightarrow \text{R(z)}]$

b. Let P $=$ KISSED $= \lambda y.\lambda x.$ kissed (x,y)

c. Q'(KISSED) $= \lambda x.$ Q$(\lambda y.$ kissed (x,y))

d. Q'(KISSED) $= \lambda x.\ \lambda R_{<e,t>}.\forall z[\text{boy(z)} \rightarrow \text{R(z)}](\lambda y.$ kissed (x,y))

e. Q'(KISSED) $= \lambda x.\forall z[\text{boy(z)} \rightarrow \text{kissed(x, z)}]$

Then, an existential quantifier like *a girl* applies to the derived meaning (50e). As the quantifier that applies latest in the derivation takes widest scope at the semantics (see Chapter 2), the universal quantifier automatically takes narrow scope in sentences like *a girl kissed every boy* ($\exists > \forall$).

Thus, the type-shifting rule (49) prevents the object quantifier from taking wide scope over the subject quantifier by forcing the former to apply prior to the latter. This is a test solution for my proposal's problem of how a type-mismatch of a non-subject quantifier can be resolved if that quantifier does not undergo obligatory QR at the LF structure for surface scope. I leave further investigation to future research.

In conclusion, as the answer to (1b), I have demonstrated that QR out of a *during*-PP and inverse linking are not compatible with obligatory QR. Alternatively, I have made the arguments in (34) as a consequence of Scope Economy

[21]Note that the final string of (49) should be read as something like $[[[[P(x)](A_1)](\ldots)](A_n)]$ apply P to x, apply the result to A_1, the result of that to A_2, and so on through A_n.

in (33). On the basis of the discussion, I have argued against the existence of obligatory QR that is purely triggered by type-mismatches. QR must be triggered by scope-shift, as argued by Reinhart (2006). On the other hand, unlike Reinhart, I have claimed that QR may resolve a type-mismatch as a by-product of a successive cyclic scope-shifting operation. Only if a type-mismatch with a non-subject quantifier is unresolved by QR, the semantics requires type-shifting to repair that type-mismatch as an additional repair operation. There should be a limited set of type-shifting rules like (50) to prevent type-shifting from taking place anywhere else (e.g. for scope-shift).

6.6 The additional question on *while*-prepositional gerunds

Let us now turn to the additional question regarding QR from a *while*-prepositional gerund (5), raised in Section 6.1. Recall that as given in (5), *after*-prepositional gerunds and *while*-prepositional gerunds are both prepositional gerunds, but *while*-prepositional gerunds are scopally similar to bare participial gerunds rather than *after*-prepositional gerunds, unexpectedly.

Here are some data illustrating similarity between *while*-prepositional gerunds and bare participial gerunds. As shown in (51) and (52), *while*-prepositional gerunds do not differ from bare participial gerunds with respect to the difficulty of an inverse scope reading (?? $\forall > \exists$):

(51) a. A manager burst out laughing [listening to each comedy programme].

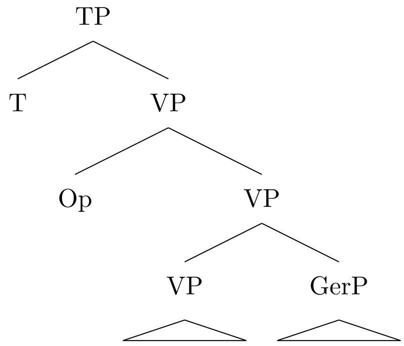
b. A manager burst out laughing [while listening to each comedy programme].

(52) a. A detective solved his case [reading each mystery].

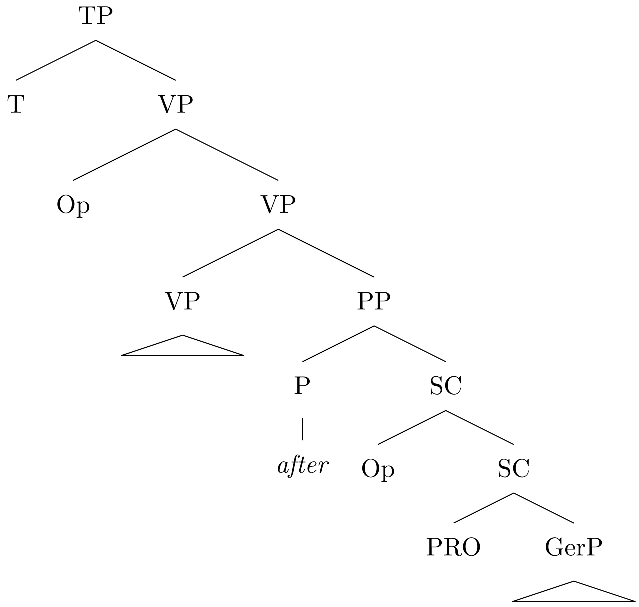
b. A detective solved his case [while reading each mystery].

Because of the similarity between the two types of adjuncts, I assume that the structure of a *while*-prepositional gerund must be similar to that of a bare participial gerund shown in (53) (repeated from (9)). This entails that the structure of a *while*-prepositional gerund is like (55a) but not like (55b), syntactically identical to the structure of an *after*-prepositional gerund shown in (54) (repeated from (8)):

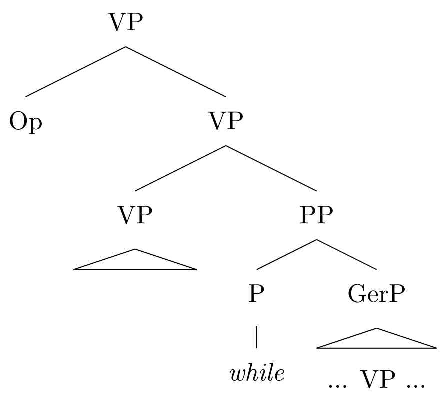
(53) **Bare participial gerund**



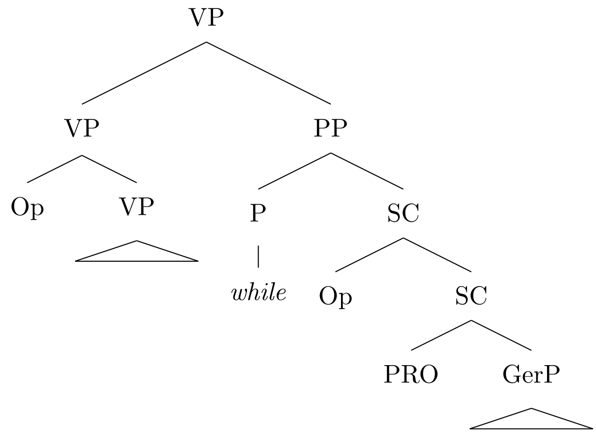
(54) ***After*-prepositional gerund**



(55) a.



b.



I assume that (55a) differs from (55b) as follows:

(56) **Assumptions on (55a)**

i. A *while*-prepositional gerund has no temporal operator.

ii. A *while*-prepositional gerund is syntactically related to the matrix VP like a bare participial gerund.

iii. A *while*-prepositional gerund has no structural subject.

First, a *while*-prepositional gerund involves a temporal operator in (55b) but not in (55a).

Second, a *while*-prepositional gerund jointly forms the matrix VP together with the matrix predicate under a sisterhood relation like (53) in (55a) but not in (55b).

Third, (55a) has no subject (Williams 1980; 1983, Rothstein 2001a) like (53), whereas (55b) has a structural subject PRO (Stowell 1981) like (54).

As calculated by the reduction mechanism (23) in (57), QR out of (55a) is as difficult as QR from a bare participial gerund (27). On the other hand, as shown in (58), QR from (55b) may marginally allow QR like QR from an *after*-prepositional gerund (28). Hence, as an answer to (5), we need to substantiate (55a) as the structure of a *while*-prepositional gerund:

(57) **QR from a *while*-prepositional gerund (55a) (3.5 reduction)**

0.5_c $\quad\quad\quad\quad$ $0.5_c{+}1_b$

$[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ \ [_{\text{vP}}\ t''_{\forall}\ \ [_{\text{vP}}\ t_{\exists} \ldots [_{\text{PP}}\ \textit{while}\ [_{\text{GerP}}\ t'_{\forall}\ [_{\text{VP}} \ldots\ t_{\forall}\ ]]]]]]]$

$0.5_c{+}1_a$

(58) **QR from a *while*-prepositional gerund (55b) (3.0 reduction)**

$0.5_c{+}1_a$ $\quad\quad\quad\quad$ 0.5_c

$[_{\text{TP}}\ \forall\ [_{\text{TP}}\ \exists\ \ [_{\text{vP}}\ t'''_{\forall}\ \ [_{\text{vP}}\ t_{\exists} \ldots [_{\text{PP}}\ t''_{\forall}\ [_{\text{PP}}\ \text{Op}\ [_{\text{P}'}\ \textit{while}\ [_{\text{SC}}\ t'_{\forall}\ [_{\text{SC}}\ \text{PRO}\ [_{\text{VP}} \ldots\ t_{\forall}\ ]]]]]]$

0.5_c $\quad\quad\quad\quad$ 0.5_c

Let us now consider evidence may validate (55a) as the correct analysis of a *while*-prepositional gerund. Here are two pieces of evidence from Larson (1990) and Williams (1994). Larson presents some data exhibiting a difference between *while* and other temporal prepositions, whereas Williams demonstrates that *while* is allowed to modify a secondary predicate and a bare participial gerund.

First, Larson (1990) presents a difference between *while*-prepositional clauses and other temporal clauses in the (un)availability of certain temporal ambiguities. For example, (59a) is ambiguous between the two possible interpretations of the *after*-clause in (59b) and (59c), whereas the *while*-clause allows only one pragmatically odd reading (60b) for (60a):

(59) a. I encountered Alice after she swore that she had left.

b. "I encountered Alice after the time of her swearing that she had left (sometime)." (t_2 in CP_1)

c. "I encountered Alice after some time that she swore would be the time of her leaving." (t_2 in CP_2)

(Larson 1990: 170)

(60) a. I didn't see Mary in New York while she said she was there.

b. I didn't see Mary during the time of her uttering that she was in New York. (t_2 in CP_1)

c. *I didn't see Mary during some time that she said would be the time of her stay in New York. (t_2 in CP_2)

(Larson 1990: 174)

(59) and (60) suggest the following difference between *after* and *while*.[22] Be-

[22] Larson's (1990) main argument over the difference between *while* in (60) and *after* in (59) is that *while* may only pick up the reference time of the highest local CP complement (CP_1), and therefore does not have any mechanism enabling the preposition to link to the reference time of its non-local complement. On the other hand, *after* and other prepositions can pick the reference time of non-local lower CP complements like CP_2 via variable binding and operator movement. For the details of the analysis, see Larson (1990).

cause of the ambiguity of (59), *after* must be able to relate the time of the matrix clause (t_m) with the time of an adjunct (i.e. t_a) either locally (CP_1) or non-locally (CP_2). On the other hand, the absence of (60c) indicates that *while* requires the time of an adjunct (t_a) to be locally related with the time of the matrix clause (t_m).[23]

On the basis of the difference between *while* and *after* demonstrated by Larson's data, I argue that the reason why *while* does not yield a temporal operator for its complement is because *while* requires t_a to link with t_m in a local way. I assume that this requirement of local linking is satisfied by the structure (55a), where t_m and t_a can link locally via the matrix temporal operator, similar to the structure of a bare participial gerund in (53).

On the other hand, I argue that *after* is capable of relating t_m with t_a either locally or non-locally, as presented by Larson in (59), because *after* yields a temporal operator taking the reference time of its complement, as (54) shows. The possibility of non-local link between t_m and t_a in (59c) should provide evidence for the presence of a temporal operator in the complement of *after* in that the reference time of the non-local complement of *after* can link to t_m; for example, via variable binding (see Larson 1990). Similarly, the impossibility of non-local link between t_m and t_a in (60c) is consistent with my claim that *while* does not involve a temporal operator, since variable binding would be thereby unavailable.

In sum, on the basis of Larson's (1990) data demonstrating the difference between *while* and *after* with respect to the absence / presence respectively of a non-local temporal interpretation, we have discussed how this supports my argument that *while* adjuncts do not involve a temporal operator, whereas *after* adjuncts do.

Next, let us turn to evidence from Williams (1994) for (55a) as the structure of a *while*-prepositional gerund. Williams presents the following data exhibiting that *while* can modify either a subject-oriented secondary predicate or a bare participial gerund unlike the other temporal prepositions, as shown in (61a) and

[23]See Stump (1985) for his semantic analysis of *while*, which has a similarity with Larson's (1990) syntactic analysis explained here (see also footnote 12 of Larson 1990: 180 for brief explanation of Stump's analysis).

(61b), respectively:[24]

(61) a. The device arrived (while) still explosive.

b. The device arrived (while) spewing forth sparks.

(Williams 1994: 84)

I argue that the possibility of modifying a secondary predicate and a bare participial gerund by *while*, shown in (61), is relevant to the requirement on the temporal relation between the matrix time (t_m) and the adjunct time (t_a) with a secondary predicate or a bare participial gerund, formalized as TPCONNECT (11) (Rothstein 2003) (see Section 6.2). I assume that *while* places a simultaneity requirement on t_m relative to t_a; $t_m \subseteq t_a$. This temporal relation expressed by *while* is identical to the one required by the syntactic structure of a bare participial gerund and a subject-oriented secondary predicate, in that the adjunct event is required to occur simultaneously with the matrix event by (11). Hence, I claim that the reason why these constructions do not resist modification by temporal *while* is because the simultaneity requirement of the structures is compatible with the simultaneity relation introduced by *while* (i.e. $t_m \subseteq t_a$).

In contrast, temporal prepositions like *after* express temporal precedence between the matrix event and the adjunct event ($t_m > t_a$). The precedence requirement is incompatible with the simultaneity requirement of bare participial gerunds and subject-oriented secondary predicates. Therefore, I argue that these syntactic structures resist modification by *after*, contrary to the case of *while*.

In sum, on the basis of (61), demonstrating that *while* may modify bare participial gerunds and secondary predication, whereas other temporal prepositions like *after* may not, I have argued that the simultaneity requirement of the bare participial gerund construction (53) can be matched with the meaning of *while* but resists the meaning of *after*.

Because of this difference, the structure of a *while*-prepositional gerund can be replaced with that of a bare participial gerund (53), as shown in (55a), while the

[24] However, Williams (1994) himself does not explain the reason why only *while* may modify secondary predication and bare participial gerunds.

structure of an *after*-prepositional gerund cannot and should be as in (54). This also explains the reason why an *after*-prepositional gerund requires its own temporal operator is because the meaning of an *after* requires temporal precedence between two independent times ($t_m > t_a$).

We have discussed so far the two pieces of evidence from Larson (1990) and Williams (1994). I have argued for the first assumption (56a) that a *while*-prepositional gerund lacks a temporal operator on the basis of Larson's data in (59) and (60), and I have also argued for the second assumption (56b) that a *while*-prepositional gerund should be syntactically related to the matrix VP like a bare participial gerund (53) on the basis of Williams' data in (61).

Let us now consider the third assumption (56c) that a *while*-prepositional gerund has no subject. In order to motivate my assumption that a *while*-prepositional gerund lacks a subject, I make the following further assumption pertaining to the availability of a subject in a prepositional gerund:

(62) a. If a preposition requires a temporal operator (Op), then its clausal complement is a proposition.

b. If a preposition has a propositional complement, then the complement has a subject by definition.

The requirement of *after* for a temporal operator entails that *after* selects a proposition as its complement (62a). Therefore, an *after*-prepositional gerund must have subject (62b).

On the other hand, *while* does not yield a temporal operator. Since the entailment in (62a) fails, *while* does not select a proposition and instead selects an event (e). Hence, *while* does not require a subject since (62b) fails and there should be no subject if not necessary due to Economy (Chomsky 1995).

To sum up, I have explained how the third assumption (56c) can be motivated by the difference between *while* and *after*, with respect to what these prepositions select as their complements. The absence of a temporal operator within a *while*-prepositional gerund, which I have argued for on the basis of Larson's data, has the consequence that the complement of while may lack a subject, due to (62).

In conclusion, we have discussed above the three assumptions for the structure of a *while*-prepositional gerund, listed in (56), on the basis of the differences between *while* and *after*, supported by evidence from Larson (1990) and Williams (1994). The confirmed assumptions (56) jointly argue for (55a) as a clue to the additional puzzle (5). As demonstrated in (57), the reduction mechanism (23) predicts that QR out of a *while*-prepositional gerund (55a) comes with -3.5 reduction like QR from a bare participial gerund (see (27) in Section 6.4) and thus accounts for the scopal similarity between (51) and (52).

6.7 Conclusion

In this chapter, I have argued that QR and *wh*-argument extraction are subject to the following constraints at the syntax and the syntax-semantics interface:

(63) **Restrictions of phases** (repeated from (18))

a. **Cyclicity**

An adjunct is a phase. Movement out of an adjunct must be via an edge of that adjunct because of the PIC.

b. **Barrier-hood**

A phase-hood of a phase HP_1 gives rise to a barrier-effect on movement of a DP / QP argument from the edge of H_1 to the edge of a head H_2 of a phase HP_2, only if HP_1 is merged into a non-complement position in the domain of H_2.

(64) **Scope Economy (revised) (repeated from (22))**

a. Every QR-chain must create a new scope possibility.

b. Every link in a QR chain must be licensed by:

(i) potential scope-shift

(ii) resolution of type-mismatches

(65) **The Single Event Grouping Condition** (repeated from (21))

An instance of *wh*-movement is legitimate only if the minimal constituent containing the head and the foot of the chain can be construed as describing a single event grouping. (Truswell 2011)

On the basis of the linking hypothesis that I proposed, I have established the reduction mechanism in (66) (repeated from (23)). (66) counts how many constraints QR and *wh*-movement are subject to over the course of the derivation and calculates the reduction that the sentence is subject to as a result. (66a) with (63b) indicates that extraction from adjuncts always reduce acceptability. In addition to (66a) and (66b), following Reinhart (2006), I assume that each step of QR gives rise to a light processing cost, as given in (66c). This assumption indicates that QR always leads to more reduced acceptability than *wh*-extraction. As has been demonstrated by (24)-(26) and (27)-(29), (66) captures the gradations in acceptability of *wh*-argument extraction and QR from non-finite adjuncts:

(66) **Reduction mechanism**

a. QR / *wh*-argument extraction out of an adjunct comes with a reduction in acceptability due to (63b). (-1.0 reduction)

b. If QR / a *wh*-question does not satisfy Scope Economy (64) / the Single Event Grouping Condition (65), the acceptability of the given scope interpretation / the *wh*-question comes with a reduction.

(-1.0 reduction)

c. Every instance of QR comes with a reduction in acceptability.

(-0.5 reduction)

Because QR and *wh*-movement are subject to the different constraints at the interface as given in (66b), the rankings of QR (2) and *wh*-extraction (3) differ with respect to bare participial gerunds, discussed as Question 1 (1a).

As discussed in Section 6.4, the reason why QR and *wh*-movement from bare participial gerunds differ in acceptability is accounted for by the same factor: the absence of a temporal operator in the structure. The structure of a bare participial gerund (9) lacks a temporal operator unlike the structure of an *after*-prepositional gerund (8) or a *during*-PP (12). This gives rise to a violation of (64) by QR to the edge of a bare participial gerund, as (27) shows. On the other hand, because of TPCONNECT (11), the subject oriented secondary predicate-like structure of (9) structurally requires the matrix and adjunct events to spatio-temporally overlap. Hence, *wh*-argument extraction from a bare participial gerund may satisfy (65). Consequently, (66) determines that QR from a bare participial gerund is difficult, while *wh*-extraction is marginally acceptable, as (27) and (24) show, respectively.

On the basis of the answer to (1a), I claim that QR from adjunct islands cannot be fully accounted for by existing theories of locality. As a result of the reduction resulting from syntactic and interface restrictions, and the processing costs associated with each step of QR, QR from a bare participial gerund becomes difficult. This strategy follows Truswell's (2007; 2011) account of *wh*-argument extraction out of adjuncts in that the adjunct island constraint is not purely syntactic.

In conclusion, I argue in favour of the theory of QR, in that the parallelism between QR and *wh*-movement in terms of adjunct islands holds in that both the operations are subject to the same syntactic constraint on movement. On the other hand, *wh*-movement is subject to (65), while QR is subject to (64) and additionally gives rise to a processing cost. This difference at the post-syntax stage yields the discrepancy between (2) and (3). Therefore, I do not consider the difference between QR and *wh*-extraction from bare participial gerunds to constitute evidence against the QR theory.

In the remainder of the chapter, I discussed Question 2 (1b) and demonstrated that obligatory QR (Fox 1995; 2000) is not always an optimal way to resolve a type-mismatch with a non-subject quantifier on the basis of QR from a *during*-PP and inverse linking. As an alternative to Fox's proposal, I have argued for (34), which assumes that type-mismatches can be resolved by two different modules: successive cyclic QR for scope-shift or type-shifting. I have proposed that type-shifting is an additional repair operation that takes place only if a type-mismatch is not resolved by QR (e.g. a type-mismatch with an in-situ non-subject quantifier at the LF structure for surface scope).

Finally, the additional question pertaining to *while*-prepositional gerunds (5) has been resolved by invoking a syntactic similarity between *while*-prepositional gerunds and bare participial gerunds (and secondary predicates), in contrast to *after*-prepositional gerunds.

Chapter 7

Conclusion

Our voyage began with the question of whether quantifier scope-shift in English can be analyzed as movement (QR). As reported in Chapter 4, the primary aim of the main experiment was to test the hypothesis that scope-shift is a form of covert movement subject to the adjunct island constraint. The conclusion we have reached is that there is a syntactic parallelism between scope-shift and *wh*-movement with respect to their sensitivity to a weak restriction on extraction from a non-finite adjunct. This conclusion is based on the findings from the main experiment: both scope-shift and *wh*-argument extraction out of a non-finite adjunct are marginally acceptable at best. Thus, this thesis has provided experimental evidence for the movement theory of scope-shift (the QR theory).

The outcome of the main experiment also allowed us to engage in a more detailed investigation into what the fine-grained judgements of the participants mean for the faculty of language. This exploration has resulted in the linking hypothesis between the grammar and psycholinguistic judgements, which was elaborated in Chapter 6. On the basis of the specific linking hypothesis I proposed, the intricate gradations in the acceptability of QR and *wh*-movement out of non-finite adjuncts have been accounted for by relating these operations to processing costs. I have argued that any violation of a constraint imposed by the syntax or the interfaces incurs a processing cost. The total processing costs that result from violations of these constraints over the course of the derivation give rise to an overall reduction in the acceptability of the sentence.

This proposal sheds new light on how the output of movement operations that take place in the language faculty may be linked to acutual performance. We have seen that my account based on the linking hypothesis can capture why surface scope is generally less effortful than inverse scope in a simple quantified sentence by following Reinhart's (2006) account of QR as a reference-set computation (see Chapter 2) and by assuming that each step of QR gives rise to a processing cost.

Moreover, the discussion of the two remaining questions which arose as a result of the main experiment (Question 1 and 2: see Chapter 6) offer further insight into the structure of the language faculty.

Question 1 concerned why the structure of a bare participial gerund marginally allows *wh*-argument extraction but disallows QR. It was assumed that a bare participial gerund is structurally similar to a secondary predication construction. Consequently, TPCONNECT (Rothstein 2003) requires the event described by a bare participial gerund to be simultaneous with the matrix event. As a result, the structure of a bare participial gerund lacks a temporal operator. In answering the question, I argued that this syntactic property of bare participial gerunds aids satisfaction of the Single Event Grouping Condition (Truswell 2007; 2011) for *wh*-extraction, but gives rise to a violation of Scope Economy for QR. This distinguishes QR from *wh*-movement in terms of the acceptability of extraction out of a bare participial gerund.

The answer to Question 1 indicated that the syntactic structure of a bare participial gerund results in a violation of Scope Economy and satisfaction of the Single Event Grouping Condition at the syntax-semantics interface, and thereby deriving the unavailability of an inverse scope interpretation and the (marginal) availability of a felicitous *wh*-interpretation at the semantics. This naturally coheres with the structure of the language faculty standardly assumed in generative linguistics.

The second question concerned the (in)compatibility of Fox's (1995; 2000) obligatory QR with cases of QR from PP-adjuncts and inverse linking. As outlined in Chapter 2, Fox posits an operation of obligatory QR for resolution of a type-mismatch as a mapping operation from syntax to semantics, and optional QR as a scope-shifting operation subject to Scope Economy, the semantic constraint. This indicates that in Fox's model, the syntax-semantics interface always requires QR to take place for a non-subject quantifier in order to repair a type-mismatch prior to allow semantic composition to proceed.

In Chapter 6, we discussed a problem with Fox's theory: namely that it cannot capture the fact that surface scope is generally more acceptable than inverse scope if a universal quantifier is contained in a PP-adjunct. This is because the operation of obligatory QR predicts that for both surface and inverse scope, the universal quantifier must move out of the PP-adjunct island to the matrix clause-denoting node. The difference in the acceptability between surface and inverse scope empirically suggests that there should be no such scopally vacuous movement that is subject to the restriction of an adjunct boundary for surface scope.

How can this problem be reinterpreted in light of the structure of the language faculty? In the model of the grammar presupposed by Fox, the syntax-semantics interface forces obligatory QR to take place, even if this mapping operation violated an island constraint. If the interface is blind to the locality constraint, this would be problematic in terms of optimal design of the language faculty. Moreover, the availability of surface scope indicates that obligatory QR would have to ignore the island constraint at LF, whereas the degradedness of inverse scope indicates that QR should conversely be restricted by the adjunct boundary. Due to this inconsistency, obligatory QR cannot be said to be an optimal interface operation bridging syntax and semantics.

On the other hand, in the model proposed in this thesis, the syntax-semantics interface requires QR as an optional scope-shifting operation only if it needs QR to give rise to the LF structure for inverse scope. The interface also requires Scope Economy to check each instance of QR on the basis of the locality constraint (the PIC). As discussed in Section 6.5, this system does not face the same problem as Fox's theory since the interface does not require QR for surface scope. In this case, the type-mismatch with a non-subject quantifier has not been resolved prior to the semantics due to the unavailability of a QR operation, but the semantics requires type-shifting to take place as an additional repair operation.

I claim that the design of this model is more optimal than Fox's in the following respects: First, the computation at the syntax-semantics interface is subject to locality. Second, QR / type-shifting is an optional operation that takes place only if the interface / semantics requires that operation to repair unfilled elements necessary for the interpretation. The core proposal mostly follows Reinhart's (2006) optimal design of the language faculty but differs in that QR may resolve a type-mismatch as a by-product of scope-shift.

To conclude this thesis, I have attempted to reconsider the optimal structure of the language faculty on the basis of experimental findings concerning *wh*-movement and QR. The model proposed here, however, is indebted to Reinhart's (2006) model, and my proposed revision is just a sketch based on a limited set of experimental data of QR and *wh*-movement. In order to draw a firmer conclusion concerning the structure of the language faculty, I will need to embark on further research in order to begin to answer some of the questions left open by this piece of work.

As discussed in Chapter 6, the core proposal has focused on associating processing costs with violations of syntactic and interface constraints incurred over the course of the derivation. However, I have left the processing cost (if any) associated with the type-shifting repair operation in the semantics as an open question. The general availability of surface scope and inverse linking suggests that application of type-shifting does not impose over and above QR. On the other hand, I have argued that type-shifting is an additional repair operation required by the semantics; therefore, like QR, a scope-shifting operation required by the interface, an additional application of type-shifting should give rise to some additional processing cost.

In order to account for this tension, we would need to inspect where type-shifting may and may not apply more closely. Additionally, we need to investigate to what extent its application is constrained by type-shifting rules. In Section 6.5, I have outlined one attempt to formulate a type-shifting rule that only allows type-shifting to resolve a type-mismatch for the surface scope representation, but there was not sufficient space to provide type-shifting rules for other occasions (e.g. inverse linking). I leave these open questions for further research.

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Appendix A

Main experiment

A.1 Materials: the *wh*-movement test

A.1.1 Test items

WPN1: Which programme did he burst out laughing listening to?

WPN2 Which porn channel did he drop his wine glass watching?

WPN3 Which banknote did Johnny let out a yelp finding?

WPN4 Which novel did he solve the case reading?

WPU1 Which audio book did she burst out laughing listening to?

WPU2 Which kids' TV show did Benjamin drop his glass watching?

WPU3 Which boot did he let out a yelp finding?

WPU4 Which comic book did he solve the problem reading?

WAN1 Which student did he burst out laughing after meeting?

WAN2 Which concert did she drop her bag after leaving?

WAN3 Which goal did the guy let out a yelp after seeing?

WAN4 Which film did you solve your spaghetti problem after watching?

WAU1 Which professor did she burst out laughing after meeting?

WAU2 Which park did you drop your handbag after leaving?

WAU3 Which film star did Jack let out a yelp after seeing?

WAU4 Which comedian did you solve the problem after watching?

WDN1 Which comedy film did Rob burst out laughing during?

WDN2 Which landing did you drop your flag during?

WDN3 Which rugby match did she let out a yelp during?

WDN4 Which class did Jimmy solve the problem during?

WDU1 Which war film did he burst out laughing during?

WDU2 Which opera did Ralf drop a glass during?

WDU3 Which documentary did Dan let out a yelp during?

WDU4 Which wedding did you solve the problem during?

A.1.2 Control items

WCN1 What scary stories have you read lately?

WCN2 Who do you think she might have been kissing?

WCN3 Who do you think she's having an affair with?

WCN4 Which one do you think is the most attractive?

WCN5 What kind of car was he trying to fix anyway?

WCN6 Who didn't you speak to?

WCN7 Who are you going to take a picture of?

WCN8 Which paper was Roy wondering whether to present?

WCN9 Which child did Greta say you had spoil?

WCN10 What did he fly to Amsterdam and buy?

WCN11 Which dish do you want to know how to cook?

WCN12 Which student do you regret that you gave a scholarship?

WCN13 Whose paintings do you think Mr Cabot would never buy?

WCU1 Who do you think that will arrive first?

WCU2 Which musician would you prefer for to perform first?

WCU3 Which politician are you wondering when you should serve the wine to?

WCU4 Which conductor do you wonder if the host has invited him?

WCU5 Who did you hear the rumour Connie is getting married to?

WCU6 Which city did you meet people who were inhabitants of?

WCU7 Who did you see Mr Emmet's picture of?

WCU8 What country did she go to and excavate a velociraptor jawbone?

WCU9 Which textbook did he announce his plan for students to read?

A.1.3 Contexts

WPN1: Mary and Tom are talking about John, their colleague who always listens to the radio in his office at lunch time.

Mary: *At lunch time yesterday, I went to John's office to return his dictionary. When I knocked on the door, I heard him burst out laughing. He was listening to a comedy programme on the radio.*
Tom: *That's odd. Normally John doesn't like comedy. I wonder what he found so funny.* <u>*Which programme did he burst out laughing listening to?*</u> *Was it Just a Minute or Cabin Pressure?*
Mary: *I'm not sure.*

WPN2: Jane is chatting with Sally about her husband Jack, who usually has a glass of wine and watches some TV when he gets home from work.

Jane: *Jack is so easy to startle. Last night he was channel-hopping, looking for something interesting, and he accidently switched on one of those porn channels. He was so shocked he dropped his wine glass in his lap.*

Sally: *Really! I wonder what he saw.*

Which porn channel did he drop his wine glass watching? Do you know?

Jane: *I certainly do not, you wicked thing.*

WPN3 Ken and Bill are talking about Johnny, who collects rare banknotes. Last weekend, Ken invited Johnny to see the collection of banknotes that his grandfather left him when he died.

Ken: *My grandpa left us a big collection of banknotes, including a note from the French Revolution, one of the first Japanese banknotes and a ten-cent banknote from French Indochina. They all seemed pretty uninteresting to us, but they were treasures for Johnny. He was so excited. When he found one of the banknotes in the collection, I heard him let out a yelp. It was a banknote he had been looking for forever.*

Bill: *Your grandpa's collection sounds fascinating, but I wonder what Johnny found so exciting. Which banknote did Johnny let out a yelp finding?*

Ken: *The one from Indochina, I believe.*

WPN4 Tony and Sade are two young police detectives. They are discussing their boss, who is one of the most successful chief inspectors Scotland Yard has ever had.

Tony: *Is it true that he gets his ideas from detective novels?*

Sade: *I don't know but that's what he tells people. For example, that's what he said about this latest case. He said he suddenly realised who the murderer must be while he was reading an Agatha Christie novel.*

Tony: *Are you sure? I've read most of the Agatha Christie novels, but I can't think which one might be relevant to that case. Did the Chief say which one it was? Which novel did he solve the case reading?*

Sade: *I don't remember. Maybe it wasn't Agatha Christie.*

WPU1: Two college students are talking about their friend Wendy. Wendy needed to study some audio books for her course on business management. If the weather is good, she usually can be found studying in her favourite spot in the park.

Linda: *When I saw Wendy yesterday, she was sitting on her favourite bench wearing her pink earphones and listening to one of those boring audio books she has on business management. Surprisingly, she burst out laughing, which seemed pretty weird considering what she was listening to. Turns out it wasn't the audio book that made her laugh, though. It was some text message from her boyfriend.*

George: *I need to borrow one of those audio books of Wendy's. I wonder if she has finished with the one I need.*

Which audio book did she burst out laughing listening to?

Linda: *And I'm supposed to know the answer to such a question because...*

George: *You don't always have to be so sarcastic, do you? I was just asking.*

WPU2: Benjamin and Emily have a three-year-old and a six-year-old son. Every Sunday morning Benjamin watches cartoons with them over breakfast. Now Emily is telling her friend Fiona what happened last Sunday.

Emily: *You know how Benjamin likes to watch cartoons with the kids on Sunday morning? Well, last Sunday they were watching cartoons as usual and, wouldn't you know, Benjamin goes and drops his glass of milk on the floor.*

Fiona: *Are you telling me that some cartoon caused him to drop his glass?*

Emily: *No, silly. It was the cat that did it. It suddenly jumped and landed on his shoulder.*

Fiona: *I see. So, what cartoon were they watching?*

Which kids' TV show did Benjamin drop his glass watching?

Emily: *I think it was "Postman Pat". Why do you want to know?*

WPU3: Sam and Harry often go fishing together. They always find all kinds of stuff in the water. Last weekend, Sam found 3 boots. Now Harry is talking about Sam with Cindy.

Harry: *The last time we went fishing here, Sam pulled 3 old boots out of the river, first a high healed leather boot, then a rubber boot, and finally one of those brightly coloured rubber boots for kids. When he found one of the boots, he suddenly let out a yelp. I thought he might have found something valuable inside it. However, what got Sam all excited was not the boot, but a bird dropping that had just fallen down the back of his shirt.*

Cindy: *Good old lucky Sam. So, which boot was he pulling out of the water when he got hit by the bird bomb?*

<u>*Which boot did he let out a yelp finding?*</u> *Was it the colourful kids' boot?*

Harry: *What? Is that one of your witch superstitions or something? I suppose you are going to claim that fishing an old boot out of the river brings bad luck.*

Cindy: *Only if it's a child's boot.*

WPU4: Beth and Paula are high school students. Now they are chatting about Joshua, a friend of theirs who detests calculus.

Beth: *Joshua has been racking his brains all week on that calculus problem. It's really pathetic. Anyway, he finally solved it this morning while reading a comic book.*

Paula: *Are you telling me he got the solution to the calculus problem from a comic book?*

Beth: *Of course not! He got it from me. I sent him a clue in a text message while he was reading that stupid comic book.*

Paula: *I see. So, what kind of comic books does Joshua read anyway?*

Beth: *I don't know, and I don't care.*

Paula: *Well,* <u>*which comic book did he solve the problem reading?*</u>

Beth: *I think it was called "spider boy" or "ant man" or something. Some insect.*

Paula: *A spider is not an insect.*

WAN1: Professor Johnson, who teaches medieval theology, is notorious for his seriousness. Allegedly, he has never laughed or smiled in his lifetime. Now, two of his students are talking about him.

Mark: *You know, people say he has a terrible sense of humour but the other day I'm sure I heard him burst out laughing.*

Luke: *Oh yeah? What did he find amusing?*

Mark: *Well, he was meeting some of the new students and one of the women was wearing this ridiculous hat. He burst out laughing when he told the secretary about it.*

Luke: *Hmm. My girlfriend has a ridiculous hat and she was supposed to meet Professor Johnson yesterday. I wonder if it was her.*

Which student did he burst out laughing after meeting? *Was it a tall thin girl with blonde hair and glasses?*

WAN2: Kevin, a serious heavy metal fan, recently found a girlfriend, Amy. He is talking about her to Sam.

Kevin: *We often go to heavy metal concerts together. Last month, we saw Def Leppard, Iron Maiden, and Sylosis. Amy likes rock music, so she enjoys heavy metal concerts, too, in general. However, she surprised me when she suddenly dropped her handbag just after we left one of the concerts.*

Sam: *Really? What happened to her?*

Kevin: *She got dizzy and was about to faint. This was because the sound was deafening — too loud for her to listen to for a couple of hours.*

Sam: *I've had that experience in an Iron Maiden concert. Was it Iron Maiden as well? Which concert did she drop her bag after leaving?*

Kevin: *The Def Leppard concert. It's a pity. Their music is so cool!*

WAN3: Bob and Joe are having a drink at a sports pub. They are commenting on the other customers.

Bob: *See that idiot over there watching the match? He must be a Manchester United fan.*

Joe: *How do you know?*

Bob: *Well, he let out a yelp a minute ago when a goal was scored, wasn't he?*

Joe: *Yeah, but both clubs scored recently, didn't they? So, who scored that goal, Manchester United or Real Madrid?*

Which goal did the guy let out a yelp after seeing?

WAN4: Two film buffs, Sue and Lisa, are having a debate about film genres.

Sue: *The reason why science fiction films are more interesting than gangster films is because they always teach you something about the real world, some scientific fact, or some hypothesis, about the way the world really is.*

Lisa: *That's true, but you also can learn things from gangster films.*

Sue: *Like what?*

Lisa: *Well, for example, I am good at cooking spaghetti, but I was worried about cooking spaghetti for 20 when I was having a party. I solved this problem after I watched a gangster film.*

Sue: *Yeah, right! Which film did you solve your spaghetti problem after watching?*

Lisa: *The first Godfather film. There's a scene where Clemenza teaches Michael how to cook spaghetti. Don't you remember?*

WAU1: There are a few young professors on campus that are very popular with the female students because of their striking good looks. It seems to be a trend for them to dress very well and ride a motorcycle to campus. However, Molly and Lisa are not impressed by these members of staff. Moreover, they have nothing but contempt for those who are. Now they are discussing a classmate named Pauline.

Molly: *Pauline is such an airhead. The other day at the orientation, when the freshers were meeting all the faculty members, she burst out laughing after she shook hands with one of those new-style professors I think is was Black. I was very surprised!*

Lisa: *Yeah, but it wasn't meeting that Professor that made her laugh. It was her boyfriend in the crowd making faces. And by the way, it wasn't Professor Black.*

Molly: *I see. Who was she shaking hands with then?*

Which professor did she burst out laughing after meeting?

WAU2: Mary has lost her house keys. She thinks she might have lost them when she dropped her handbag in the park. Now she is talking to her boyfriend Tim, who is going to help her try to find the missing keys.

Mary: *Damn it. I went to the park for lunch and on the way back I dropped my handbag. The keys must have fallen out when my handbag hit the ground.*
Tim: *I see. But there are two parks near where you work, aren't there? Which park did you drop your handbag after leaving?*
Mary: *Battersea Park.*

WAU3: One day while Jack was taking the train home from work, something unusual happened. As he sat there talking to his colleague Tom on his mobile phone, a famous actress got in the train and sat down right next to him. Jack looked at her and let out a yelp. It was quite embarrassing. Now Tom is explaining to Jack's secretary Jane what really happened.

Tom: *I know how it must have looked, but the real reason Jack let out a yelp like that had nothing to do with seeing the film star. He was excited because I had just told him that the Planning Commission had accepted his proposal.*
Jane: *Oh. Too bad. I was hoping it was the actress. Who was she anyway? Which film star did Jack let out a yelp after seeing?*
Tom: *Angelina Jolie, I think.*

WAU4: Tom is an undergraduate student. These days he is very busy studying for an exam in theoretical physics, which he is in danger of failing. He also has a lot to do for the college newspaper. He writes reviews of films and TV shows. Now Tom is talking to his girlfriend Lizzie.

Tom: *I had a terrible time last night because I had to finish this assignment for my physics course but I also had to watch a comedy show on TV so I could write a review about it for the paper. The physics problem was really* *giving me trouble. I just couldn't figure it out. Finally the solution came to me right after the last comedian walked off stage.*

Lizzie: *Are you telling me the comedian helped you find the solution to a physics problem?*

Tom: *Well, of course not! I heard him all right, but I was thinking so hard about the physics problem that I didn't pay attention to what he was saying.*

Lizzie: *I see. So, which comedian did you solve the problem after watching?*

WDN1: Rob, who never laughs while watching a comedy with Nancy, told her that people who easily laugh at comedies are stupid. Because Nancy always laughs, she was annoyed by what he said. Now, Edward, who is Rob's best friend, is talking with Nancy about the all-night event that he and Rob went to. Three comedy films were shown there back-to-back.

Edward: *Are you telling me that Rob looks down on people who laugh at comedies? But he burst out laughing during that all-night event, where they were showing Johnny English, Paul, and Hot Fuzz. All pretty good comedies, by the way.*

Nancy: *Really? I can't believe that! I'm very curious what kind of comedies make him laugh. I'll take him to one, and then he'll have to take back what he said to me! So, tell me.*

Which comedy film did Rob burst out laughing during?

Edward: *Paul, the one with the funny alien plus some excellent comedians! I never told you this, OK?*

WDN2: Rose is in the navy. She works on the deck of an aircraft carrier. Her job is to warn the pilots that the chocks are still in place so that they don't taxi to the catapult for take-off. She has to hold up a yellow flag as long as the chocks are in place. Now, Rose is explaining to her superior what happened yesterday when a jet fighter she was handling tried to taxi to the catapult before it was supposed to, a violation of protocol that could have cost lives as well as millions in damage.

Rose: *I was still holding up the flag for flight 308 because he wasn't green* *for take-off. I was waiting for the go ahead from the control tower.*

Officer: *According to the pilot your flag went down, allowing initiation of the take-off procedure. Why did you put it down?*

Rose: *I didn't! I mean, I didn't mean to, if I did. I was so startled by that Harrier landing right behind me on deck 40 that I lost my balance. As I fell, I may have dropped my flag. Maybe the pilot thought I was signalling.*

Officer: *According to the log, there were two Harriers that landed during your watch. Which landing did you drop your flag during?*

WDN3: Terry and Rachel are talking about Sally, who told them that her boyfriend plays for the UCL rugby team, but she's never said exactly who he is.

Terry: *In my team, the only players who have girlfriends are Tim, Johnny, Matt, and Seth. So, Sally's boyfriend should be one of those guys, but I have no idea which one.*

Rachel: *I wanted to find out, so I went to the last three rugby matches with her. She never mentioned her boyfriend's name. However, she let out a yelp several times during one of the matches. Unfortunately, I don't know much about rugby rules, so I had no idea what was happening. But I'm sure that her boyfriend must have been the star player of that match.*

Terry: *Oh, that might help us. You guys went to the matches on Tuesday, Saturday, and Monday, didn't you?*

Which rugby match did she let out a yelp during? I think I know who scored the most in each of those matches.

Rachel: *The match last Tuesday, I think. So, who is it?*

WDN4: Paul and Laura are computer science students. Lately they have been having a hard time with their studies. One of their instructors is a hard taskmaster and each weekly assignment for his course has been harder than the previous one. Now Paul and Laura are talking about a classmate of theirs who does not seem to find the assignments as difficult as they do.

Laura: *The last assignment really was a killer. Virtually everyone in the* *class had to ask Professor Miller for a hint on how to solve the third problem, but Naomi said she found it easy to solve. I don't get how she did it.*

Paul: *I know her secret. Her boyfriend Jimmy, who takes more advanced courses than we do, happened to be in a class on exactly these kind of problems when she texted him yesterday. Because they were working on similar problems in class, he could solve Naomi's problem immediately.*

Laura: *Oh really? I wonder whether there are power point slides for that class on the school's website.*

Which class did Jimmy solve the problem during?

WDU1: Neil and Rick watched three war films at the London Film Festival. Now, Rick is talking about Neil with Emma.

Rick: *At the film festival, we watched The Hurt Locker, The Thin Red Line, and Apocalypse Now. The reason why I asked Neil to come along was because he studied the history of war at university and always takes war films very seriously.*

Emma: *I'm sure that he is so serious that he doesn't make a peep when he's watching a film.*

Rick: *Well— In fact, he burst out laughing when we were watching one of the films. What made him laugh was an old man sitting in front of us. He was sleeping and snoring, and a big bubble was hanging from his nose. Neil thought this was very funny. By the way, the film we were watching was the best of the three. Neil said so, too.*

Emma: *I cannot believe that such a trivial thing made him laugh! But I'd like to see that film if Neil liked it so much.*

Which war film did he burst out laughing during?

Rick: *The Thin Red Line. I would have enjoyed it more if Neil hadn't laughed.*

WDU2: Ralf and Sara are senior citizens who often go to the Royal Opera House to see operas. In the spring season, they saw *La bohème, Don Giovanni*, and *Carmen*. Now, Sara is chatting about those operas with Jenny.

Sara: *I loved all the operas that Ralf and I went to, although something un-*

fortunate happened during one of the performances. We were in balcony seats and were having a little wine. While we were watching, suddenly he dropped his glass...

Jenny: *What happened? Was the performance so boring that he fell asleep and dropped it?*

Sara: *Oh, no. He saw a mouse run by his foot and dropped the wine. We missed half the opera because we had to go down and apologize to the people we had drenched in wine. It was too bad, because that particular performance was the best of all. Erwin Schrott, my favourite singer, was in it.*

Jenny: *I'm sorry to hear about the accident. I also like Erwin, so I'd like to see that opera. Maybe you'd like to come along?*

Which opera did Ralf drop a glass during? *Was it Don Giovanni, or one of the others?*

WDU3: Emily is chatting with Fanny about her dates with Dan, a zoologist.

Emily: *Dan often asks me to come over to watch wild-life documentaries, which he has to review for his job. Over the last three weekends we have watched three documentaries: First, Life, then, Planet Earth, and finally Penguin Island. You want to hear something funny? One of the times, Dan suddenly let out a yelp while we were watching one of the documentaries.*

Fanny: *Why? Did he see some especially interesting animal in that documentary?*

Emily: *Oh, no. His hamster had slipped out of its cage and jumped into his shirt! But actually, the documentary we were watching at the time was great, and I'm no expert in zoology.*

Fanny: *Really? Maybe I should borrow it from him. Which one was it? Which documentary did Dan let out a yelp during?*

Emily: *Penguin Island. I'll ask him to bring it.*

WDU4: Sally is a string-theoretical physicist. She loves working on very abstract problems and spends most of her time doing that, no matter where she is. Last weekend she was supposed to attend two weddings, one on Saturday and the other on Sunday. Now she is talking to Dr Sheldon, a friend of hers at the university.

Dr Sheldon: *So, how's it going? Have you solved any interesting physics problems lately?*
Sally: *Well, yes, actually. Last weekend I was supposed to be attending a wedding but I pretended to be sick so I wouldn't have to go. It was a good decision because that same afternoon I had a breakthrough, and by supper time I had completely worked out the solution to a problem that I've been working on for 6 weeks.*
Dr Sheldon: *But you said there were two weddings you were supposed to go to last weekend. Did you skip both of them? If not,*
<u>which wedding did you solve the problem during?</u> I'm asking because I know the bride of the one on Sunday.

WCN1: Clive, who likes reading scary short stories, is having a chat with Grace, who has the same interest.

Grace: *I just finished reading "The Tell-Tale Heart" by Edgar Allen Poe. Great story! Have you ever read it?*
Clive: *Of course. It's one of Poe's best, although I like the "The Black Cat" even better.*
Grace: *How about you? <u>What scary stories have you read lately?</u>*
Clive: *Well, right now I'm reading "The Canterville Ghost" by Oscar Wilde. Ever read it?*

WCN2: Fred is talking with his best friend Bob about his ex-girlfriend Clara, who he just broke up with.

Alfred: *The reason why I broke up with Clara is that I saw her kissing some bloke in Hyde Park last week.*
Bob: *Really. <u>Who do you think she might have been kissing?</u>*
Alfred: *I don't have to wonder about it too much. I saw very clearly who she was kissing. It was you! Don't try to deny it!*

WCN3: Lisa is talking with Sally about the rumour that their colleague Kelly is having an affair with someone working in the same company.

Lisa: *I know that Kelly can't live without a man, so it wouldn't surprise me in the least if she's sleeping with someone in our own office.*
Sally: *Who do you think she's having an affair with?*
Lisa: *Maybe Mr Dalton, her boss. You notice how they are always smiling at each other these days.*

WCN4: Ed, a dentist, is on the pull. He has come to a party to see if he can pick up some attractive young woman. As soon as he arrives he finds his old friend Kevin, who's come to the party for the same reason.

Ed: *Hey. How's it going. Seen any fit birds here?*
Kevin: *Oh yeah. Lots. For example, those two dancing together over there in the corner.*
Ed: *Nice. Which one do you think is the most attractive?*
Kevin: *The blond. She's the one I am going to talk to. You try your luck with the other one.*

WCN5: Cheryl is talking to Aidan about her last date with William, her fiance. William is a nice man but he is a bit of a lunatic about cars. He's always boasting about how he can fix anything that goes wrong with a car, but his knowledge of car mechanics is actually quite limited.

Cheryl: *We went for a drive in Walter's new car last weekend. On the way to Brighton, we came across a man whose car was stopped on the road. So, of course, Walter has to pull over and lend a hand, without thinking for a moment about what I might want to do.*
Aidan: *Well, was he able to fix it?*
What kind of car was he trying to fix anyway?
Cheryl: *It was a Nissan Skyline GTR, and no, he was not able to fix it, even though he spent two hours trying. A real night on the town for me.*

WCN6: Dr Ely, a psychology professor, often goes to the pub for a drink with PhD students and post docs, including Dr Fara. Prof. Ely is very sociable and he tries to talk to everyone who he goes drinking with.

Ely: *When we went for a drink last time, I tried to talk to everyone, as usual, but there was one person who I didn't get a chance to speak to.*
Fara: *I thought that you did talk to everyone. Who didn't you speak to?*
Ely: *I didn't speak to Ada, because she fell asleep before she had even finished her first pint.*

WCN7: Chris is a dentist. He is an amateur photographer. Now he is boasting to Abigail, his dental hygienist, about the new camera he bought last weekend.

Chris: *I finally got that camera I've been wanting to buy for so long. The first thing I'm going to do with it is a portrait shot.*
Abigail: *Oh? Who are you going to take a picture of?*
Chris: *My favourite assistant, of course. You. Say "cheese".*

WCN8: Dr Boyl and Sam belong to the linguistics reading group, and each week a member of the group presents a paper that he or she is interested in. Now, they are talking about Roy, who will be presenting a paper at the next meeting.

Boyl: *Yesterday, Roy came to my office to ask me about a paper for his presentation. He had a specific paper in mind that he wanted to discuss but he wasn't sure whether he should, because he felt it was more a work of speculative philosophy than linguistics.*
Sam: *Which paper was Roy wondering whether to present?*
Boyl: *Hauser, Chomsky, and Fitch's paper on the evolution of language.*

WCN9: Maggie has just met Mr Don at a party. She already knew a lot about him and his family because her friend best Greta had worked for Mr Don as the tutor for his children. Now Maggie is asking him why he fired Greta.

Don: *I didn't want to let Greta go; she was a great tutor and the children loved her. However, I couldn't countenance her telling the neighbours that we had spoiled one of our children.* Maggie: *I see. So,*
which child did Greta say you had spoil? Don: *My youngest son.* Maggie: *But you have two youngest sons, don't you? They are identical twins. Which one was Greta referring to?* Don: *The one that's spoiled rotten, I suppose. What does it matter?*

WCN10: Erin is a customs officer at Heathrow Airport. Now she is talking with her co-worker Laura, who is worried about her boyfriend Norbert. Laura is worried because Norbert was supposed to return from a trip to the Netherlands three days ago but she still hasn't heard a word from him. By coincidence, Erin saw Norbert in the customs area a few days ago. She has some bad news for Laura.

Erin: *I'm afraid your boyfriend may have got himself into a bit of trouble when he came through here last Friday. It seems he was carrying drugs.*
Laura: *What? Damn that man! What did he fly to Amsterdam and buy?*
Erin: *Ten pounds of hashish, apparently. They sell that stuff openly in Amsterdam, you know, at what they call "coffee shops".*

WCN11: Toby, who is a waiter at an Italian restaurant, has a girlfriend who loves Italian food. He promised to cook pasta for her next weekend, although he actually knows nothing about cooking, much less Italian dishes. Now Toby is asking Donna, a waitress at the same restaurant, if she knows anything about cooking pasta.

Toby: *Do you know how to cook pasta? I promised my girlfriend I'd cook her a real Italian pasta dish the next time she came over to my place for dinner, but, to be honest, I haven't got a clue about how to cook pasta. I can't even manage spaghetti.*
Donna: *Well, I'm just a waitress here, just like you, but I do often cook pasta at home. Which dish do you want to know how to cook?*
Toby: *Pasta putanesca. I have no idea what it is but I like sound of it.*

WCN12: Each year the department of linguistics offers three scholarships for PhD students who wish to attend a summer school in the Netherlands. Dr Ack and Dr Skin run this program and now they are talking about a student they gave a scholarship to for this year's Dutch summer school.

Ack: *I've got some bad news about one of the students we gave a scholarship to. He seems to have stopped going to class and basically dropped off the radar for a few weeks until finally one of the other students spotted him making a purchase at a coffee shop. I regret that we gave him one of the scholarships.*
Skin: *Who is it?* *Which student do you regret that you gave a scholarship?*
Ack: *Ernest.*

WCN13: Mr Elson, a member of staff in the Tate Britain, knows many affluent art collectors in London. For example, he is a friend of Mr Cabot, a wealthy private collector of oil paintings by famous artists who lived before the 20th century. Mr Elson is now chatting with Celia, who has heard of Mr Cabot.

Elson: *Mr Cabot is wealthy enough to buy portraits by any artist, but, of course, he has his preferences. He likes many different artists but I can think of at least one whose paintings I'm sure he'd never buy.*
Celia: *Really?* *Whose paintings do you think Mr Cabot would never buy?*
Elson: *Van Gogh. Mr Cabot has told me before that he finds van Gogh paintings extremely depressing. He can't stand being in the same room with one.*

WCU1: Amber and Justin arrived at the hall earlier than their two friends so they could help set up for the party. Now the party has started but neither of their friends has turned up yet.

Amber: *I thought that Terence and Jones would get here before the party started.*
Justin: *They said they were coming in separate cars.*
Who do you think that will arrive first?
Amber: *Terence. He drives faster.*

WCU2: Harold, the owner of a fancy nightclub, is talking with his events manager Curtis. They are waiting for two special guest musicians, namely Eric Clapton and Paul Rodgers, who were supposed to show up an hour ago.

Curtis: *Well, boss. It seems that both of our celebrities have been delayed by the heavy traffic. Which musician would you prefer for to perform first?*

Harold: *Paul Rodgers. Most of our customers are fans of Free, but, to be honest, I'm not sure they even know who Eric Clapton is. So, put Paul on first.*

WCU3: Luke is a waiter whose job is to serve wine to guests at the Sheffield Gardens Restaurant. Hugh, who also works there as a waiter, is helping Luke with a problem.

Hugh: *What's the matter?*

Luke: *I was asked to serve this vintage wine to a guest who is a politician, but I don't know when I should serve it to him — now or after the first entree is served. He's having a vodka and tonic now.*

Hugh: *Which politician are you wondering when you should serve the wine to?*

Luke: *I'm not sure how to pronounce his name; Yeltskin or Yelsin or something. He's with the Russian delegation.*

Hugh: *Russian? Go ahead and serve the wine now.*

WCU4: Mr Tate, a music critic, was looking forward to seeing some classical musicians at the party but he has not seen anyone yet. Now Tate is asking Kim, a member of the party staff, which musicians have been invited.

Tate: *OK. I understand that these violinists can't arrive at the party until after their concerts are finished, but I expect that some conductor should also have been invited.*

Kim: *Which conductor do you wonder if the host has invited him?*

Tate: *Sir John Eliot Gardiner. I'd like to talk with him about his latest* *concert.*

WCU5: Colin has secretly fancied Connie ever since his first year at the university. So naturally he was rather disheartened by the rumour that Connie is planning to get married.

Colin: *To tell you the truth, I've been pretty depressed since I heard that Connie, who I have loved for a long time, is getting married soon.*
Percy: *You know, it's just a rumour. Maybe it's not true. Maybe she hasn't decided yet. And who is it anyway?*
Who did you hear the rumour Connie is getting married to?
Colin: *Allenhoff. That prick in the boat club. Rumour has that his parents are loaded.*

WCU6: Dr Cotter had just come back from Paris to London by Eurostar, and then he rushed to the hall for the party this evening. Now he is talking about an incident at King's Cross Station with Elma, a friend of his.

Cotter: *On the way here, at the entrance to King's Cross Station, I saw a group of tourists who had lost their way, so I helped them to find the right platform for their train. They said that all of them were citizens of the same city.*
Elma: *Which city did you meet people who were inhabitants of? Did you ask them?*
Cotter: *Utrecht in the Netherlands. I went there once for a conference.*

WCU7: Isadora and Lana are talking about Mr Emmet, who is their boss in the pharmaceutical company. Mr Emmet has a photo album in his office desk, but he has never shown it to anyone. He's very secretive about it.

Lana: *I was very interested in the pictures in the photo album, so I took a peek. But I only got to see one of them because Mr Emmet suddenly came back and I had put the album back in the drawer before he saw that I had been looking at it.*

Isadora: *So, who did you see Mr Emmet's picture of?*

Lana: *His wife, and she's stunning.*

WCU8: Prof. Astor, an archaeologist, got a letter from his daughter Christine, who excavated a dinosaur fossil while she was on a field trip. Now Prof. Astor is boasting about her success to his favourite student Leroy.

Astor: *My daughter Christine is also working on a PhD in archaeology, you know. She told me that she had just excavated the fossil of a velociraptor jawbone at the dig where she is doing her fieldwork.*

Leroy: *Wow. Some people have all the luck.*

What country did she go to and excavate a velociraptor jawbone?

Astor: *Mongolia, of course. Maybe you should go visit her there some time and find something yourself.*

WCU9: Dr McVis, a management lecturer at a business school, has invited Mr Kips, a financial adviser for a large Dutch bank, to visit his department as a guest lecturer. This evening Dr McVis has gotten acquainted with Ms Noel, who is Mr Kips' secretary.

McVis: *I'm very happy that Mr Kips has agreed to teach a management course next term. I see that he has already posted a syllabus on the course website. He plans to assign a lot of readings.*

Noel: *That's odd. Last time I talked with him he said he was holding off announcing the course readings till he found out whether or not he'd be able to use a new textbook that is supposed to be available soon.*

Which textbook did he announce his plan for students to read?

McVis: *Well, I didn't study the list carefully but I believe it included the latest edition of the Drucker textbook.*

A.1.4 Instruction

In this study we are going to ask you, a native speaker of British English, to judge how natural and native-speaker-like some English sentences are in a given context. Some of the sentences you will see should seem perfectly correct and normal in the given dialogue. They will look like the kind of thing that any native speaker might say. However, others may seem a bit weird, or incorrect in some way, or perhaps even so unnatural that they are hard to understand. That is, to one extent or another, they will not look like the kind of sentence that a native speaker of British English would use in the given dialogue. And you may also find that some sentences are not entirely correct, but nonetheless sound normal enough for a native speaker to use. In all cases the only thing that matters to us is how natural and native-speaker-like each sentence seems to you in the relevant context, not how grammatically correct it may or may not be according to someone who is fussy about "grammatical correctness" (such as an editor or an English teacher).

Please don't focus only on the target sentences, but read each context very carefully, so that you can judge how natural the sentence is in the context that is given.

To help you evaluate the sentences in the way we would like you to it may help to think of the test as a kind of find-the-spy-game'. Imagine that you are an MI6 operative, a colleague of James Bond, and your task is to examine a set of transcribed tape recordings of conversations. In each recording, one of the speakers is suspected of being a foreign spy while the others are ordinary British English native speakers. The spies are definitely not British English native speakers, but their English is extremely good, good enough to fool most people into thinking they are. Unless you carefully study what they say, you can easily be tricked. If you listened to them speaking, for example, you would hear nothing foreign about their accent. However, when it comes to putting words together into sentences they sometimes slip up and say things that a true native speaker would most likely never say.

Your mission, then, is to study 46 transcribed tape recordings of conversations, each of which follows a short background story, and to determine how natural their use of English is in a given dialogue. A picture is also given to clarify the context and intended meaning of the underlined sentence. After reading each dialogue, you will be asked to answer a question: How natural (native-speaker like) is the underlined sentence?

To answer the question, you can use a scale of 1 to 5, where 1 was “not at all native speaker like / perfectly unnatural” and 5 was “completely native speaker like / perfectly natural”. Please circle the appropriate number on the right side of each question to answer it.

Remember:

- Please make sure that you read carefully all parts of the scenario and the dialogue before you answer each question.
- We expect you to spend about 45 minutes to complete one questionnaire. Please take your time to complete it. We don’t accept your answers if you finish the questionnaire too fast (i.e. less than 30 minutes).
- Please don’t communicate with the other participants during the experiment or after the experiment and don’t talk about the content of the questionnaire with other subjects.

Thank you very much for your help.

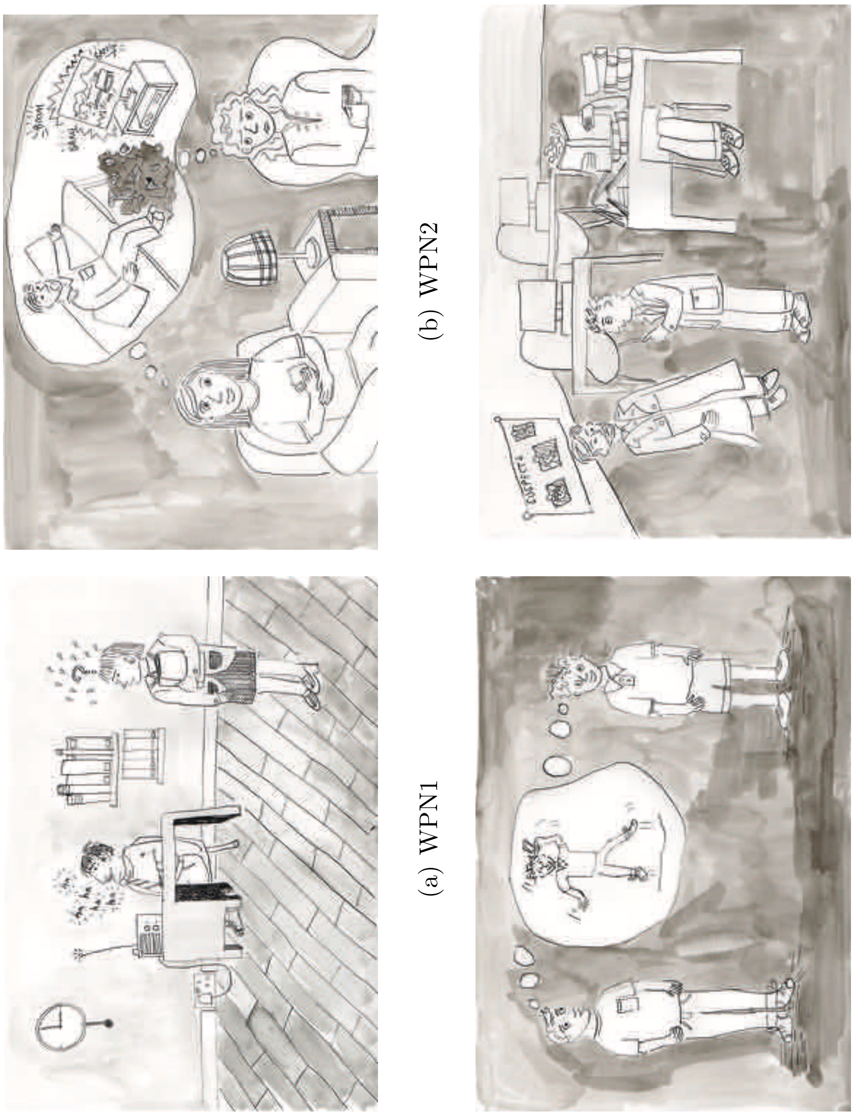
A.1.5 Question & answer sheet for an acceptability judgement task

How natural is the underlined sentence? 1 – 2 – 3 – 4 – 5

A.1.6 Pictures

[1]

[1] All pictures used in the *wh*-movement and QR tests were drawn by Hannah Yate.



(a) WPN1

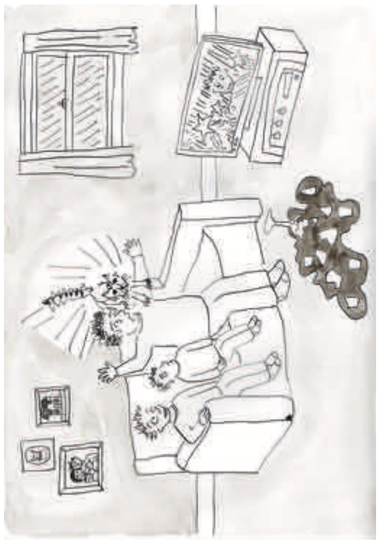
(b) WPN2

(c) WPN3

(d) WPN4

Figure A.1: Pictures: WPN items

(a) WPU1



(b) WPU2

(c) WPU3

(d) WPU4

Figure A.2: Pictures: WPU items

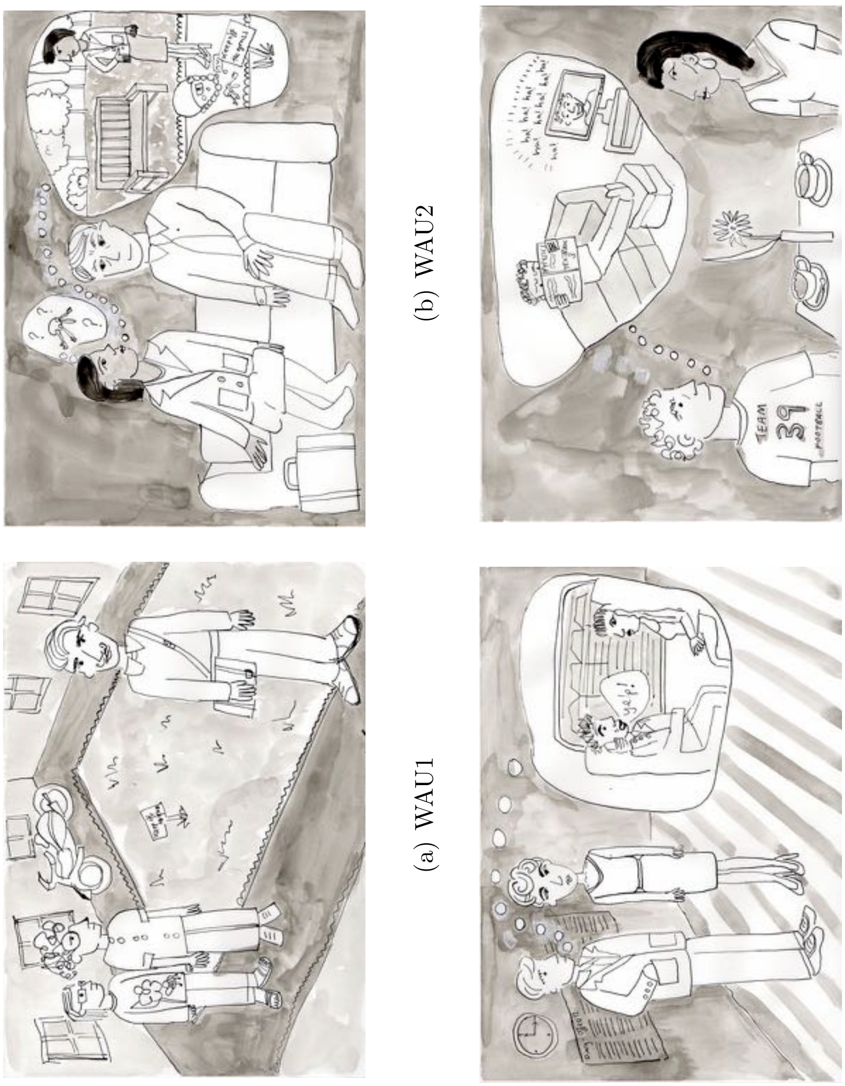
(a) WAN1

(b) WAN2

(c) WAN3

(d) WAN4

Figure A.3: Pictures: WAN items



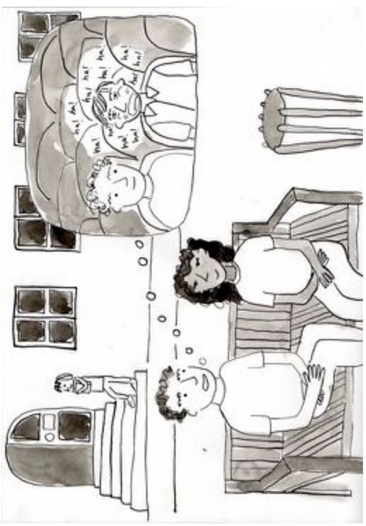
(a) WAU1

(b) WAU2

(c) WAU3

(d) WAU4

Figure A.4: Pictures: WAU items



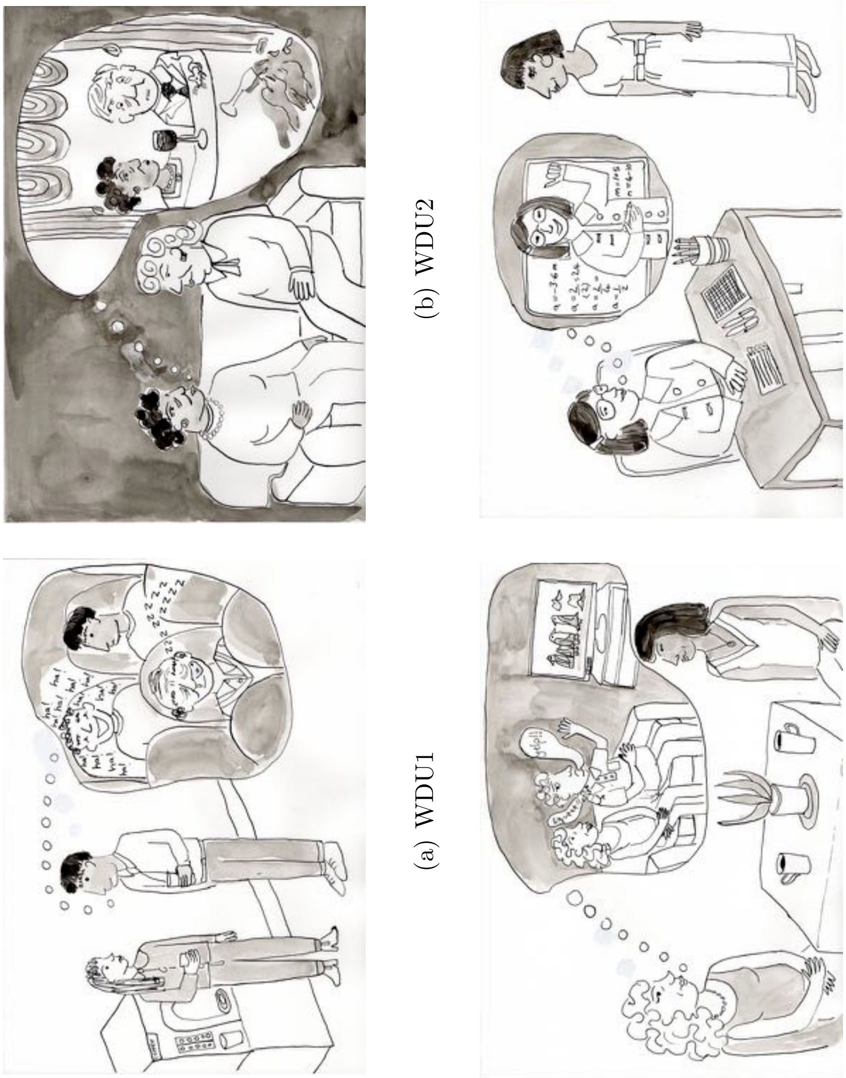
(a) WDN1

(b) WDN2

(c) WDN3

(d) WDN4

Figure A.5: Pictures: WDN items



(a) WDU1

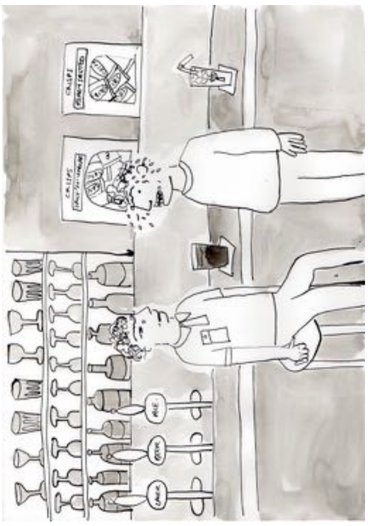
(b) WDU2

(c) WDU3

(d) WDU4

Figure A.6: Pictures: WDU items

(a) WCN1

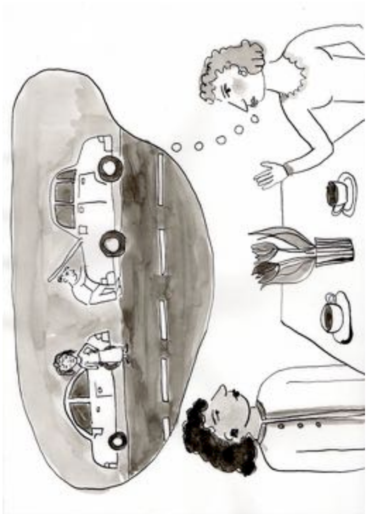


(b) WCN2

(c) WCN3

(d) WCN4

Figure A.7: Pictures: WCN items (1-4)



(a) WCN5

(b) WCN6

(c) WCN7

Figure A.8: Pictures: WCN items (5-7)

(a) WCN8

(b) WCN9

(c) WCN10

Figure A.9: Pictures: WCN items (8-10)

(a) WCN11

(b) WCN12

(c) WCN13

Figure A.10: Pictures: WCN items (11-13)

(a) WCU1

(b) WCU2

(c) WCU3

Figure A.11: Pictures: WCU items (1-3)

(a) WCU4

(b) WCU5

(c) WCU6

Figure A.12: Pictures: WCU items (4-6)

(a) WCU7

(b) WCU8

(c) WCU9

Figure A.13: Pictures: WCU items (7-9)

A.2 Materials: the QR test

A.2.1 Test items

QPN1 A manager burst out laughing listening to each comedy programme.

QPN2 A boy dropped his glass watching each porn show.

QPN3 A collector let out a yelp finding each banknote.

QPN4 A police detective solved his case reading each novel.

QPU1 A girl burst out laughing listening to each boring audiobook.

QPU2 A parent dropped a glass watching each kids' programme.

QPU3 A fisherman let out a yelp finding each boot.

QPU4 A boy solved the problem reading each comic book.

QAN1 A professor burst out laughing after meeting each student.

QAN2 A girl dropped her handbag after leaving each concert.

QAN3 A guy let out a yelp after seeing each goal.

QAN4 A film buff solved her spaghetti problem after watching each film.

QAU1 A girl burst out laughing after meeting each professor.

QAU2 A girl dropped her handbag after leaving each park.

QAU3 A man let out a yelp after seeing each film star.

QAU4 An editor solved that physics problem after watching each comedian.

QDN1 One of the guys burst out laughing during each comedy film.

QDN2 A signalman dropped her flag during each Harrier landing.

QDN3 A girl let out a yelp during each rugby match.

QDN4 A student solved Miller's problem during each advanced class.

QDU1 An academic burst out laughing during each war film.

QDU2 A lady dropped her glass during each opera.

QDU3 A zoologist let out a yelp during each documentary.

QDU4 A physicist solved that problem during each wedding.

A.2.2 Control items

QCN1 A boy kissed each girl on the hand.

QCN2 A doctor had to examine each patient.

QCN3 A cop caught each thief.

QCN4 A mechanic fixed each car in about 30 minutes.

QCN5 A consultant must be present when each patient having a tantrum is given a tranquilizer.

QCN6 A glass of vintage wine is going to be served to each celebrity.

QCN7 A child gave each chimpanzee an apple.

QCN8 A rose bush will grow where each fatal crash occurs.

QCN9 A secretary started to cry when each executive came forward to officially tender his or her resignation.

QCN10 A Mafioso went to NYC and bought each type of handgun available on the market there.

QCN11 An armed guard will be standing at front door of each of our branches.

QCU1 A secretary in his own office believes each politician is corrupt.

QCU2 At your clinic a nurse makes sure each patient feels comfortable.

QCU3 A swimmer used a sharkskin suit to win each race.

QCU4 One of you expected each new release to be a flop

QCU5 He showed a group each film.

QCU6 You gave a girl in the class each French novel that was in the shop.

QCU7 An artist whispered to me that Mr Aap haggled offensively about each and every painting in the gallery tonight.

QCU8 A student thinks that Cynthia has given each of her professors' sexual favours?

QCU9 At your hospital a nurse loves each doctor but hates the director.

QCU10 A critic has predicted Ann would win each Oscar she was nominated for.

A.2.3 Contexts

QPN1: Mary and Tom are talking about Ms White and Mr Black, sales managers who always listen to the radio in their offices at lunchtime.

Mary: *At lunchtime yesterday, I went to Ms White's office to return her umbrella. When I knocked on the door, I heard her burst out laughing. She was listening to Just a Minute on the radio.*
Tom: *What a coincidence! While you were visiting Ms White's office, I went to Mr Black's office to return his dictionary. When I opened the door, I saw him burst out laughing as well. He was also listening to a comedy programme, but it was Cabin Pressure. I know that both Just a Minute and Cabin Pressure are funny enough to make even someone that serious laugh out loud.*
Mary:
Oh, <u>a manager burst out laughing listening to each comedy programme.</u> I didn't know that our bosses are both fans of comedy shows.

QPN2: Jane is chatting with Sally about an incident that happened while she was staying in a hotel with her two teenage sons.

Jane: *My sons are so easily startled. While Rob was taking a shower, Jack* *was channel-hopping, looking for something interesting on TV, and he accidently switched on one of two porn channels available in the room. It was so graphic that he dropped his glass of juice on the floor.*

Sally: *Oh, really? That kind of channel is harmful to young boys. It was good that Rob wasn't there.*

Jane: *Well, Rob made the same mistake after taking his shower... When Jack was out of the room, Rob was surfing TV channels. Like his brother, Rob also accidently switched to a porn channel, but it was the other one. He was so surprised that he dropped a glass of water in his lap.*

Sally: *Wow, a boy dropped his glass watching each porn show. But do you think his was really a coincidence? Aren't teenagers normally curious about porn shows?*

QPN3 Gregory's grandfather collected banknotes when he was still alive. After his death, Gregory invited two collectors of rare banknotes to his grandfather's house in order to help him authenticate some of the banknotes that his grandfather left him. However, once Gregory showed the collectors to the attic, they started finding treasures. Now, Gregory is talking with Donna about this.

Donna: *So, did you guys discover any valuable banknotes?*

Gregory: *Yes, we did. There were two very valuable banknotes in the attic. The collectors I invited were very excited. First, Ms Brown let out a yelp when she found a note from the French Revolution. Next, I heard Mr Thompson let out a yelp when he found one of the first ever Japanese banknotes. It was a banknote that he had been looking for forever.*

Donna: *Oh, a collector let out a yelp finding each banknote. Was plaster falling from the ceiling?*

QPN4 Tony, the chief police detective, loves detective novels by Agatha Christie. He had two colleagues who had difficulties solving the murder cases they were working on. Tony lent Dan Murder on the Orient Express, while Bill borrowed And Then There Were None from him. The idea was that these novels would give them hints that could help them solve their cases. Now, Tony is talking with Victoria about this.

Victoria: *Is it true that both Dan and Bill solved their murder cases with the help of an Agatha Christie novel that you lent them?*
Tony: *Yes, that's the truth. What a genius Agatha Christie was! First, Dan realised how the night train murder he was working on must have happened while he was reading Murder on the Orient Express. Then, Bill got an idea while reading And Then There Were None about who the murderer was from among the residents of a small village. As a result, both murder cases were finally solved!*
Victoria: *Amazing! <u>A police detective solved his case reading each novel.</u> I didn't realize how useful your collection of Agatha Christie novels is.*

QPU1: Two college students are talking about their friends Wendy and Iris, who had to study some audio books for their course on business management. When the weather was good, they usually could be found studying at their favourite spots in the park.

Oliver: *When I met Wendy the other day, she was sitting on her favourite bench listening to Time Management. She told me that audio book was incredibly boring. Afterwards, I hid behind a tree near her bench and sent her a very funny text message. As soon as she had a look at her mobile phone, she burst out laughing.*
Erin: *Ha-ha, well done! That must have cheered her up. What about Iris? Did you meet her as well?*
Oliver: *Yes, I did. After surprising Wendy, I saw Iris sitting on the grass under a tree. She was listening to The Hypnotic Salesman, and seemed very bored. So, again, I hid behind a tree and sent her a funny message. Like Wendy, my message made her burst out laughing.*
Erin: *<u>A girl burst out laughing listening to each boring audiobook.</u> That must have been a very funny message. Can you send it to me as well?*

QPU2: The Robinsons have two sons. Every Sunday morning, the whole family watch two BBC kids' programmes: one is Postman Pat, the older son's favourite, and the other is Timmy Time, the younger son's favourite. Mrs Robinson is chatting with Mrs Knightley about what happened last Sunday.

Mrs Robinson: *While we were watching Postman Pat last Sunday, my husband was drinking a glass of milk. Suddenly our cat jumped on his lap, which made him drop his glass.*

Mrs Knightley: *Oh, he should have more careful. Broken glass and children don't mix!*

Mrs Robinson: *Yes, you are right. In fact, both of us should be more careful... When we were watching Timmy Time, I noticed a mouse running across the floor. It made me drop a glass of iced coffee. I'm very afraid of mice. Fortunately, the children didn't seem to notice.*

Mrs Knightley: <u>*A parent dropped a glass watching each kids' programme.*</u> *The children are more careful than the adults, aren't they?*

QPU3: Harry went fishing with Sam and Ricky last weekend. He and his friends always find all kinds of stuff in the water. Now Harry is talking about his outing with Cindy.

Harry: *The last time we went fishing, Sam pulled a kid's rubber boot out of the river, while Ricky found a high-healed leather boot.*

Cindy: *I heard that fishing a child's boot out of the river brings good luck. Did anything good happen to Sam?*

Harry: *Well, not really. When he found that kid's boot, he suddenly let out a yelp. What got him all excited was not that boot, though, but a bird dropping that had just fallen down the back of his shirt.*

Cindy: *Oh, so the superstition about a kid's boot isn't true.*

Harry: *I suppose not. And I should add that when Ricky found that high-healed leather boot later, he also suddenly let out a yelp. In his case, it was because a bird bomb landed on his head.*

Cindy: <u>*A fisherman let out a yelp finding each boot!*</u> *Your little group must have annoyed the other fishermen quite a bit.*

QPU4: Gill and Lisa are high school students. They are chatting about Colin and Josh, friends of theirs who detest calculus.

Gill: *Colin has been racking his brains all week on that calculus problem. It's really pathetic. Anyway, he finally solved it this morning while reading Spiderman.*
Lisa: *Are you telling me he got the solution to the calculus problem from a comic book?*
Gill: *Of course not! He got it from me. I sent him a clue in a text message while he was reading that stupid comic book.*
Lisa: *I see. I didn't imagine that our lives ran on parallel tracks...*
Gill: *What do you mean?*
Lisa: *Well, Josh also solved that calculus problem this morning. And he, too, was reading a comic book: Batman. Like Colin, he solved the problem because he got a clue, not from that comic book, but because I sent him an email.*
Gill: *What a coincidence!*
<u>A boy solved the problem reading each comic book.</u> But we are the heroes that saved them, rather than Spiderman and Batman, aren't we?

QAN1: Professor Harris and Professor Lennon, who teach medieval theology, are notorious for their seriousness. Allegedly, they have never laughed or smiled in their lifetimes. Now, two of their students are discussing them.

Nick: *You know, people say my supervisor Professor Harris has a terrible sense of humour but the other day I'm sure I heard him burst out laughing.*
Oliver: *Oh yeah? What did he find so amusing?*
Nick: *Well, he was meeting some of the new students and one of the women was wearing this ridiculous hat. He burst out laughing when he told the secretary about it.*
Oliver: *Hmm. It may have been my new girlfriend. She was supposed to meet Professor Harris yesterday and she is into colourful hats. But your story reminds me of something. You know Professor Lennon is also supposed to be super-serious. Well, I heard him bursting out in laughter the other day.*

Nick: *Oh, really? What did he find so funny?*

Oliver: *Just before our meeting, he met with a guy wearing a ridiculously large nose ring, a bit like a cow. After the guy left, I knocked on the door. Lennon didn't answer for a while, but I heard him laugh out loud.*

Nick: *Ha-ha. <u>A professor burst out laughing after meeting each student.</u> It seems they are human beings after all.*

QAN2: Kevin and Sam are big fans of heavy metal. Now they are talking about their new girlfriends, who they recently introduced to the heavy metal scene.

Kevin: *Last weekend, Amy and I went to the Iron Maiden concert together. Amy likes rock music in general, but she surprised me when she suddenly dropped her handbag just after we left the concert.*

Sam: *Really? Did she get dizzy because of sound levels at the concert?*

Kevin: *Yes, that's exactly what happened. She was about to faint — how do you know?*

Sam: *Well, Erika and I had the same experience at the Def Leppard concert. The sound was too loud for her and made her get dizzy, and then she dropped her handbag on the way out.*

Kevin: *Oh, so <u>a girl dropped her handbag after leaving each concert.</u> Not a good sign. Do you think these women are right for us?*

QAN3: Rob and Ted are having a drink in the pub. They have just finished watching the match between Real Madrid and Manchester United, which ended in a draw (1-1). Now they are commenting on the other customers.

Rob: *See that bald guy over there drinking a pint of lager? He must be a Manchester United fan.*

Ted: *How do you know?*

Rob: *Didn't you see that he was letting out a yelp when Manchester United scored a goal?*

Ted: *No, I didn't see that, but I saw that guy with the tattoo on his arm letting out a yelp when Real Madrid scored. He must be a Real Madrid fan.*

Rob: *Ha — that's funny. <u>A guy let out a yelp after seeing each goal.</u> It's a* *pity that there weren't more goals.*

QAN4: Two film buffs, Kate and Donna, are having a debate about what you can learn from films.

Kate: *The reason why science fiction films are more interesting than gangster films is because they always teach you something about the real world, some scientific fact or some hypothesis, about the way the world really is.*
Donna: *That's true, but you can also learn things from gangster films.*
Kate: *Like what?*
Donna: *Well, for example, I am good at cooking spaghetti, but I was worried about cooking spaghetti for twenty when I was having a party. I solved this problem after watching The Godfather. There's a scene where Clemenza teaches Michael how to cook spaghetti. Don't you remember?*
Kate: *I do! I used to have the same problem cooking spaghetti. The film that helped me to solve this problem was not Godfather but The Big Blue. Do you remember Jean Reno's mother cooking spaghetti for a whole lot of people in that film? After watching that, I knew the trick.*
Donna: *That's amazing.*
<u>*A film buff solved her spaghetti problem after watching each film.*</u> *See? We can learn lots of things from films.*

QAU1: There are two young professors on campus who are very popular with the female students because of their striking good looks: Professor Potter and Professor Bentham. It seems to be a trend for them to dress very well and ride a motorcycle to campus. Now, Molly and Pauline, who are not impressed by these members of staff, are discussing their classmates.

Molly: *The other day at the orientation, when the freshmen were meeting the faculty members, Lisa laughed after shaking hands with Potter.*
Pauline: *Why? Did meeting Potter make her laugh?*
Molly: *No. She was talking to Potter all right, but she burst out laughing because she saw some of Potter's fans looking very jealous while she was shaking hands with him.*

Pauline: *I see. Do you remember I told you almost the same story about Emily? After she shook hands with Bentham, I saw her burst out laughing.*

Molly: *How come? Did Bentham do something funny?*

Pauline: *No! It was her boyfriend in the crowd making faces.*

Molly: *A girl burst out laughing after meeting each professor. What a pity they weren't laughing at the supposed charms of those star members of staff.*

QAU2: Tim is talking to Ben about his girlfriend Mary, who recently lost her keys.

Tim: *Mary lost her house keys. She said she might have lost them when she dropped her handbag on the way back from Battersea Park, where she had lunch. So I went back with her to help her look for the missing keys. Fortunately, I managed to find out them on the pavement near the park entrance.*

Ben: *You guys were very lucky. What happened with Amy's keys is much worse.*

Tim: *What? Did she lose her keys, too?*

Ben: *Yes, she did. Amy also thought she might have lost her flat keys when she dropped her handbag after having lunch in the park. Unfortunately, it was Hyde Park, and she couldn't remember where she dropped her bag. Can you imagine how difficult it is to find lost keys there? We didn't find them, so she had to ask the landlord for new ones.*

Tim: *Ha-ha, a girl dropped her handbag after leaving each park! Our girlfriends are a bit clumsy, aren't they?*

QAU3: One day, while John was taking the train home from work, something unusual happened. As he was sitting there talking to his colleague Tom on his mobile phone, a famous actress got on the train and sat down right next to him. John looked at her and let out a yelp. It was quite embarrassing. Now Andy is explaining to John's secretary Sammy what really happened.

Andy: *I realize it must have seemed otherwise, but the real reason Jack let out a yelp like that had nothing to do with seeing the film star. He was excited because I had just told him that the Planning Commission had accepted his* *proposal.*

Sammy: *Oh. Too bad. I was hoping it was the actress. Who was she anyway?*

Andy: *Jessica Alba, I think.*

Sammy: *I see. But Ted and I saw an even more famous actress than Jessica on a train. Do you know Angelina Jolie?*

Andy: *Yes, of course. You guys must have been excited.*

Sammy: *No, neither of us likes her, really. But Angelina must have thought Ted was a fan because he looked at her and let out a yelp, just like John in your story. However, the person that caused his excitement was not her but you!*

Andy: *Me?*

Sammy: *Yeah, don't you remember that you had him on the phone and told him that his proposal had won a grant? That was exactly when Angelina sat down!*

Andy: *Wow, a man let out a yelp after seeing each film star, all because of my phone calls!*

QAU4: Tom and Fred are undergraduate students. These days they are very busy studying for an exam in theoretical physics, which they are in danger of failing. They also do a lot for the college newspaper. They write reviews of films and TV shows. Now Tom is talking to his girlfriend Naomi.

Tom: *I had a terrible time last night because I had to finish this assignment for my physics course but I also had to watch Live at the Apollo on TV so I could write a review of it for the paper. The physics problem was really giving me trouble. I just couldn't figure it out. Finally the solution came to me right after the last comedian, Jack Whitehall, walked off stage.*

Naomi: *Are you telling me a comedian helped you find the solution to a physics problem?*

Tom: *Of course not! I heard him well enough but I was thinking so hard about the physics problem that I didn't pay attention to what he was saying.*

Naomi: *I see. Did you know that something similar happened to Fred? He was struggling with that very same physics problem. He told me he discovered*

the solution just after John Bishop left the stage in that program he does. But of course John Bishop could never inspire you to solve a physics problem.
Tom: *Yeah, like me, he had to watch a comedy show to write a review for the paper. Funny, though:*
an editor solved that physics problem after watching each comedian. I must tell our physics teacher all about it.

QDN1: Bob and Patrick, who never laugh when they watch a comedy with Nancy, told her that people who easily laugh at comedies are stupid. Because Nancy always laughs, she was shocked by what they said. Now, Peter, who is a good friend of the two guys, is talking with Nancy about the all-night event showing two classic comedy films he went to with Bob and Patrick.

Peter: *Are you telling me that Bob and Patrick look down on people who laugh at comedies? But I saw them laughing during the all-night event showing the Apartment and Modern Times.*
Nancy: *Really? I can't believe that!*
Peter: *Well, first, when we were watching the Apartment, I saw Bob burst out laughing. It was because of that scene in which Jack Lemmon cooks pasta and uses a tennis racket as a colander.*
Nancy: *I see. How about Patrick? Did he laugh during that film as well?*
Peter: *No, but Modern Times had a scene that made him laugh out loud. It was the scene in which Charlie Chaplin sings Titine in Gibberish in a pub that did it.*
Nancy: *Oh, one of the guys burst out laughing during each comedy film. I think what makes them laugh is classical comedies, rather that the rom-coms I watched with them. I'll ask them along to Kind Hearts and Coronets next!*

QDN2: Nancy and Rose are colleagues in the navy. They work on the deck of an aircraft carrier. Their job is to warn the pilots that the chocks are still in place so that they don't taxi to the catapult for take-off. They have to hold up a yellow flag as long as the chocks are in place. Now, Nancy is explaining to her superior what happened yesterday when a jet fighter she was handling tried to taxi to the catapult before it was supposed to, a violation of protocol that could have cost lives as well as millions in damage.

Nancy: *I was still holding up the flag for flight 308 because he wasn't green for take-off. I was waiting for the go ahead from the control tower.*
Officer: *According to the pilot your flag went down, allowing initiation of the take-off procedure. Why did you put it down?*
Nancy: *I didn't! I mean, I didn't mean to, if I did. I was so startled by that Harrier landing right behind me on deck 40 that I lost my balance. As I fell, I may have dropped my flag. Maybe the pilot thought I was signalling.*
Officer: *Amazing. Before you came in, I talked to Rose. She got into the same trouble as you yesterday afternoon. A Harrier landing behind her on deck 15 made her lose her balance; as a result, she dropped her flag. I don't know what's wrong with you new recruits:*
a signalman dropped her flag during each Harrier landing. *It's back to basic training for the both of you!*

QDN3: Jane and Bianca are talking about Sally and Rachel, whose boyfriends play in the UCL rugby team.

Jane: *Last weekend, I went to a rugby match with Sally. To me, the game was really boring. I'm just not interested in rugby. But Sally was really excited. She even let out a yelp at one point.*
Bianca: *What got her so excited?*
Jane: *Well, her boyfriend Terry turned out to be the star player of the match, and he made this crucial pass.*
Bianca: *I see. That's more or less what happened when Rachel took me I to a rugby match on Wednesday. Her boyfriend Ken was the top scorer, so she was very excited. In fact, she let out a yelp when he scored in the final minute.*
Jane: *Oh, a girl let out a yelp during each rugby match. I think our friends have a taste for rugby.*

QDN4: Paul and Linda are computer science students. Lately they have been having a hard time with their studies. One of their instructors is a real slave-driver and each weekly assignment for his course has been harder than the previous one. Now Paul and Linda are talking about classmates of theirs who does not seem to find the assignments as difficult as they do.

Linda: *The last assignment really was a killer. Virtually everyone in the class had to ask Professor Miller for a hint on how to solve the third problem, but Mary and Ricky said they found it easy to solve. I don't get how they did it.*

Paul: *I know their secret: Mary takes an advanced course in software design, and in one of the sessions there was an elaborate discussion of exactly the kind of problem that Miller set us. So it was easy for her to work out the answer during that class.*

Linda: *Oh, that's unfair! How about Ricky? Does he take to the same advanced course?*

Paul: *No. He takes an advanced course, but a different one — in computational theory. But in one of the sessions a teaching assistant worked through a problem similar to Miller's on the whiteboard. So, he could then solve Miller's problem just like that.*

Linda: *So, <u>a student solved Miller's problem during each advanced class.</u> I wonder whether there are power point slides for those courses on the Department's website.*

QDU1: Neil went to watch two war films at the London Film Festival. He watched *Apocalypse Now* with Dick on Friday and watched *The Thin Red Line* with Emma on Sunday. Dick and Emma are academics who study the history of war. Now, Neil is talking about them with Vivian.

Neil: *The reason why I asked Dick and Emma to come along was because they teach history of war at university and always take war films very seriously.*

Vivian: *I don't know much about Emma, but Dick is such a serious guy. I'm sure he doesn't make a sound when he's watching.*

Neil: *Well — In fact, he burst out laughing when we were watching Apoca-*

lypse Now. What made him laugh was not the movie, but an old man sitting in front of us. He was sleeping and snoring, and a big bubble was hanging from his nose. Neil said later he found this hilarious.

Vivian: *I can't believe that such a trivial thing made him laugh!*

Neil: *Don't you know that academics often have a child-like sense of humour? Emma is as serious as Dick, but she was also laughing out loud when we were watching The Thin Red Line.*

Vivian: *But that's not a humorous film at all. What made her laugh?*

Neil: *The same snoring old man was sitting in front of us. Only this time, the big bubble hanging from his nose exploded. That made her laugh out loud.*

Vivian: *I see. <u>An academic burst out laughing during each war film.</u> Maybe they're not as obsessed by their work as they seem to be.*

QDU2: Charlie and Patricia are senior citizens who often go to the Royal Opera House to see operas. Now Patricia is talking with Charlie about an opera she recently saw with a friend.

Patricia: *I went to see Carmen with my friend Jenny. I loved it, although something happened during the performance. We had balcony seats and were having a glass of wine watching the opera. Suddenly, Jenny dropped her glass...*

Charlie: *What happened? Was the performance so boring that she fell asleep and dropped it?*

Patricia: *Oh, no. She dropped the glass because she saw a mouse run by her foot. We missed half the opera because we had to go down and apologize to the people we had drenched in wine.*

Charlie: *I'm sorry to hear that. But what happened to Jenny was nothing compared to what happened to Susan the other day. We were watching the second act of Don Giovanni, and suddenly Susan dropped her glass, too. But what made her drop her glass was not a mouse.*

Patricia: *No? So what was it?*

Charlie: *She saw a ghost behind one of those big chandeliers. She claimed that she saw the phantom of the opera! It was awful. She made such a fuss* *that we had to leave early.*

Patricia: *Oh, my goodness.* *A lady dropped her glass during each opera.* *I won't dare to book balcony seats again!*

QDU3: Last weekend, Danny, who is a zoologist, invited his colleagues Fanny and Colin to his flat to watch two wild-life documentaries together for a joint project. Now Danny is chatting with Anna about what happened.

Danny: *Last weekend, we watched two documentaries: Life and Penguin Island. It was a very funny evening. First, when we were watching Life, Fanny suddenly let out a yelp.*

Anna: *How come? Was there something in the documentary that startled her?*

Danny: *Oh no. My hamster had slipped out of its cage and jumped into her dress!*

Anna: *I see. Did you manage to catch it?*

Danny: *No, it hid under the sofa. Then, when we were watching Penguin Island, my hamster got out from under the couch and jumped into Colin's shirt! He let out a very strange yelp!*

Anna: *Oh, my goodness.*

A zoologist let out a yelp during each documentary. *If you want your project to succeed, you'd better get a new hamster cage.*

QDU4: Lucy and Susan are string-theoretical physicists. They love working on very abstract problems and spend most of their time doing exactly that, no matter where they are. Last weekend Lucy attended the wedding of her sister on Saturday, while Susan attended the wedding of her cousin on Sunday. Now Ed and Will, colleagues of Lucy and Susan, are talking about them.

Ed: *Hey, do you remember that interesting problem in multi-dimensional string dynamics that we discussed during the last reading group?*

Will: *Yes, I do. Susan told me that she had solved that problem during her cousin's wedding on Sunday. She can't have been a very attentive guest, as she doesn't remember anything about the wedding itself!*

Ed: *Really? I didn't know that. But I wanted to tell you something very similar. Lucy came up with a completely worked out solution to the problem during her sister's wedding on Saturday. I'm sue her sister must have noticed how distracted she was.*

Will: *Amazing! A physicist solved that problem during each wedding. Little chance of them catching the wedding bouquet, huh?*

QCN1: One day Ms Abbot, a dance teacher, took her students to a ballroom dance. There were 10 male students and 10 female students, so each student had a dance partner. Before the first waltz started, just as Ms Abbot had instructed, each male student gallantly kissed his partner's hand before escorting her to the dance floor. Now Ms Abbot is talking with Mrs Allen, the mother of one of her female students.

Abbot: *Last weekend, I took my students to a ball. I think they enjoyed themselves and I was pleased to see that they all performed the dance moves correctly, just as I had taught them.*

Allen: *When she came back from the ball, my daughter told me that a boy kissed each girl on the hand just before the 1st dance started. Is that a correct dance move too?*

Abbot: *Indeed it is.*

QCN2: In the hospital new patients are routinely examined by a nurse unless they come in with a very severe health problem or life-threatening injury. However, yesterday the nurses were on strike, so all new patients were examined by a doctor rather than a nurse regardless of the seriousness of their complaint. Now Dr Jones is complaining about this situation to an old friend who works in the hospital laboratory.

Doctor: *Man, I was so busy here yesterday. All the nurses were on strike so a doctor had to examine each patient, no matter how trivial the complaint.*

Lab tech: *I see. You lot had to do a little work for a change.*

Doctor: *Very funny. Maybe you'd like to switch places one day.*

QCN3: Last night, Vikki witnessed a robbery. Hearing a scream, she looked out of her front window and saw that two thieves were holding up the off licence directly across the street from her flat. She quickly went to her kitchen to call the police and then returned to the front window to watch. She couldn't see anything else, though. The next day, she learned that the robbers had both been arrested almost immediately. One had been caught right in the off licence by an off-duty police officer who happened to have been buying a bottle of scotch when the crime occurred. The other thief was tackled in an alley behind the off licence by a policewoman who had been on patrol down the road when the store owner screamed. Now Vikki is talking to her neighbour Polly about the recent excitement.

Polly: *I was surprised by the news that robbers had broken into the off licence across the street. It just isn't safe anywhere these days, is it?*
Vikki: *Well, the police did stop that crime rather fast. On the news this morning they said that <u>a cop caught each thief</u> shortly after a local resident called the police. It was me who called the police, by the way.*

QCN4: Jones Body Repair is famous for fixing damaged car bodies very quickly. On average the two mechanics who work there can each repair about one car an hour. However, after the big pile up on the M25 last weekend, these two mechanics broke their own record for fast work. Each one repaired 10 different cars in 5 hours. In other words, they both averaged about two cars an hour. Two other car mechanics, Jinx and CW, who work in at garage down the street, are discussing this amazing feat.

Jinx: *I heard that at Jones' the other day about 20 cars got fixed in only 5 hours.*
CW: *That's right. <u>A mechanic fixed each car in about 30 minutes.</u> So, in 5 hours, 20 cars.*

QCN5: Molly is a nurse at a psychiatric hospital specializing in the treatment of mental disorders characterized by expressions of extreme anger and uncontrollable rage. Last month the newly appointed director of this hospital instituted a new regulation regarding the proper procedure for dealing with patients having temper tantrums. According to this rule, whenever a patient gets so angry that he needs to be given a tranquilizer, the doctor who authorizes the use of such a drug must also actually be present when it is administered. Previously, a nurse would have done this without the doctor watching. As a result of this change in procedure, the doctors at the hospital are starting to feel over-worked. One of them, Dr Ton, is now complaining to his friend Molly, who works in the hospital as a lab technician.

Molly: *What do you think of the new director?*
Ton: *He's a slave driver. And he has no clue about how to allocate human resources effectively. According to his new rule,*
a consultant must be present when each patient having a tantrum is given a tranquilizer. *Do you know how often these patients go berserk? About three or four times a day, and that's on a quiet day. So, we doctors are running around all day doing the work that nurses should be doing.*
Molly: *I guess you know how the nurses feel now, don't you.*

QCN6: Mr Dixon is a retired football player with an expensive hobby: he loves vintage wine. In fact, he has gotten so accustomed to fine wine that he finds ordinary table wine revolting. For this reason, he usually avoids house parties where only cheap wine is served. Tonight, however, Mr Dixon has indeed gone to a house party because he heard that several celebrities would be present and that each one was going to be served a different, very expensive, vintage wine. Mr Dixon is hoping to get involved. Now he is talking to another guest at the party.

Dixon: *Why do you keep gazing at the waiters? Are you waiting for the vintage wine to be brought out or something?*
Guest: *Yes, I admit it. That's the only reason I'm here. I heard that a glass of vintage wine is going be served to each celebrity and I thought that I might get a glass or two myself.*
Dixon: *That's why I'm here too. Let's work together. You keep an eye on the*

kitchen and I'll watch the bar.

QCN7: Yesterday was "Children's Day" at the zoo. The most popular attraction was in the Simian House, where children were allowed to feed apples to the chimpanzees. In order to prevent the chimpanzees from being fed too many apples, only those children who had won a lottery were actually permitted to give apples to a chimp. There were five lottery winners, one for each of the five chimpanzees in the zoo. So, each chimpanzee got only one apple. Now Ms Bain, the zoo manager, is talking with Mrs Champ, who lives in the same building.

Champ: *I went to your zoo yesterday, but my daughter missed the event she had been looking forward to participating in.*
Bain: *Which event was that?*
Champ: *The most popular one, of course, the one in which*
<u>a child gave each chimpanzee an apple</u>. We got there too late for the lottery, you see.
Bain: *Well, we're doing it again next Saturday. Try to get there before 10 AM.*

QCN8: In Roger's hometown there is a dangerous stretch of road in the mountains called the "Rose Bush Hill". Over the years it has been the scene of several fatal car accidents, and, according to legend, every time there is a fatal accident a wild rose bush appears the following year in exactly the spot where the fatality occurred. Hence the name. Roger has never given any credence to this old wives' tale but, after a particularly heated argument on the topic with his grandfather, he decided to carry out a little investigation into the facts of the matter and settle the issue once and for all. Now he is talking with Mr Top, the town librarian.

Top: *How's the investigation going? Have you found the proof you were looking for that the stories about Rose Bush Hill are false?*
Roger: *According to my grandfather,*
<u>a rose bush will grow where each fatal crash occurs</u>, but after the accident in

1953 two rose bushes were found at the crash site. That shows the legend is false.

Top: *Not necessarily. There were two fatalities in that accident, a man and his wife.*

QCN9: The government finally agreed to bail out the airline that had filed for bankruptcy, but only on condition that each executive resign. Moreover, the executives in question were compelled to resign one by one in a public ceremony. Bearing a disturbing resemblance to a public execution, this ceremony was very emotional. In particular, the secretaries of the condemned executives made quite a scene. Angela and Leo are two news reporters who have just finished presenting the story about this event. Now they are discussing it off the air.

Angela: *Frankly, I found it a bit medieval the way they sadistically humiliated them like that.*

Leo: *I know what you mean. Everyone was sickened by it. And could you believe the way the secretaries behaved?*

Angela: *That's right.*

<u>*A secretary started to cry when each executive came forward to officially tender his or her resignation.*</u> *By the end of the ceremony almost all the secretaries were in tears.*

QCN10: Jude is an Interpol agent. His job is to monitor the activities of the Mafia in Northern Sicily. Last month he noted that several of the individuals that he keeps under surveillance suddenly went together on a trip to New York City. Jude secretly followed them and there observed a large purchase of firearms. Not only did they buy a large quantity of weapons but, curiously, they also bought a great variety of different kinds of firearms. In fact, for each type of handgun that can be legally purchased in New York, there was at least one member of the Mafia group who bought one. Now Jude is discussing his report with his boss.

Boss: *According to your report,*

a Mafioso went to NYC and bought each type of handgun available on the market there. Why do you suppose they wanted to have so many different types of guns?

Jude: *I'm not sure but my theory is that they are gun fanatics and each one wants to have one of everything, like a child in a sweet shop.*

Boss: *The ole "child-in-a-sweet-shop" hypothesis, is it?*

Jude: *Right.*

QCN11: In the last demonstration, some protesters vandalized a couple of bank offices. This was a bit of a shock for every bank manager in the city, but it was especially upsetting to Mr Ever, who oversees the management of all Lloyd's banks in London. Mr Ever has decided that the next time there is a big "occupy" event of this sort each branch of Lloyds in the path of the demonstration will have a guard standing at its front door. Now Mr Ever is talking with a bank teller of Lloyds who witnessed the mob violence at one of their branches.

Ever: *I hear that you were working at one of our branches that was attacked by the crowd. It must have been pretty scary?*

Teller: *A little. I myself didn't feel personally threatened but some of my co-workers were quite terrified, especially Mr Jones, the branch manager.*

Ever: *Well, you did a good job and you can be sure we won't let this kind of thing ever happen again. The next time there's a large scale demonstration an armed guard will be standing at front door of each of our branches.*

QCU1: Last month, Ms Collins, a journalist, interviewed people working in all the London offices of major politicians about corruption in politics. What she learned was that for each London politician, there was at least one secretary in their office who believed they were corrupt. Now Ms Collins is talking to her neighbour Dr Dash.

Dash: *Good afternoon, Ms Collins. Is it true that you are the journalist who wrote that article about the public's perception of corruption among politi-*

cians?

Collins: *That's right. What did you think of my story?*

Dash: *Great investigative reporting. To be honest, I was shocked to read that a secretary in his own office believes each politician is corrupt.*

QCU2: Dr Curzon is the founder and director of the Rose Water Clinic, a privately funded hospital in the outskirts of London. He only employs nurses who are optimistic and willing to make patients feel comfortable at all times. In addition, he limits the number of admissions so that at all times there are just as many nurses as patients. Consequently, each person who is admitted virtually has his or her own private nurse. Dr Curzon is now at a fund raising dinner. He is talking to the mayor of London, Mrs Alit.

Alit: *I didn't realize that you were the doctor who founded the Rose Water Clinic.*

Curzon: *Yes, it's a small hospital but we try to do our best.*

Alit: *Indeed you do. As I understand it, at your clinic a nurse makes sure each patient feels comfortable. But it's also very hard to be admitted, I hear. What about the people who you have to turn away? And how do you decide how to admit and who not to?*

QCU3: Dr Bonham, a marine biologist and biochemist, has invented a revolutionary new swimsuit that he claims will enable a swimmer to increase his or her swim speed by 35% in fresh water and by 45% in salt water. It's made from a special material that has the same properties as shark skin. The effectiveness of the new swimsuit was recently put to the test at a swimming gala in London. There were two long-distance swims, one for men and one for women, and in both the winner was wearing the new suit. Moreover, both winners finished a good 20 minutes ahead of their competitors, a clear demonstration of the dramatic increase in swim speed caused by the new suit. A reporter is now interviewing Dr Bonham, the inventor of the so-called "sharksuit".

Reporter: *Are you Dr Bonham, the marine biologist who invented the shark-*

suit?

Bonham: *Yes, I am. How did you know about my swimsuit?*

Reporter: *I saw with my own eyes just how effective it is. I was covering a swimming gala in London the other day. In both the men's and the women's 5 kilometre swims, a swimmer used a sharkskin suit to win each race.*

QCU4: Mr Card, a film critic, went to a social gathering with fellow film critics last weekend. There he and his colleagues discussed which new releases they thought would be flops. As it turned out, each of the film critics had a different idea about which new film would be the least popular. Each of the new releases was predicted to be a terrible financial disaster by one film critic or another, though no two critics agreed about which film was the worst. Now Mr Card is at a party. He is talking with Mr Eden, who is a film producer.

Card: *Nice to meet you, Mr Eden. I always enjoy meeting film producers. My name is Card. I'm a film critic.*

Eden: *Really. That's nice. You know, there's another film critic at this party. Jack Collins. Perhaps you know him.*

Card: *Sure. Jack and I are old friends.*

Eden: *Well, maybe you can shed some light on something he told me. He said you film critics had a meeting recently and that at that meeting one of you expected each new release to be a flop, though nobody could agree on which film that was. Is that true?*

QCU5: Last term Professor Lean, who teaches film history, divided his class into five groups. He selected five Hitchcock masterpieces — *Rear Window, Vertigo, The Birds, Psycho*, and *North by Northwest* — and showed each one to one of the groups. Then he asked each group to prepare a talk for the rest of the class on the camera tricks that Hitchcock used in each film. Now two other professors are discussing teaching methods in general and Dr Lean's teaching technique in particular.

Prof 1: *I'm teaching film history next term but I've never taught the course before. Do you have any good ideas?*

Prof 2: *Well, you might try Dr Lean's technique.*

Prof 1: *What's that?*

Prof 2: *He selects a set of well-known masterpieces from a certain director, for example a set of Hitchcock films. Then he divides the class into groups and shows a group each film. The groups have to prepare a talk to the rest of the class about the film they saw.*

QCU6: Andy's father owned a second-hand bookshop and when he died he left Andy all the books. This included a few 19th century French novels, written in French, which Andy wasn't at all interested in. Since these books also had little monetary value, he decided to give them away. He reckoned he might make a good impression on the girls in his French course if he gave the books to them. So, one day he came to class with the French books and gave one or two to each girl. Now he's talking to Mrs Black, a neighbour and the mother of one of the girls in Andy's French class.

Andy: *Thank you very much for your letter of condolence for my father, Mrs Black and thank you for coming to the funeral.*

Black: *Your father was a very dear friend and I will miss him terribly. And I'm also so sorry to hear that you are closing his second hand bookshop as well. It was one of the best in the city.*

Andy: *We aren't closing the bookshop. Where did you hear that?*

Black: *Well, my daughter, who is in your French class, says that you gave a girl in the class each French novel that was in the shop. I thought that meant you are closing the business.*

QCU7: Lady Beck's art gallery annually holds a ""painting market" in which artists can bring one of their paintings to the gallery and attempt to sell it directly to a customer without the gallery getting a cut. Mr Aap, a collector who boasts that he is able to beat down the price of any painting at any gallery, came to the gallery's painting market last week. He was seen haggling for a long time with one artist after another, and each time, when Aap finally left empty-handed, the artist in question went directly to Lady Beck and quietly whispered a complaint about Mr Aap's rude and aggressive behaviour. Mr Aap has now left and Lady Beck is talking about him with Professor Wawa, one of her regular customers.

Beck: *Yes, I have heard a lot of complaints about Mr Aap this evening, all whispered, mind you; nobody wanted Aap to overhear what they were saying about him. In fact, it seems to me that an artist whispered to me that Mr Aap haggled offensively about each and every painting in the gallery tonight. Not one of the artists had anything nice to say about him.*
Wawa: *So, what are you going to do? Tell Aap he cannot come here any more?*
Beck: *Of course not. These artists are such wimps; they should all stop whining.*

QCU8: Cynthia is a very attractive female undergraduate student at the psychology department. It was generally believed, however, that she was not the sharpest tool in the box and that her final mark for her degree would not be anything to brag about. It was a great surprise, then, when she ended up earning a first. According to the official record, this was clearly due to a dramatic improvement in her academic performance during the last year of her degree. However several of her fellow students, and a few professors as well, believed that she had exchanged sexual favours for higher marks than she deserved. Now Professor Duds and Professor Bran are discussing the latest malicious rumour about Cynthia.

Duds: *I have spoken with one of the students of each of the courses Cynthia took this year and each one is convinced that Cynthia seduced the professor teaching their course.*
Bran: *That's outrageous. A student thinks that Cynthia has given each of her professors sexual favours? How can people be so cruel? She has never been a student of mine but, having read her thesis, I can see she is a brilliant student.*

QCU9: The hospital where Jack works as a nurse is managed by an avaricious director, who directs his attention exclusively to rich patients. The nurses can't stand him. On the other hand, the nurses like the doctors well enough, since in general they are truly dedicated to their work and take good care of every patient regardless of their economic status. In fact, for each doctor there is at least one nurse who loves working with him, if not several. Now Jack is talking to a neighbour in the laundry room of their flat.

Fiona: *Your hospital has a good reputation, but people say that there are some issues with the director.*
Jack: *That's right. Most of us love the doctors but we can't stand the director. In fact, it's not just most of us; pretty much all of us feel this way.*
Fiona: *You mean that at your hospital a nurse loves each doctor but hates the director?*

QCU10: Last year the American actress Ann Bening gave excellent performances in three different films and consequently has been nominated for several different Oscars, including best actress. Moreover, for each Oscar that she's been nominated for, there has been one or another film critic who predicted she would win it. Now Ned and Eek, two fans of Ann's, are discussing her prospects of winning an Oscar.

Ned: *Obviously she is going to win at least one Oscar. A critic has predicted Ann would win each Oscar she was nominated for. None of them agree about which Oscar she would win but still that's a lot of support.*
Eek: *You're right. The question is not whether or not she will win an Oscar but rather how many she will win.*

A.2.4 Instruction

In this study we are going to ask you, a native speaker of British English, to judge how natural and native-speaker-like some English sentences are in a given context. Some of the sentences you will see should seem perfectly correct and normal in the given dialogue. They will look like the kind of thing that any native speaker might say. However, others may seem a bit weird, or incorrect in some way, or perhaps even so unnatural that they are hard to understand. That is, to one extent or another, they will not look like the kind of sentence that a native speaker of British English would use in the given dialogue. And you may also find that some sentences are not entirely correct, but nonetheless sound normal enough for a native speaker to use. In all cases the only thing that matters to us is how natural and native-speaker-like each sentence seems to you in the relevant context, not how grammatically correct it may or may not be according to someone who is fussy about "grammatical correctness" (such as an editor or an English teacher).

Please don't focus only on the target sentences, but read each context very carefully, so that you can judge how natural the sentence is in the context that is given. Sometimes a sentence may be grammatical but a meaning of the sentence does not fit the context. In that case, the sentence should be judged as unnatural.

To help you evaluate the sentences in the way we would like you to it may help to think of the test as a kind of find-the-spy-game'. Imagine that you are an MI6 operative, a colleague of James Bond, and your task is to examine a set of transcribed tape recordings of conversations. In each recording, one of the speakers is suspected of being a foreign spy while the others are ordinary British English native speakers. The spies are definitely not British English native speakers, but their English is extremely good, good enough to fool most people into thinking they are. Unless you carefully study what they say, you can easily be tricked. If you listened to them speaking, for example, you would hear nothing foreign about their accent. However, when it comes to putting words together into sentences they sometimes slip up and say things that a true native speaker would most likely never say, or use a sentence whose meaning does not fit the context.

Your mission, then, is to study 45 transcribed tape recordings of conversations, each of which follows a short background story, and to determine how natural their use of English is in a given dialogue. A picture is also given to clarify the context and intended meaning of the underlined sentence. After reading each dialogue, you will be asked to answer a question: How natural (native-speaker like) is the underlined sentence?

To answer the question, you can use a scale of 1 to 5, where 1 was "not at all native speaker like / perfectly unnatural" and 5 was "completely native speaker like / perfectly natural". Please circle the appropriate number on the right side of each question to answer it.

Remember:

- Please make sure that you read carefully all parts of the scenario and the dialogue before you answer each question.
- We expect you to spend about 45 minutes to complete one questionnaire. Please take your time to complete it. We don't accept your answers if you finish the questionnaire too fast (i.e. less than 30 minutes).
- Please don't communicate with the other participants during the experiment or after the experiment and don't talk about the content of the questionnaire with other subjects.

Thank you very much for your help.

A.2.5 Question & answer sheet for an acceptability judgement task

How natural is the underlined sentence? 1 – 2 – 3 – 4 – 5

A.2.6 Pictures

(a) QPN1

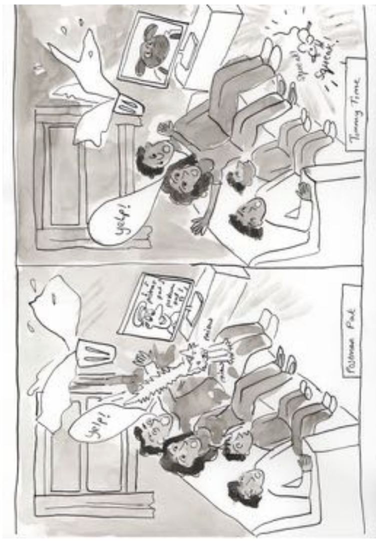
(b) QPN2

(c) QPN3

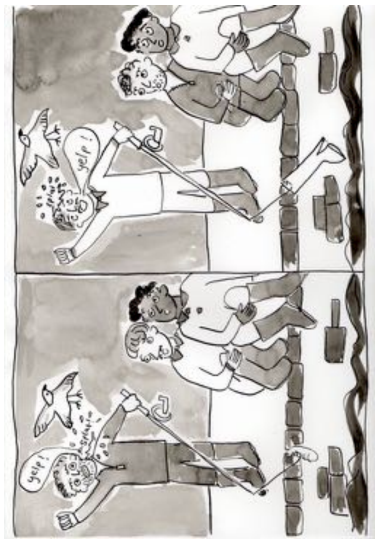
(d) QPN4

Figure A.14: Pictures: QPN items

(a) QPU1



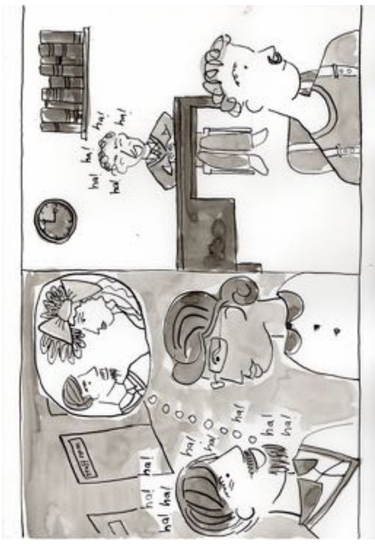
(b) QPU2



(c) QPU3

(d) QPU4

Figure A.15: Pictures: QPU items



(a) QAN1

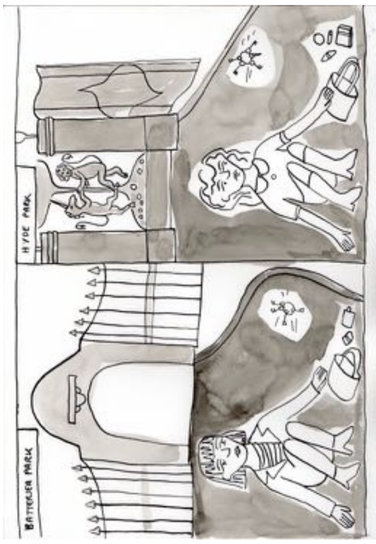
(b) QAN2

(c) QAN3

(d) QAN4

Figure A.16: Pictures: QAN items

(a) QAU1

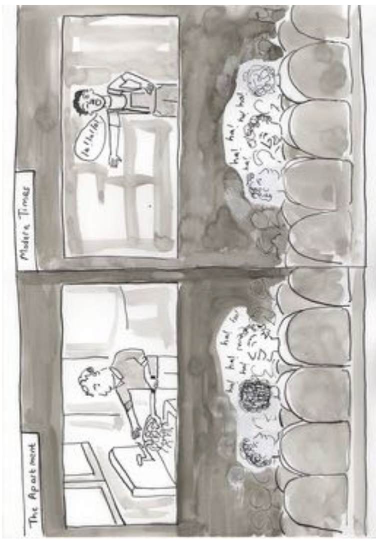


(b) QAU2

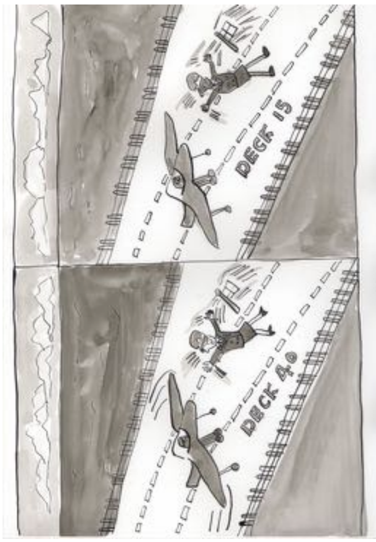
(c) QAU3

(d) QAU4

Figure A.17: Pictures: QAU items

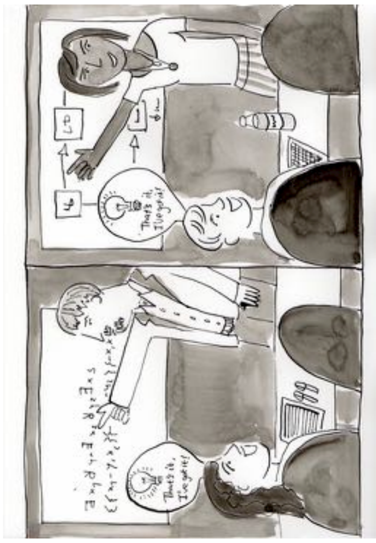


(a) QDN1



(b) QDN2

(c) QDN3



(d) QDN4

Figure A.18: Pictures: QDN items

(a) QDU1

(b) QDU2

(c) QDU3

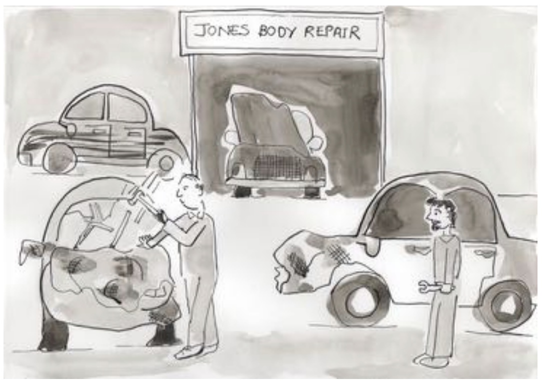
(d) QDU4

Figure A.19: Pictures: QDU items

(a) QCN1

(b) QCN2

(c) QCN3

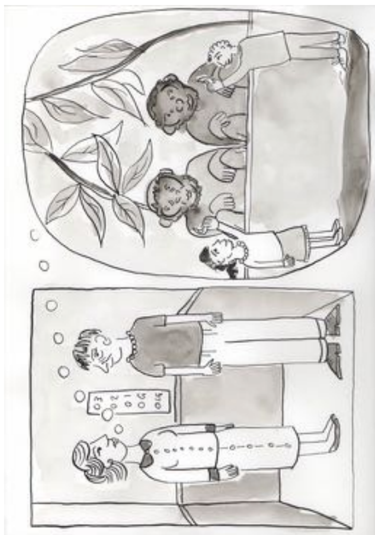


(d) QCN4

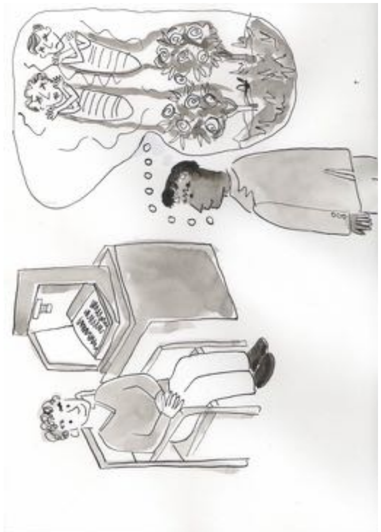
Figure A.20: Pictures: QCN items (1-4)

(a) QCN5

(b) QCN6



(c) QCN7



(d) QCN8

Figure A.21: Pictures: QCN items (5-8)

(a) QCN9

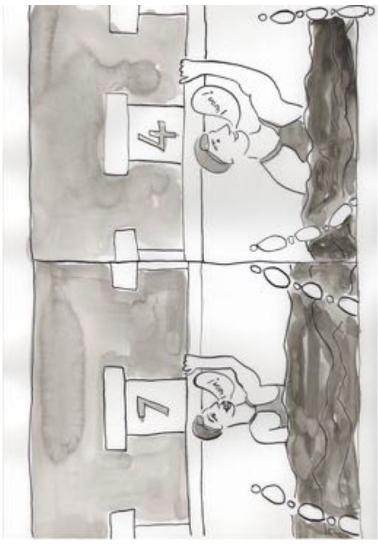
(b) QCN10

(c) QCN11

Figure A.22: Pictures: QCN items (9-11)

(a) QCU1

(b) QCU2

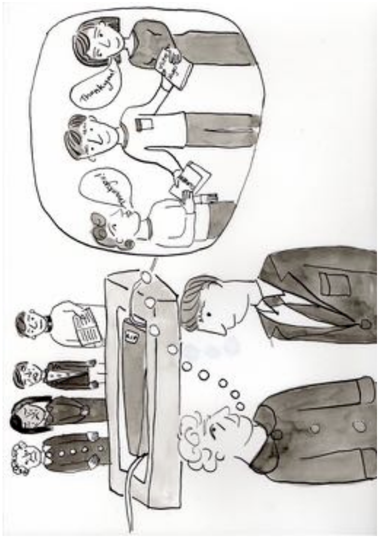


(c) QCU3

(d) QCU4

Figure A.23: Pictures: QCU items (1-4)

(a) QCU5



(b) QCU6

(c) QCU7

Figure A.24: Pictures: QCU items (5-7)

(a) QCU8

(b) QCU9

(c) QCU10

Figure A.25: Pictures: QCU items (8-10)

A.3 Statistic tests

A.3.1 *Wh*-movement test

Report

	WPN1	WPN2	WPN3	WPN4	WPU1	WPU2	WPU3	WPU4	WAN1	WAN2	WAN3	WAN4	WAU1	WAU2	WAU3	WAU4	WDN1	WDN2	WDN3	WDN4	WDU1	WDU2	WDU3	WDU4
Mean	3.66	3.26	2.79	3.21	3.36	3.21	2.61	3.09	3.28	2.98	3.13	3.04	2.94	2.70	3.15	2.41	3.24	3.60	3.51	2.98	3.28	3.41	3.08	3.20
N	79	80	80	80	80	80	80	80	80	80	80	80	80	80	79	80	80	80	80	80	80	80	80	80
Std. Deviation	1.175	1.177	1.229	1.177	1.275	1.240	1.288	1.265	1.067	1.222	1.236	1.277	1.236	1.287	1.262	1.155	1.225	1.186	1.169	1.232	1.292	1.198	1.320	1.277
Std. Error of Mean	.132	.132	.137	.132	.143	.139	.144	.141	.119	.137	.138	.143	.138	.144	.142	.129	.137	.133	.131	.138	.144	.134	.148	.143

Table A.1: The mean acceptability of each individual test item

Report

	WCN1	WCN2	WCN3	WCN4	WCN5	WCN6	WCN7	WCN8	WCN9	WCN10	WCN11	WCN12	WCN13	WCU1	WCU2	WCU3	WCU4	WCU5	WCU6	WCU7	WCU8	WCU9
Mean	4.74	4.53	4.88	4.61	4.61	4.84	4.84	3.79	2.24	2.89	4.46	2.35	4.65	1.84	2.26	2.95	1.28	1.56	1.31	2.26	3.30	2.54
N	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Std. Deviation	.689	.779	.432	.849	.849	.625	.561	1.110	1.553	1.423	.980	1.045	.618	1.206	1.394	1.349	.693	.966	.805	1.280	1.316	1.252
Std. Error of Mean	.077	.087	.048	.095	.095	.070	.063	.124	.174	.159	.110	.117	.069	.135	.156	.151	.077	.108	.090	.143	.147	.140

Table A.2: The mean acceptability of each individual control item

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	1879.664	12444.349	.000
adjunct	2	1247.348	11.974	.000
causality	1	1879.664	10.904	.001
adjunct * causality	2	1247.348	1.234	.291
verb	3	888.292	6.174	.000
adjunct * verb	6	594.547	6.524	.000
causality * verb	3	888.292	.017	.997
adjunct * causality * verb	6	594.547	2.129	.048

a. Dependent Variable: acceptability.

Table A.3: F-test of repeated measure LMM with *Causality, Adjunct Type*, and *Matrix Verbal Predicate* as factors

Estimates[a]

adjunct	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
WP	3.150	.049	628.679	3.055	3.245
WA	2.952	.048	623.352	2.857	3.047
WD	3.286	.049	627.803	3.190	3.382

a. Dependent Variable: acceptability.

Pairwise Comparisons[a]

(I) adjunct	(J) adjunct	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c] Lower Bound	95% Confidence Interval for Difference[c] Upper Bound
WP	WA	.198*	.068	1252.027	.012	.034	.362
	WD	-.136	.069	1256.380	.147	-.301	.029
WA	WP	-.198*	.068	1252.027	.012	-.362	-.034
	WD	-.334*	.069	1251.008	.000	-.499	-.169
WD	WP	.136	.069	1256.380	.147	-.029	.301
	WA	.334*	.069	1251.008	.000	.169	.499

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
2	1254.677	11.974	.000

The F tests the effect of adjunct. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: acceptability.

Table A.4: Estimated marginal means and pairwise comparisons of test conditions by *Adjunct Type* (P: Bare Participial Gerund; A: *After*-Prepositional Gerund; D: *During*-PP)

Estimates[a]

causality	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
WU	3.037	.041	942.655	2.957	3.116
WN	3.222	.039	941.507	3.146	3.298

a. Dependent Variable: acceptability.

Pairwise Comparisons[a]

(I) causality	(J) causality	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c] Lower Bound	95% Confidence Interval for Difference[c] Upper Bound
WU	WN	-.185*	.056	1879.664	.001	-.295	-.075
WN	WU	.185*	.056	1879.664	.001	.075	.295

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	1879.664	10.904	.001

The F tests the effect of causality. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: acceptability.

Table A.5: Estimated marginal means and pairwise comparisons of test conditions by *Causality* (N: with causal construal; U: without causal construal)

Estimates[a]

adjunct	causality	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
WP	U	3.069	.071	315.755	2.929	3.208
	N	3.231	.066	315.469	3.101	3.362
WA	U	2.800	.069	312.860	2.664	2.937
	N	3.103	.067	310.888	2.971	3.235
WD	U	3.241	.071	314.458	3.101	3.381
	N	3.331	.067	315.404	3.199	3.464

a. Dependent Variable: acceptability.

Pairwise Comparisons[a]

adjunct	(I) causality	(J) causality	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c] Lower Bound	95% Confidence Interval for Difference[c] Upper Bound
WP	U	N	-.163	.097	628.679	.095	-.353	.028
	N	U	.163	.097	628.679	.095	-.028	.353
WA	U	N	-.303*	.097	623.352	.002	-.492	-.113
	N	U	.303*	.097	623.352	.002	.113	.492
WD	U	N	-.091	.098	627.803	.355	-.283	.102
	N	U	.091	.098	627.803	.355	-.102	.283

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

adjunct	Numerator df	Denominator df	F	Sig.
WP	1	628.679	2.801	.095
WA	1	623.352	9.835	.002
WD	1	627.803	.857	.355

Each F tests the simple effects of causality within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: acceptability.

Table A.6: Estimated marginal means and pairwise comparisons of *Adjunct Type* conditions by *Causality* (Adjunct Type * Causality) (for Figure 4.5)

Paired Samples Test

		Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t
					Lower	Upper	
Pair 1	WPN - WPU	.15521	.73092	.08172	-.00745	.31787	1.899
Pair 2	WAN - WAU	.30521	.64685	.07232	.16126	.44916	4.220
Pair 3	WDN - WDU	.09063	.55581	.06214	-.03307	.21432	1.458
Pair 4	No violation - WD	.82272	1.03361	.11556	.59270	1.05274	7.119
Pair 5	WD - WP	.13884	.73023	.08164	-.02367	.30134	1.701
Pair 6	WP - WA	.19531	.67451	.07541	.04521	.34542	2.590
Pair 7	WA - Wcontrol*	.80734	.96602	.10800	.59236	1.02232	7.475
Pair 8	WAU - Wcontrol*	.65347	.97035	.10849	.43753	.86941	6.023
Pair 9	WP - WAN	.04397	.83852	.09375	-.14263	.23058	.469

Paired Samples Test

		df	Sig. (2-tailed)
Pair 1	WPN - WPU	79	.061
Pair 2	WAN - WAU	79	.000
Pair 3	WDN - WDU	79	.149
Pair 4	No violation - WD	79	.000
Pair 5	WD - WP	79	.093
Pair 6	WP - WA	79	.011
Pair 7	WA - Wcontrol*	79	.000
Pair 8	WAU - Wcontrol*	79	.000
Pair 9	WP - WAN	79	.640

Table A.7: Two-tailed dependent T-test on both the test and control conditions (for Figure 4.6 and 4.7). Bonferroni adjusted level of significance: $p < 0.0055$ (0.05 / 9)

A.3.2 QR test

Report

	QPN1	QPN2	QPN3	QPN4	QPU1	QPU2	QPU3	QPU4	QAN1	QAN2	QAN3	QAN4	QAU1	QAU2	QAU3	QAU4	QDN1	QDN2	QDN3	QDN4	QDU1	QDU2	QDU3	QDU4
Mean	2.58	2.46	2.43	2.65	2.48	2.51	2.44	2.03	3.01	2.51	2.86	2.89	3.00	2.56	2.86	2.61	3.41	3.24	2.94	2.84	3.44	3.29	3.10	2.76
N	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	79	80
Std. Deviation	1.271	1.158	1.178	1.213	1.147	1.253	1.077	.968	1.258	1.273	1.230	1.359	1.201	1.281	1.209	1.345	1.280	1.225	1.194	1.326	1.112	1.255	1.326	1.343
Std. Error of Mean	.142	.129	.132	.136	.128	.140	.120	.108	.141	.142	.138	.152	.134	.143	.135	.150	.143	.137	.134	.148	.124	.140	.149	.150

Table A.8: The mean acceptability of each individual test item

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	QCN1	QCN2	QCN3	QCN4	QCN5	QCN6	QCN7	QCN8	QCN9	QCN10	QCN11	QCU1	QCU2	QCU3	QCU4	QCU5	QCU6	QCU7	QCU8	QCU9	QCU10
Mean	3.60	4.70	3.80	3.96	4.56	4.56	3.39	4.60	3.61	3.62	3.31	2.69	4.05	3.55	3.39	2.71	2.09	3.63	3.56	2.29	3.47
N	80	80	80	80	80	80	80	80	80	79	80	80	80	80	80	79	80	80	80	80	79
Std. Deviation	1.346	.644	1.326	1.247	.898	.898	1.382	.756	1.175	1.390	1.643	1.374	1.066	1.242	1.454	1.602	1.203	1.381	1.311	1.324	1.279
Std. Error of Mean	.151	.072	.148	.139	.100	.100	.155	.085	.131	.156	.184	.154	.119	.139	.163	.180	.135	.154	.147	.148	.144

Table A.9: The mean acceptability of each individual control item

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	1857.128	9824.678	.000
adjunct	2	1230.777	50.685	.000
verb	3	867.147	6.849	.000
causality	1	1857.128	1.190	.275
adjunct * verb	6	582.788	2.782	.011
adjunct * causality	2	1230.777	1.166	.312
verb * causality	3	867.147	2.477	.060
adjunct * verb * causality	6	582.788	.438	.853

a. Dependent Variable: acceptability.

Table A.10: F-test of repeated measure LMM with *Causality, Adjunct Type*, and *Matrix Verbal Predicate* as factors

Estimates[a]

adjunct	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
QP	2.445	.046	617.477	2.355	2.535
QA	2.789	.050	627.261	2.690	2.888
QD	3.127	.050	622.352	3.029	3.225

a. Dependent Variable: acceptability.

Pairwise Comparisons[a]

(I) adjunct	(J) adjunct	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c] Lower Bound	95% Confidence Interval for Difference[c] Upper Bound
QP	QA	-.344*	.068	1236.476	.000	-.507	-.181
	QD	-.681*	.068	1232.355	.000	-.844	-.519
QA	QP	.344*	.068	1236.476	.000	.181	.507
	QD	-.338*	.071	1249.594	.000	-.507	-.168
QD	QP	.681*	.068	1232.355	.000	.519	.844
	QA	.338*	.071	1249.594	.000	.168	.507

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
2	1291.277	50.685	.000

The F tests the effect of adjunct. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: acceptability.

Table A.11: Estimated marginal means and pairwise comparisons of test conditions by *Adjunct Type* (P: Bare Participial Gerund; A: *After*-Prepositional Gerund; D: *During*-PP)

Estimates[a]

causality	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
QU	2.756	.039	917.415	2.679	2.833
QN	2.818	.040	940.089	2.739	2.897

a. Dependent Variable: acceptability.

Pairwise Comparisons[a]

(I) causality	(J) causality	Mean Difference (I-J)	Std. Error	df	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
QU	QN	-.061	.056	1857.128	.275	-.172	.049
QN	QU	.061	.056	1857.128	.275	-.049	.172

Based on estimated marginal means

a. Dependent Variable: acceptability.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	1857.128	1.190	.275

The F tests the effect of causality. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: acceptability.

Table A.12: Estimated marginal means and pairwise comparisons of test conditions by *Causality* (N: with causal construal; U: without causal construal)

Estimates[a]

adjunct	causality	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
QP	U	2.363	.062	305.520	2.240	2.485
	N	2.528	.067	314.381	2.396	2.661
QA	U	2.759	.070	313.238	2.621	2.898
	N	2.819	.072	314.155	2.678	2.960
QD	U	3.147	.071	308.528	3.008	3.286
	N	3.106	.070	313.956	2.968	3.245

a. Dependent Variable: acceptability.

Pairwise Comparisons[a]

adjunct	(I) causality	(J) causality	Mean Difference (I-J)	Std. Error	df	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	95% Confidence Interval for Difference[b] Upper Bound
QP	U	N	-.166	.092	617.477	.072	-.346	.015
	N	U	.166	.092	617.477	.072	-.015	.346
QA	U	N	-.059	.100	627.261	.555	-.257	.138
	N	U	.059	.100	627.261	.555	-.138	.257
QD	U	N	.041	.100	622.352	.681	-.155	.237
	N	U	-.041	.100	622.352	.681	-.237	.155

Based on estimated marginal means

a. Dependent Variable: acceptability.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

adjunct	Numerator df	Denominator df	F	Sig.
QP	1	617.477	3.253	.072
QA	1	627.261	.349	.555
QD	1	622.352	.169	.681

Each F tests the simple effects of causality within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: acceptability.

Table A.13: Estimated marginal means and pairwise comparisons of *Adjunct Type* conditions by *Causality* (Adjunct Type * Causality)(for Figure 4.8)

Paired Samples Test

		Paired Differences					
					95% Confidence Interval of the Difference		
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t
Pair 1	No violation - long QR	.51371	.74918	.08376	.34699	.68043	6.133
Pair 2	long QR - QD	.33472	1.22726	.13721	.06160	.60783	2.439
Pair 3	No violation - QD	.84843	.97321	.10881	.63185	1.06501	7.797
Pair 4	QD - QA	.33705	.56482	.06315	.21136	.46275	5.337
Pair 5	QA - QP	.34375	.57144	.06389	.21658	.47092	5.380
Pair 6	QP - Q Control*	.08906	1.21409	.13574	-.18112	.35924	.656
Pair 7	QAN - QAU	.05938	.65512	.07324	-.08641	.20516	.811
Pair 8	QDN - QDU	-.03750	.77347	.08648	-.20963	.13463	-.434
Pair 9	QPN - QPU	.16563	.55396	.06193	.04235	.28890	2.674
Pair 10	QAU - QP	.31406	.62988	.07042	.17389	.45424	4.460
Pair 11	QAU - QPN	.23125	.69215	.07738	.07722	.38528	2.988
Pair 12	QPN - Q Control*	.17188	1.27602	.14266	-.11209	.45584	1.205
Pair 13	QD - QAN	.30737	.68349	.07642	.15526	.45947	4.022

Paired Samples Test

		df	Sig. (2-tailed)
Pair 1	No violation - long QR	79	.000
Pair 2	long QR - QD	79	.017
Pair 3	No violation - QD	79	.000
Pair 4	QD - QA	79	.000
Pair 5	QA - QP	79	.000
Pair 6	QP - Q Control*	79	.514
Pair 7	QAN - QAU	79	.420
Pair 8	QDN - QDU	79	.666
Pair 9	QPN - QPU	79	.009
Pair 10	QAU - QP	79	.000
Pair 11	QAU - QPN	79	.004
Pair 12	QPN - Q Control*	79	.232
Pair 13	QD - QAN	79	.000

Table A.14: Two-tailed dependent T-test on the test and control conditions (for Figure 4.9 and 4.10). Bonferroni adjusted level of significance: $p < 0.0038$ (0.05 / 13)

A.3.3 Overall result

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	3736.528	22188.580	.000
sentence_type	1	3736.528	74.238	.000
adjunct	2	2471.986	39.918	.000
verb	3	1759.299	12.300	.000
causality	1	3736.528	9.638	.002
sentence_type * adjunct	2	2471.986	21.427	.000
sentence_type * verb	3	1759.299	.756	.519
sentence_type * causality	1	3736.528	2.433	.119
adjunct * verb	6	1161.694	5.613	.000
adjunct * causality	2	2471.986	1.522	.219
verb * causality	3	1759.299	1.196	.310
sentence_type * adjunct * verb	6	1161.694	4.056	.000
sentence_type * adjunct * causality	2	2471.986	.819	.441
sentence_type * verb * causality	3	1759.299	1.339	.260
adjunct * verb * causality	6	1161.694	1.286	.261
sentence_type * adjunct * verb * causality	6	1161.694	1.203	.302

a. Dependent Variable: acceptability.

Table A.15: F-test of repeated measure LMM with *Causality, Adjunct Type, and Matrix Verbal Predicate*, and *Sentence Type* as factors on the overall result.

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	Q-control: no violation	long QR	Q Control*	W-control: no violation	W control*
Mean	3.9745	3.4608	2.3563	4.1087	2.1444
N	80	80	80	80	80
Std. Deviation	.51842	.78161	1.00202	.34568	.57895
Std. Error of Mean	.05796	.08739	.11203	.03865	.06473

Table A.16: Descriptive statistics of the control conditions (both Q- and W-controls)

A.3.4 *Matrix Verbal Predicate*

This subsection shows some data related to the sub-factor manipulated in the main experiment: *Matrix Verbal Predicate*. In the main experiment, we pre-controlled the Agentivity effect of Truswell's (2007; 2011) Single Event Grouping Condition by only making use of the four types of non-agentive verbs for matrix verbal predicates, in order to prevent this effect from interfering with our measurement of *Causality* (for the details of this factor, see Footnote 4, 5, and 9 in Chapter 4).

I did not discuss *Matrix Verbal Predicate* in the thesis since it did not exhibit any relevant result for the core of our discussion, but the readers who are interested in this factor are referred to the following outcome of the statistic tests.

Estimates[a]

verb	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
burst_out_laughing	3.292	.055	467.185	3.183	3.400
drop_DP	3.194	.056	472.212	3.084	3.303
let_out_a_yelp	3.044	.057	470.229	2.932	3.156
solve_DP	2.988	.056	471.138	2.877	3.098

a. Dependent Variable: acceptability.

Pairwise Comparisons[a]

(I) verb	(J) verb	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence ...[c] Lower Bound
burst_out_laughing	drop_DP	.098	.078	939.397	1.000	-.110
	let_out_a_yelp	.248*	.080	936.623	.012	.037
	solve_DP	.304*	.079	938.212	.001	.096
drop_DP	burst_out_laughing	-.098	.078	939.397	1.000	-.305
	let_out_a_yelp	.150	.080	941.616	.366	-.061
	solve_DP	.206	.079	943.228	.056	-.003
let_out_a_yelp	burst_out_laughing	-.248*	.080	936.623	.012	-.458
	drop_DP	-.150	.080	941.616	.366	-.361
	solve_DP	.057	.080	941.055	1.000	-.155
solve_DP	burst_out_laughing	-.304*	.079	938.212	.001	-.513
	drop_DP	-.206	.079	943.228	.056	-.415
	let_out_a_yelp	-.057	.080	941.055	1.000	-.269

Pairwise Comparisons[a]

(I) verb	(J) verb	95% Confidence ...[c] Upper Bound
burst_out_laughing	drop_DP	.305
	let_out_a_yelp	.458
	solve_DP	.513
drop_DP	burst_out_laughing	.110
	let_out_a_yelp	.361
	solve_DP	.415
let_out_a_yelp	burst_out_laughing	-.037
	drop_DP	.061
	solve_DP	.269
solve_DP	burst_out_laughing	-.096
	drop_DP	.003
	let_out_a_yelp	.155

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Table A.17: Estimated marginal means and pairwise comparisons of test conditions by Matrix Verbal Predicate (WH test)

Estimates[a]

verb	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
burst_out_laughing	2.985	.055	468.926	2.877	3.094
drop_DP	2.763	.057	472.003	2.651	2.874
let_out_a_yelp	2.771	.055	465.118	2.663	2.879
solve_DP	2.629	.058	455.442	2.516	2.743

a. Dependent Variable: acceptability.

Pairwise Comparisons[a]

(I) verb	(J) verb	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence ... Lower Bound
burst_out_laughing	drop_DP	.223*	.079	940.563	.030	.013
	let_out_a_yelp	.214*	.078	934.041	.037	.008
	solve_DP	.356*	.080	921.294	.000	.145
drop_DP	burst_out_laughing	-.223*	.079	940.563	.030	-.432
	let_out_a_yelp	-.009	.079	936.692	1.000	-.217
	solve_DP	.133	.081	926.105	.599	-.081
let_out_a_yelp	burst_out_laughing	-.214*	.078	934.041	.037	-.421
	drop_DP	.009	.079	936.692	1.000	-.200
	solve_DP	.142	.080	917.323	.455	-.069
solve_DP	burst_out_laughing	-.356*	.080	921.294	.000	-.568
	drop_DP	-.133	.081	926.105	.599	-.347
	let_out_a_yelp	-.142	.080	917.323	.455	-.353

Pairwise Comparisons[a]

(I) verb	(J) verb	95% Confidence ... Upper Bound
burst_out_laughing	drop_DP	.432
	let_out_a_yelp	.421
	solve_DP	.568
drop_DP	burst_out_laughing	-.013
	let_out_a_yelp	.200
	solve_DP	.347
let_out_a_yelp	burst_out_laughing	-.008
	drop_DP	.217
	solve_DP	.353
solve_DP	burst_out_laughing	-.145
	drop_DP	.081
	let_out_a_yelp	.069

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Table A.18: Estimated marginal means and pairwise comparisons of test conditions by Matrix Verbal Predicate (QR test)

Estimates[a]

adjunct	verb	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
WP	V1	3.513	.097	156.809	3.322	3.703
	V2	3.238	.096	157.581	3.049	3.426
	V3	2.700	.100	157.662	2.503	2.897
	V4	3.150	.097	157.183	2.959	3.341
WA	V1	3.106	.091	154.706	2.926	3.287
	V2	2.838	.099	157.579	2.642	3.033
	V3	3.138	.099	156.829	2.943	3.334
	V4	2.725	.096	156.426	2.535	2.915
WD	V1	3.256	.100	157.545	3.060	3.453
	V2	3.506	.094	157.985	3.320	3.692
	V3	3.294	.099	155.742	3.099	3.488
	V4	3.088	.099	157.800	2.892	3.283

a. Dependent Variable: acceptability.

Estimates[a]

adjunct	verb	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
QP	V1	2.525	.096	156.375	2.336	2.714
	V2	2.488	.095	157.026	2.299	2.676
	V3	2.431	.089	156.765	2.255	2.607
	V4	2.338	.087	150.567	2.166	2.509
QA	V1	3.006	.097	157.667	2.814	3.198
	V2	2.538	.101	157.993	2.338	2.737
	V3	2.863	.096	157.954	2.672	3.053
	V4	2.750	.107	157.983	2.539	2.961
QD	V1	3.425	.095	154.980	3.238	3.612
	V2	3.263	.098	157.907	3.069	3.456
	V3	3.019	.100	154.882	2.822	3.217
	V4	2.800	.106	157.974	2.592	3.008

a. Dependent Variable: acceptability.

Table A.19: Estimated marginal means of *Adjunct Type* conditions by *Matrix Verbal Predicate*: V1 = *burst out laughing*, V2 = *drop* DP, V3 = *let out a yelp*, and V4 = *solve* DP

Pairwise Comparisons[a]

adjunct	(I) verb	(J) verb	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c] Lower Bound	Upper Bound
WP	V1	V2	.275	.136	314.327	.264	-.086	.636
		V3	.813*	.139	314.257	.000	.444	1.181
		V4	.363	.137	313.990	.050	.000	.725
	V2	V1	-.275	.136	314.327	.264	-.636	.086
		V3	.538*	.138	314.733	.001	.171	.904
		V4	.088	.136	314.721	1.000	-.273	.448
	V3	V1	-.813*	.139	314.257	.000	-1.181	-.444
		V2	-.538*	.138	314.733	.001	-.904	-.171
		V4	-.450*	.139	314.589	.008	-.818	-.082
	V4	V1	-.363	.137	313.990	.050	-.725	.000
		V2	-.088	.136	314.721	1.000	-.448	.273
		V3	.450*	.139	314.589	.008	.082	.818
WA	V1	V2	.269	.135	310.595	.282	-.089	.627
		V3	-.032	.135	309.798	1.000	-.390	.325
		V4	.381*	.133	310.428	.026	.029	.734
	V2	V1	-.269	.135	310.595	.282	-.627	.089
		V3	-.301	.140	314.408	.196	-.673	.071
		V4	.113	.138	313.789	1.000	-.255	.480
	V3	V1	.032	.135	309.798	1.000	-.325	.390
		V2	.301	.140	314.408	.196	-.071	.673
		V4	.413*	.138	313.020	.018	.047	.780
	V4	V1	-.381*	.133	310.428	.026	-.734	-.029
		V2	-.113	.138	313.789	1.000	-.480	.255
		V3	-.413*	.138	313.020	.018	-.780	-.047
WD	V1	V2	-.250	.137	314.550	.415	-.614	.114
		V3	-.038	.140	313.282	1.000	-.409	.334
		V4	.169	.141	315.339	1.000	-.204	.542
	V2	V1	.250	.137	314.550	.415	-.114	.614
		V3	.213	.136	312.891	.721	-.150	.575
		V4	.419*	.137	314.946	.014	.055	.782
	V3	V1	.038	.140	313.282	1.000	-.334	.409
		V2	-.213	.136	312.891	.721	-.575	.150
		V4	.206	.140	313.543	.847	-.165	.578
	V4	V1	-.169	.141	315.339	1.000	-.542	.204
		V2	-.419*	.137	314.946	.014	-.782	-.055
		V3	-.206	.140	313.543	.847	-.578	.165

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

adjunct	Numerator df	Denominator df	F	Sig.
WP	3	297.904	11.773	.000
WA	3	303.530	4.429	.005
WD	3	297.751	3.182	.024

Each F tests the simple effects of verb within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: acceptability.

Table A.20: Pairwise comparisons of *Adjunct Type* conditions by *Matrix Verbal Predicate* (WH test): V1 = *burst out laughing*, V2 = *drop* DP, V3 = *let out a yelp*, and V4 = *solve* DP

Pairwise Comparisons[a]

adjunct	(I) verb	(J) verb	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c] Lower Bound	Upper Bound
QP	V1	V2	.038	.135	313.392	1.000	-.321	.396
		V3	.094	.131	311.561	1.000	-.254	.441
		V4	.188	.129	305.030	.885	-.155	.530
	V2	V1	-.038	.135	313.392	1.000	-.396	.321
		V3	.056	.131	312.447	1.000	-.290	.403
		V4	.150	.129	305.936	1.000	-.192	.492
	V3	V1	-.094	.131	311.561	1.000	-.441	.254
		V2	-.056	.131	312.447	1.000	-.403	.290
		V4	.094	.124	307.311	1.000	-.237	.424
	V4	V1	-.188	.129	305.030	.885	-.530	.155
		V2	-.150	.129	305.936	1.000	-.492	.192
		V3	-.094	.124	307.311	1.000	-.424	.237
QA	V1	V2	.469*	.140	315.238	.006	.097	.841
		V3	.144	.137	315.593	1.000	-.220	.507
		V4	.256	.145	312.904	.463	-.127	.640
	V2	V1	-.469*	.140	315.238	.006	-.841	-.097
		V3	-.325	.140	315.282	.123	-.696	.046
		V4	-.213	.147	314.942	.897	-.603	.178
	V3	V1	-.144	.137	315.593	1.000	-.507	.220
		V2	.325	.140	315.282	.123	-.046	.696
		V4	.113	.144	312.622	1.000	-.270	.495
	V4	V1	-.256	.145	312.904	.463	-.640	.127
		V2	.213	.147	314.942	.897	-.178	.603
		V3	-.113	.144	312.622	1.000	-.495	.270
QD	V1	V2	.163	.136	312.702	1.000	-.200	.525
		V3	.406*	.138	308.924	.021	.040	.772
		V4	.625*	.142	310.023	.000	.248	1.002
	V2	V1	-.163	.136	312.702	1.000	-.525	.200
		V3	.243	.140	312.491	.502	-.129	.615
		V4	.463*	.144	314.196	.009	.080	.845
	V3	V1	-.406*	.138	308.924	.021	-.772	-.040
		V2	-.243	.140	312.491	.502	-.615	.129
		V4	.219	.145	312.293	.795	-.167	.606
	V4	V1	-.625*	.142	310.023	.000	-1.002	-.248
		V2	-.463*	.144	314.196	.009	-.845	-.080
		V3	-.219	.145	312.293	.795	-.606	.167

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

adjunct	Numerator df	Denominator df	F	Sig.
QP	3	288.183	.814	.487
QA	3	303.762	3.964	.009
QD	3	302.420	7.478	.000

Each F tests the simple effects of verb within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: acceptability.

Table A.21: Pairwise comparisons of *Adjunct Type* conditions by *Matrix Verbal Predicate* (QR test): V1 = *burst out laughing*, V2 = *drop* DP, V3 = *let out a yelp*, and V4 = *solve* DP

Appendix B

Follow-up study

B.1 Materials

B.1.1 Test items

B.1.1.1 Group A

IndSbA1 Last year, a different student said that each professor dated Sue.

IndObA1 Last year, a different student said that Nancy dated each professor.

IndSbA2 After the fight, a different woman told her friends that each man had hit the policeman.

IndObA2 After the fight, a different woman told her friends that the policeman had hit each man.

IndSbA3 Yesterday, a different commentator claimed that each of the three Italian players had bribed the Spanish coach.

IndObA3 After the final, a different commentator claimed that the Italian coach had bribed each of the three Spanish players.

IndSbA4 After the dinner, a different guest thought that each waiter had flirted with Ms May.

IndObA4 After the dinner, a different guest thought that Ms Briggs had flirted with each waiter.

IndSbA5 Yesterday, a different history teacher explained that each of the three pharaohs fought the Nubians.

IndObA5 Yesterday, a different history teacher explained that the Hittites fought each of the three pharaohs.

SubSbA1 After the lecture, a different professor suggested that each student talk to Prof Chomsky.

SubObA1 After the lecture, a different professor suggested that Prof Dawkins talk to each student.

SubSbA2 During roulette, a different gangster predicted that each gambler would swindle Gondorff.

SubObA2 During roulette, a different gangster predicted that Hooker would swindle each gambler.

SubSbA3 After the nineteenth retake, a different producer demanded that each actor should apologize to Lean.

SubObA3 After the nineteenth retake, a different producer demanded that Hitchcock should apologize to each actor.

SubSbA4 Before the meeting, a different secretary made sure that each executive emailed the chair of the committee.

SubObA4 Before the meeting, a different secretary made sure that the chair of the committee emailed each executive.

SubSbA5 Last year, a different gangster requested that each hitman kill Mr Corleone.

SubObA5 Last year, a different gangster requested that Mr Cimino kill each bodyguard.

B.1.1.2 Group B

IndSbB1 Before the meeting, a different secretary said that each executive had called the chairman.

IndObB1 Before the meeting, a different secretary said that the chairman had called each executive.

IndSbB2 After the lecture, a different student told his friends that each professor had hugged Prof Chomsky.

IndObB2 After the lecture, a different student told his friends that Prof Chomsky had hugged each professor.

IndSbB3 Yesterday, a different journalist claimed that each shareholder had blackmailed Mr Hansen.

IndObB3 Yesterday, a different journalist claimed that Mr Johnston had blackmailed each shareholder.

IndSbB4 Afterwards, a different waiter thought that each cook had shouted at the manager.

IndObB4 Afterwards, a different waiter thought that the manager had shouted at each cook.

IndSbB5 Last month, a different witness explained that each doctor had harassed the nurse.

IndObB5 Last month, a different witness explained that the nurse had harassed each doctor.

SubSbB1 After the summit, a different diplomat suggested that each ambassador greet the Prime Minister.

SubObB1 After the summit, a different diplomat suggested that the Prime Minister greet each ambassador.

SubSbB2 Before the fight, a different bartender predicted that each gunman would shoot The Ringo Kid.

SubObB2 Before the fight, a different bartender predicted that Billy the Kid would shoot each gunman.

SubSbB3 Last year, a different judge demanded that each man should compensate Ms Sheen.

SubObB3 Last year, a different judge demanded that Ms Bacall should compensate each man.

SubSbB4 Last week, a different nurse made sure that each patient contacted the doctor.

SubObB4 Last week, a different nurse made sure that the doctor contacted each patient.

SubSbB5 At the photo session, a different photographer requested that each model would kiss the designer.

SubObB5 At the photo session, a different photographer requested that the designer would kiss each model.

B.1.2 Control items: Group A and B

CG1 Henry told me that a different girl kissed each dancer.

CG2 The zoo keeper explained that a different child had handed each chimpanzee an apple.

CG3 The nurse explained that a different doctor had to examine each emergency patient.

CG4 The shopkeeper told us that a different cop caught each thief.

CG5 The owner of the garage said that a different mechanic fixed each car in 30 minutes yesterday.

CG6 The manager requested that a different armed guard protect each branch.

CG7 Mr Dixon predicted that a different vintage wine would be served to each celebrity.

CG8 Tom said that Jane gave a different French novel to each student last month.

CG9 A friend told me that a different rose bush would grow somewhere near each crash site.

CG10 The chief demanded that a different policeman should inspect each carriage of the train.

CB1 (lexical SF) [1] Afterwards, John said that a different box contained each clock.

CB2 (Structural SF) James said that Mary gave a different student each French novel last week.

CB3 (Structural SF) Afterwards, Patrick said that Dr Lean showed a different group each film.

CB4 (SI) [2]After the closure, Fiona claimed that a different nurse loved each doctor but hated the director.

CB5 (lexical SF) The critic predicted that a different California wine would receive each prize this year.

CB6 (Structural SF) The owner requested that the curators should drape a different sculpture with each sheet.

CB7 (Structural SF) An administrator announced that the faculty had awarded a different postdoc each grant.

CB8 (SI) I know that John kissed a different woman who loves each man.

CB9 (SI) I heard that a different singer admired each composer but despised the lyricist.

CB10 (SI) Ms Abbot said that a different boy didn't kiss each girl's hand.

[1]SF = Scope Freezing

[2]SI = Scope Island

B.1.3 Contexts

IndSbA1: *Sue is an attractive post-doc. There are five male professors in the department. Rumours fly. At least one PhD student of each of the professors started one at some point...*

IndObA1: *Nancy is an attractive post-doc. There are five male professors in the department. Rumours fly. At least one PhD student of each of the professors started one at some point...*

IndSbA2: *Five men had a fight in front of the pub last night. They were so excited that they attacked a passing policeman. The girlfriend of each of the men witnessed what happened and boasted about it to her friends...*

IndObA2: *Five men had a fight in front of the pub last night. They were so excited that a passing policeman could not stop them in a peaceful way. Instead he had to hit each of the men. The girlfriend of each of the men witnessed what happened...*

IndSbA3: *Italy recently beat Spain. Three commentators suspected that an Italian player had bribed the Spanish coach. The commentators agreed that there were three suspects, but they each thought it was a different player...*

IndObA3: *Italy recently beat Spain. Three commentators suspected that the Italian coach had bribed a Spanish player. The commentators agreed that there were three suspects, but they each thought a different player was guilty...*

IndSbA4: *Ms May is rumoured to have had an affair with one of five waiters in her restaurant. A group of five VIPs lunched there yesterday. They were naturally curious and afterwards each said they had identified Ms Mays lover...*

IndObA4: *Ms Briggs is rumoured to have had an affair with one of five waiters in her restaurant. A group of five VIPs lunched there yesterday. They were naturally curious and afterwards each said they had identified Ms Briggs lover...*

IndSbA5: *Yesterday, three teachers told us about the battles between the ancient Egyptians and the Nubians. Three famous pharaohs were involved. Each teacher focused on one of them, sticking to chronological order...*

IndObA5: *Yesterday, three teachers told us about the battles between the Hittites and the ancient Egyptians. Three famous pharaohs were involved. Each teacher focused on one of them, sticking to chronological order...*

SubSbA1: *Prof Chomsky visited the department last week. In the department, there are three professors, each supervising one PhD student. Each professor came up with an idea of arranging for their PhD student to meet with Prof Chomsky...*

SubObA1: *Prof Dawkins visited the department last week. In the department, there are three professors, each supervising one PhD student. Each of the professors had an idea of asking Prof Dawkins to meet with their PhD student...*

SubSbA2: *Gondorff went to the casino with three gangsters. There were three professional gamblers there. It was clear to the gangsters that one of the gamblers would take Gondorff to the cleaners, but they each picked a different suspect...*

SubObA2: *Hooker went to the casino with three gangsters. There were three professional gamblers there. It was clear to the gangsters that Hooker would take one of the gamblers to the cleaners, but they each picked a different victim...*

SubSbA3: *Three producers each recommended their favourite actor to David Lean. However, each actor frequently messed up his lines, which was embarrassing for the producer who recommended him...*

SubObA3: *Three producers each convinced their favourite star to act in a Hitchcock movie. After a while, each actor was upset with the directors rudeness, which embarrassed the producer who convinced him. Each producer confronted Hitchcock...*

SubSbA4: *Five executives will attend tomorrows meeting. Each executive was asked by his secretary to email the chair of the committee about a financial problem...*

SubObA4: *Five executives will attend tomorrows meeting. The secretary of each executive asked the chair of the committee to email her boss about a staffing problem...*

SubSbA5: *Three gangsters each employed their own hitman. Blinded by ambition, each gangster wanted his hitman to assassinate Mr Corleone...*

SubObA5: *Three gangsters each suspected that their personal bodyguard was an undercover police agent. Blinded by rage, each gangster asked Mr Montana to get rid of that bodyguard...*

IndSbB1: *In the company, there were 3 executives, each assisted by a different secretary. There was a lot of scheming. Before an important meeting, each of the secretaries told me that her boss had contacted the chairman...*

IndObB1: *In the company, there were 3 executives, each assisted by a different secretary. There was a lot of scheming. Before an important meeting, each of the secretaries told me that the chairman had contacted her boss...*

IndSbB2: *A lecture by Prof Chomsky was organized by three professors, who were all good friends of his. A PhD student of each of the professors saw their supervisor hug Prof Chomsky after the lecture...*

IndObB2: *A lecture by Prof Dawkins was organized by three professors, who were all good friends of his. A PhD student of each of the professors saw Prof Dawkins hug their supervisor after the lecture...*

IndSbB3: *Three journalists were investigating a fraud case involving Mr Hansen. Mr Hansen said that a stockholder had blackmailed him. The journalists had three suspects, but they each put their money on a different one...*

IndObB3: *Three journalists were investigating a fraud case involving Mr Hamilton. They knew that Mr Hamilton had blackmailed one of three stockholders. However, they each suggested a different victim in the articles they wrote...*

IndSbB4: *The restaurant employs five cooks and five waiters. One evening, the manager failed to tell the cooks about the number of guests. The waiters thought that they had heard one of the cooks shouting at the manager, but each identified a different one...*

IndObB4: *The restaurant employs five cooks and five waiters. One evening, guests complained about hairs in their soup. The waiters thought that they had heard the manager shouting at one of the cooks, but each identified a different one...*

IndSbB5: *A nurse sued three doctors for harassment in a case heard last month. There was at least one witness who testified against each of the doctors...*

IndObB5: *Three doctors sued a nurse for harassment in a case heard last month. Three witnesses were summoned, and each of them testified for one of the doctors...*

SubSbB1: *Last month, ten countries took part in a summit. A diplomat from each country came up with the plan of arranging that after the meeting their ambassador would greet the Prime Minister of the host country...*

SubObB1: *Last month, ten countries took part in a summit. A diplomat from each country had a plan of asking the Prime Minister of the host country politely to greet their ambassador after the meeting...*

SubSbB2: *There were five bartenders and five gunmen in town. Everyone agreed that one of the gunmen would shoot The Ringo Kid, but the bartenders each put their money on a different gunman...*

SubObB2: *There were five bartenders and five gunmen in town. Everyone agreed that Billy the Kid would shoot one of the gunmen, but the bartenders each put their money on a different victim...*

SubSbB3: *Three times in a row, Ms Sheen discovered that her lover was a married man. She sued these three men for hiding their marital status. Each case was heard by a different judge...*

SubObB3: *Three times in a row, Ms Bacall tricked young men into thinking that she was unmarried, only for her true marital status to be discovered. Each of the men sued Ms Bacall for hiding her marital status. Each case was heard by a different judge...*

SubSbB4: *In three different hospitals last week, a patient suffered from side effects caused by a flu vaccine. In each hospital, the nurse in charge told the patient to get in touch with Dr Russell...*

SubObB4: *In three different hospitals last week, a patient suffered from side effects caused by a flu vaccine. In each hospital, the nurse in charge asked Dr Benjamin to get in touch with their patient...*

SubSbB5: *At the fashion show, five models each employed a personal photographer. At the end of the show, each of these photographers wanted to photograph his model kissing to the star designer...*

SubObB5: *At the fashion show, five models each employed a personal photographer. At the end of the show, each of these photographers wanted to photograph his model being given a kiss by the star designer...*

CG1: *Yesterday, there was a show with three solo dances, each by a different dancer. There were three girls in the audience. After each dance, one of them went on stage to give her favourite dancer a kiss...*

CG2: *At a special event at the zoo, five children could each hand one apple to one of five chimpanzees. The children distributed the apples equally, so each chimpanzee got a single apple...*

CG3: *There were five doctors in the hospital. Yesterday, five emergency patients came in at the same time, so each doctor was in charge of one of the patients...*

CG4: *Last night, three thieves were holding up an off-license. However, three off-duty police officers happened to wander in to buy a bottle of scotch. Each cop caught one of the thieves...*

CG5: *There were three mechanics working at the garage. After a big pile-up on the M25 yesterday, three cars came in at the same time. Each mechanic* *worked very hard and managed to repair the car assigned to him in 30 minutes...*

CG6: *During a recent demonstration, some protesters vandalized a couple of branches of a high street bank. The manager decided that during the next demo each branch would have a guard standing at the front door...*

CG7: *Last night, Mr Dixon went to a party because he had heard that several celebrities would be present. He predicted that each one would be served a different, very expensive, vintage wine...*

CG8: *Jane has three classmates who like French literature and who, coincidentally, all had their birthday last month. Jane bought three French novels gave them one each...*

CG9: *Over the years, the cliff top road had been the scene of several fatal car accidents. According to legend, every time there was a fatal accident a wild rose bush appeared the following year...*

CG10: *The chief inspector was informed that a terrorist would take the 20:10 Euro Star. The chief was in charge of 18 investigators. The investigators were each told to inspect a different carriage of the train...*

CB1 (lexical SF): *There were five boxes and five new clocks in the shop. John had to put each clock in one of the boxes and make sure that none of the boxes were empty...*

CB2 (Structural SF): *Mary has ten students in her class who love French literature. She had ten French novels she probably would not read again. So she gave the students one of the novels each...*

CB3 (Structural SF): *Dr Lean selected five Hitchcock masterpieces and divided his class into five groups. He showed each one to one of the groups.*

CB4 (SI): *There were five doctors in the hospital. Each was loved by the nurse working most closely with him. However, the nurses couldnt stand the greedy director, whose corruption led to the hospital closing down...*

CB5 (lexical SF): *At the moment, there are five excellent Californian wines left in the competition. Mr Otto, a wine critic, predicted that each wine would receive one of five international prizes, but none would receive more than one prize...*

CB6 (Structural SF): *There were ten sculptures that would be exhibited next week. Once the sculptures arrived at the gallery, they were each covered with a different sheet, on instructions of the owner...*

CB7 (Structural SF) *Last year, the faculty offered three research grants for excellent young researchers. Three postdocs won one of the grants each...*

CB8 (SI) *There were five beautiful women in John's class. He knew that the women each had a boyfriend, but he managed to kiss each of the women regardless...*

CB9 (SI) *There were three singers, each under contract to a different composer but the same lyricist. The composers were talented, but the lyricist wrote very clunky lyrics...*

CB10 (SI) *One day Ms Abbot took ten male and ten female students to a dance. So, each student had a dance partner. Despite Ms Abbots explicit instructions, each male student refused to kiss his partners hand before escorting her to the dance floor...*

B.1.4 Instructions

B.1.4.1 Introduction

Thank you very much for your willingness to complete this survey. We estimate that it will take you around 25 minutes, although some of you may be faster than others.

The aim of the survey is to judge the acceptability of English sentences with 'each'. Only native speakers of British English aged 18 or over are eligible for this study. You count as a native speaker of British English if (i) you are proficient in English, and (ii) you acquired English as a child (before the age of 12) in a British

English environment. You must speak English regularly. If you don't meet these criteria, please don't participate in the study. If you are eligible for this study, please click 'start'. You will be given more information about the study and a link to the survey. We will give one lucky participant, chosen through a lottery, a £200 Amazon voucher.
Thank you very much for your contribution!

B.1.4.2 Questions about participants themselves

QI: Do you agree to participate in this study? ◯ Yes ◯ No

QII: Your age: ◯ 18-20 ◯ 21-30 ◯ 31-40 ◯ 41-50 ◯ 51-60 ◯ 61-

QIII: Your gender: ◯ Female ◯ Male

QIV: How did you enter to this study?

◯ via Email from UCL Announce ◯ via UCL Psychology Subject Pool

QV: Are you a UCL student?

◯ Yes, I'm an undergraduate ◯ Yes, I'm a postgraduate ◯ No

QVI: Are you proficient in English and have you learned to speak this language before the age of 12 in a British English environment?

◯ Yes ◯ No

QVII: If you are multilingual, please let us know which language(s) other than English you speak proficiently:

◯ Never ◯ Sometimes ◯ Always

QVIII: Please indicate how often you speak English at home.

◯ Never ◯ Sometimes ◯ Always

QIX: Please indicate how often you speak English at work / university / school.

◯ Never ◯ Sometimes ◯ Always

QX: Please indicate how often you speak English with friends.

◯ Never ◯ Sometimes ◯ Always

QXI: Have you ever studied linguistics?

◯ Yes ◯ No

If yes, please give some details in the box below.

QXII: Please give us your email address (we will use this to contact you if you win a prize):

B.1.4.3 Instruction

Please read the following instructions carefully before you start the study.

You will find 40 English sentences below. Each sentence is preceded by a short context. You should first read the context carefully and then judge how acceptable the sentence is, given that context. In order to indicate the degree of acceptability, please select a grade between 1 (completely unacceptable) and 5 (completely acceptable).
It is important that you judge all sentences.
If we find that your response times are unrealistically short, we will exclude you from our lottery (for a £200 Amazon voucher).

B.1.5 A sample of a question and an answer sheet (from IndSbA1)

Sue is an attractive post-doc. There are five male professors in the department. Rumours fly. At least one PhDstudent of each of the professors started one at some point...

Last year, a different student said that each professor dated Sue.

◯ 1(completely unacceptable) ◯ 2 ◯ 3 ◯ 4 ◯ 5 (completely acceptable)

B.2 Statistic tests

Report

Group		IndSb1	IndOb1	IndSb2	IndOb2	IndSb3	IndOb3	IndSb4	IndOb4	IndSb5	IndOb5	SubSb1	SubOb1	SubSb2	SubOb2	SubSb3	SubOb3	SubSb4	SubOb4	SubSb5	SubOb5
A	Mean	2.66	2.52	2.76	3.15	2.64	2.32	2.51	2.42	2.93	2.89	2.98	2.90	2.65	2.33	2.72	2.96	3.45	3.10	2.62	2.81
	N	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
	Std. Deviation	1.301	1.339	1.490	1.420	1.393	1.388	1.346	1.323	1.412	1.357	1.334	1.420	1.331	1.307	1.321	1.401	1.282	1.508	1.401	1.317
	Std. Error of Mean	.124	.128	.142	.135	.133	.132	.128	.126	.135	.129	.127	.135	.127	.125	.126	.134	.122	.144	.134	.126
B	Mean	2.85	2.94	2.72	2.73	2.28	2.54	2.29	2.13	2.91	2.93	3.03	2.97	2.24	2.16	3.00	2.74	3.51	3.18	2.65	2.72
	N	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
	Std. Deviation	1.387	1.499	1.427	1.396	1.344	1.377	1.377	1.247	1.487	1.529	1.482	1.388	1.321	1.272	1.392	1.550	1.459	1.451	1.415	1.289
	Std. Error of Mean	.141	.152	.145	.142	.136	.140	.140	.127	.151	.155	.150	.141	.134	.129	.141	.157	.148	.147	.144	.131
Total	Mean	2.75	2.71	2.74	2.95	2.47	2.42	2.41	2.29	2.92	2.91	3.00	2.93	2.45	2.25	2.85	2.86	3.47	3.14	2.63	2.77
	N	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207
	Std. Deviation	1.342	1.428	1.457	1.420	1.379	1.384	1.362	1.293	1.444	1.437	1.402	1.402	1.339	1.290	1.359	1.473	1.365	1.478	1.404	1.301
	Std. Error of Mean	.093	.099	.101	.099	.096	.096	.095	.090	.100	.100	.097	.097	.093	.090	.094	.102	.095	.103	.098	.090

Table B.1: The mean acceptability of each test item by *Group*

Report

Group		CG1	CG2	CG3	CG4	CG5	CG6	CG7	CG8	CG9	CG10	CB1	CB2	CB3	CB4	CB5	CB6	CB7	CB8	CB9	CB10
A	Mean	3.52	3.95	4.06	4.34	3.79	4.26	4.73	3.91	3.87	4.32	2.85	2.38	2.88	3.49	3.56	2.94	3.69	1.64	3.01	1.86
	N	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
	Std. Deviation	1.519	1.291	1.301	1.016	1.286	1.002	.765	1.358	1.174	1.004	1.510	1.502	1.519	1.346	1.499	1.448	1.419	1.064	1.424	1.096
	Std. Error of Mean	.145	.123	.124	.097	.123	.096	.073	.130	.112	.096	.144	.143	.145	.128	.143	.138	.135	.101	.136	.105
B	Mean	3.45	3.95	4.05	3.96	3.56	4.11	4.75	3.96	3.76	3.85	2.69	2.37	2.39	2.94	3.47	2.76	3.52	1.48	2.75	1.92
	N	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
	Std. Deviation	1.414	1.278	1.349	1.241	1.407	1.172	.646	1.274	1.265	1.341	1.475	1.446	1.476	1.413	1.542	1.420	1.494	.937	1.370	1.161
	Std. Error of Mean	.144	.130	.137	.126	.143	.119	.066	.129	.128	.136	.150	.147	.150	.143	.157	.144	.152	.095	.139	.118
Total	Mean	3.49	3.95	4.06	4.16	3.68	4.19	4.74	3.93	3.82	4.10	2.77	2.38	2.65	3.23	3.52	2.86	3.61	1.57	2.89	1.89
	N	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207
	Std. Deviation	1.468	1.282	1.321	1.140	1.346	1.084	.710	1.317	1.216	1.195	1.492	1.472	1.515	1.402	1.516	1.434	1.454	1.007	1.401	1.124
	Std. Error of Mean	.102	.089	.092	.079	.094	.075	.049	.092	.084	.083	.104	.102	.105	.097	.105	.100	.101	.070	.097	.078

Table B.2: The mean acceptability of each control item by *Group*

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	800.632	7704.552	.000
Group	1	800.632	.404	.525
Clause Type	1	800.632	8.303	.004
Grammatical Function	1	800.632	.566	.452
Group * Clause Type	1	800.632	.018	.893
Group * Grammatical Function	1	800.632	.006	.939
Clause Type * Grammatical Function	1	800.632	.609	.435
Group * Clause Type * Grammatical Function	1	800.632	.385	.535

a. Dependent Variable: Acceptability.

Table B.3: F-test of LMM with *Grammatical Function*, *Clause Type*, and *Group* as factors on the overall result.

Estimates[a]

Group	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
A	2.765	.042	432.372	2.681	2.849
B	2.725	.046	383.410	2.635	2.816

a. Dependent Variable: Acceptability.

Pairwise Comparisons[a]

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	df	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	95% Confidence Interval for Difference[b] Upper Bound
A	B	.040	.063	800.632	.525	-.083	.163
B	A	-.040	.063	800.632	.525	-.163	.083

Based on estimated marginal means

a. Dependent Variable: Acceptability.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	800.632	.404	.525

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: Acceptability.

Table B.4: Estimated marginal means and pairwise comparisons of test conditions by *Group*

Estimates[a]

Clause Type	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
indicative	2.655	.044	401.300	2.568	2.742
subjunctive	2.835	.044	399.332	2.748	2.922

a. Dependent Variable: Acceptability.

Pairwise Comparisons[a]

(I) Clause Type	(J) Clause Type	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c] Lower Bound	95% Confidence Interval for Difference[c] Upper Bound
indicative	subjunctive	-.180*	.063	800.632	.004	-.303	-.057
subjunctive	indicative	.180*	.063	800.632	.004	.057	.303

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: Acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	800.632	8.303	.004

The F tests the effect of Subjunctive_vs._indicative. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: Acceptability.

Table B.5: Estimated marginal means and pairwise comparisons of test conditions by *Clause Type*

Estimates[a]

Grammatical Function	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
subject	2.769	.043	398.234	2.683	2.854
object	2.722	.045	403.052	2.633	2.810

a. Dependent Variable: Acceptability.

Pairwise Comparisons[a]

(I) Grammatical Function	(J) Grammatical Function	Mean Difference (I-J)	Std. Error	df	Sig.[b]	95% Confidence ...[b]
						Lower Bound
subject	object	.047	.063	800.632	.452	-.076
object	subject	-.047	.063	800.632	.452	-.170

Pairwise Comparisons[a]

(I) Grammatical Function	(J) Grammatical Function	95% Confidence ...[b]
		Upper Bound
subject	object	.170
object	subject	.076

Based on estimated marginal means

a. Dependent Variable: Acceptability.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	800.632	.566	.452

The F tests the effect of Quantifier_position. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: Acceptability.

Table B.6: Estimated marginal means and pairwise comparisons of test conditions by *Grammatical Function*

Estimates[a]

Group	Clause Type	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
A	indicative	2.679	.060	217.957	2.561	2.798
	subjunctive	2.851	.060	214.435	2.733	2.969
B	indicative	2.631	.065	191.499	2.503	2.759
	subjunctive	2.820	.065	191.915	2.692	2.948

a. Dependent Variable: Acceptability.

Pairwise Comparisons[a]

Group	(I) Clause Type	(J) Clause Type	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence ...[c] Lower Bound
A	indicative	subjunctive	-.172*	.085	432.372	.044	-.339
	subjunctive	indicative	.172*	.085	432.372	.044	.005
B	indicative	subjunctive	-.189*	.092	383.410	.041	-.369
	subjunctive	indicative	.189*	.092	383.410	.041	.008

Pairwise Comparisons[a]

Group	(I) Clause Type	(J) Clause Type	95% Confidence ...[c] Upper Bound
A	indicative	subjunctive	-.005
	subjunctive	indicative	.339
B	indicative	subjunctive	-.008
	subjunctive	indicative	.369

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: Acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Group	Numerator df	Denominator df	F	Sig.
A	1	432.372	4.089	.044
B	1	383.410	4.222	.041

Each F tests the simple effects of Subjunctive_vs._indicative within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: Acceptability.

Table B.7: Estimated marginal means and pairwise comparisons of *Group* conditions by *Clause Type* (*Group* * *Clause Type*)

Estimates[a]

Group	Grammatical Function	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
A	subject	2.791	.058	216.709	2.676	2.906
	object	2.739	.062	217.047	2.617	2.861
B	subject	2.746	.064	191.770	2.619	2.873
	object	2.704	.065	191.728	2.575	2.833

a. Dependent Variable: Acceptability.

Pairwise Comparisons[a]

Group	(I) Grammatical Function	(J) Grammatical Function	Mean Difference (I-J)	Std. Error	df	Sig.[b]
A	subject	object	.052	.085	432.372	.542
	object	subject	-.052	.085	432.372	.542
B	subject	object	.042	.092	383.410	.646
	object	subject	-.042	.092	383.410	.646

Pairwise Comparisons[a]

Group	(I) Grammatical Function	(J) Grammatical Function	95% Confidence Interval for Difference[b] Lower Bound	95% Confidence Interval for Difference[b] Upper Bound
A	subject	object	-.115	.219
	object	subject	-.219	.115
B	subject	object	-.138	.223
	object	subject	-.223	.138

Based on estimated marginal means

a. Dependent Variable: Acceptability.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Group	Numerator df	Denominator df	F	Sig.
A	1	432.372	.372	.542
B	1	383.410	.212	.646

Each F tests the simple effects of Quantifier_position within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: Acceptability.

Table B.8: Estimated marginal means and pairwise comparisons of *Group* conditions by *Grammatical Function* (*Group* * *Grammatical Function*)

Estimates[a]

Clause Type	Grammatical Function	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
indicative	subject	2.654	.062	202.629	2.532	2.776
	object	2.656	.063	199.034	2.531	2.781
subjunctive	subject	2.883	.061	195.606	2.763	3.003
	object	2.787	.064	204.019	2.661	2.913

a. Dependent Variable: Acceptability.

Pairwise Comparisons[a]

Grammatical Function	(I) Clause Type	(J) Clause Type	Mean Difference (I-J)	Std. Error	df	Sig.[c]
subject	indicative	subjunctive	-.229*	.087	398.234	.009
	subjunctive	indicative	.229*	.087	398.234	.009
object	indicative	subjunctive	-.131	.090	403.052	.145
	subjunctive	indicative	.131	.090	403.052	.145

Pairwise Comparisons[a]

Grammatical Function	(I) Clause Type	(J) Clause Type	95% Confidence Interval for Difference[c] Lower Bound	95% Confidence Interval for Difference[c] Upper Bound
subject	indicative	subjunctive	-.400	-.058
	subjunctive	indicative	.058	.400
object	indicative	subjunctive	-.308	.045
	subjunctive	indicative	-.045	.308

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: Acceptability.

c. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Grammatical Function	Numerator df	Denominator df	F	Sig.
subject	1	398.234	6.945	.009
object	1	403.052	2.134	.145

Each F tests the simple effects of Subjunctive_vs._indicative within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

Table B.9: Estimated marginal means and pairwise comparisons of *Grammatical Function* conditions by *Clause Type* (*Grammatical Function* * *Clause Type*) (for Figure 5.5a)

Estimates[a]

Clause Type	Grammatical Function	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
indicative	subject	2.654	.062	202.629	2.532	2.776
	object	2.656	.063	199.034	2.531	2.781
subjunctive	subject	2.883	.061	195.606	2.763	3.003
	object	2.787	.064	204.019	2.661	2.913

a. Dependent Variable: Acceptability.

Pairwise Comparisons[a]

Clause Type	(I) Grammatical Function	(J) Grammatical Function	Mean Difference (I-J)	Std. Error	df	Sig.[b]
indicative	subject	object	-.002	.089	401.300	.984
	object	subject	.002	.089	401.300	.984
subjunctive	subject	object	.096	.088	399.332	.279
	object	subject	-.096	.088	399.332	.279

Pairwise Comparisons[a]

Clause Type	(I) Grammatical Function	(J) Grammatical Function	95% Confidence Interval for Difference[b] Lower Bound	95% Confidence Interval for Difference[b] Upper Bound
indicative	subject	object	-.176	.172
	object	subject	-.172	.176
subjunctive	subject	object	-.078	.270
	object	subject	-.270	.078

Based on estimated marginal means

a. Dependent Variable: Acceptability.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests[a]

Clause Type	Numerator df	Denominator df	F	Sig.
indicative	1	401.300	.000	.984
subjunctive	1	399.332	1.176	.279

Each F tests the simple effects of Quantifier_position within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: Acceptability.

Table B.10: Estimated marginal means and pairwise comparisons of *Clause Type* conditions by *Grammatical Function* (*Clause Type* * *Grammatical Function*) (for Figure 5.5b)

Paired Samples Test

		Paired Differences					t
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper	
Pair 1	IndSb - IndOb	.0435	.6731	.0468	-.0488	.1357	.929
Pair 2	SubSb - SubOb	.0937	.6662	.0463	.0024	.1850	2.024
Pair 3	SubOb - IndOb	.1546	.7502	.0521	.0518	.2574	2.965
Pair 4	SubSb - IndSb	.2048	.7644	.0531	.1001	.3096	3.856
Pair 5	SubSb - IndOb	.2483	.7761	.0539	.1420	.3547	4.603
Pair 6	SubOb - IndSb	.1111	.7554	.0525	.0076	.2146	2.116
Pair 7	IndOb - Scope Island	.24106	.90471	.06288	.11709	.36504	3.834
Pair 8	Local QR - SubSb	1.12850	.90629	.06299	1.00431	1.25269	17.915
Pair 9	Scope Freezing - SubSb	.08148	1.05973	.07366	-.06374	.22670	1.106
Pair 10	Local QR - Lexical Scope Freezing	.86425	1.24751	.08671	.69330	1.03520	9.967
Pair 11	Lexical Scope Freezing - Structural Scope Freezing	.27415	1.16065	.08067	.11511	.43320	3.398
Pair 12	Scope Freezing - Scope Island	.57085	.99280	.06900	.43481	.70690	8.273

Paired Samples Test

		df	Sig. (2-tailed)
Pair 1	IndSb - IndOb	206	.354
Pair 2	SubSb - SubOb	206	.044
Pair 3	SubOb - IndOb	206	.003
Pair 4	SubSb - IndSb	206	.000
Pair 5	SubSb - IndOb	206	.000
Pair 6	SubOb - IndSb	206	.036
Pair 7	IndOb - Scope Island	206	.000
Pair 8	Local QR - SubSb	206	.000
Pair 9	Scope Freezing - SubSb	206	.270
Pair 10	Local QR - Lexical Scope Freezing	206	.000
Pair 11	Lexical Scope Freezing - Structural Scope Freezing	206	.001
Pair 12	Scope Freezing - Scope Island	206	.000

Table B.11: Two-tailed dependent T-test including both the test and the control conditions (for Figure 5.7). Bonferroni adjusted level of significance: $p < 0.004$ (0.05 / 12)

Report

	Local QR	Scope Island	Scope Freezing
Mean	4.0116	2.3937	2.9646
N	207	207	207
Std. Deviation	.54963	.81226	.89064
Std. Error of Mean	.03820	.05646	.06190

Table B.12: The mean acceptability of the control conditions (for Figure 5.7)

Report

	Lexical Scope Freezing	Structural Scope Freezing
Mean	3.1473	2.8732
N	207	207
Std. Deviation	1.12616	1.00238
Std. Error of Mean	.07827	.06967

Table B.13: The mean acceptability of lexical scope freezing and structural scope freezing items (involved in the control condition of Scope Freezing).

Report

	Bare Participial Gerund	Indicative	After-prepositional gerund	Subjunctive	During-PP
Mean	2.4453	2.6565	2.7891	2.8362	3.1261
N	80	207	80	207	80
Std. Deviation	.75574	.83063	.85490	.83037	.78161
Std. Error of Mean	.08449	.05773	.09558	.05771	.08739

Table B.14: The mean acceptability of QR out of the three types of adjuncts (in the main experiment) and QR out of the two types of finite clauses (for the revised QR ranking (10) in Section 5.7).

	Paired Differences					t	df	Sig.
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper			
CB2 - CB6	-.478	1.683	.117	-.709	-.248	-4.088	206	.000
CB2 - CB7	-1.232	1.671	.116	-1.461	-1.003	-10.610	206	.000
CB3 - CB6	-.203	1.900	.132	-.463	.057	-1.537	206	.126
CB3 - CB7	-.957	1.823	.127	-1.206	-.707	-7.549	206	.000
CB2 - CB3	-.275	1.745	.121	-.514	-.036	-2.270	206	.024
CB6 - CB7	-.754	1.690	.117	-.985	-.522	-6.415	206	.000

Table B.15: Two-tailed dependent T-test on the control items of structural scope freezing: CB2 = *gave*; CB3= *showed*; CB6=*drape*; and CB7=*awarded*.