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SYNTACTIC MOVEMENT AND KOREAN APHASIC COMPREHENSION

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ABSTRACT

SYNTACTIC MOVEMENT AND KOREAN APHASIC COMPREHENSION

By

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This dissertation seeks to provide a systematic and linguistically oriented description of Korean Broca's aphasic comprehension on a selected number of constructions. In addition, Korean Broca's data is used to test both current linguistic accounts of Broca's comprehension and syntactic theories in Korean. Four Broca's aphasics, two Wernicke's aphasics and six controls participated in the comprehension study involving five sentence-picture matching experiments.

Movement is a well-studied phenomenon in syntactic theory and aphasic comprehension. Empirically, this dissertation examines patterns of movement in Korean Broca's aphasia in such constructions as active, passive, scrambling, relative clauses, *wh*-questions and quantified sentences. It is shown that Korean Broca's subjects perform above chance on constructions argued in Korean to have no overt movement (e.g., active, subject and object relative clauses, and *wh*-questions) and at chance on constructions argued to have movement (e.g., scrambling and passive). Interestingly, performance on passive is lifted to above chance when the subject of the passive is quantified.

Theoretically, this dissertation tests four current linguistic accounts of aphasia. Linguistic accounts have generally fallen within two major camps: linear and structural. Linear accounts such as the Trace Deletion Hypothesis (Grodzinsky, 1995), Argument Linking Hypothesis (Piñango, 2000) and Mapping Hypothesis (Linebarger, 1995)

account for core Korean data but fail in constructions in which movement restores the canonical order of arguments. The structural account, Double Dependency Hypothesis (Mauner et al. (1993), accounts for all data except quantified passive sentences. It is concluded that accounts of Broca's aphasic comprehension that appeal to structure rather than linear assignment of thematic roles from argument structure are to be preferred.

The data from Korean Broca's comprehension is also used to glean clues as to the proper syntactic analysis in several Korean syntactic debates: passives (A-movement), relative clauses (A-bar movement) and *wh*-questions (LF movement). It is argued that there is support for A-movement in Korean *–hi* passives but no support movement in relative clauses or *wh*-questions.

Findings from Korean Broca's comprehension support the notion that errors in Broca's comprehension are not only subtle but also vary across languages. However, this variation appears systematic and highly constrained by language specific structure. Errors are dependent not upon particular sentence constructions but upon the existence of underlying syntactic properties in constructions such as movement.

To Boseung, Christopher and Nicholas

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KEY TO ABBREVIATIONS

nom	nominative
acc	accusative
top	topic
pl	plural
cl	classifier
gen	genitive
past	past tense
pres	present tense
pass	passive
asp	aspect
prog	progressive
decl	declarative
imper	imperative
Q	question morpheme
neg	negation
rel	relativizer
comp	complementizer

CHAPTER 1

INTRODUCTION

This dissertation seeks to provide a systematic and linguistically oriented description of Korean aphasic comprehension on a selected number of constructions and, in doing so, help to provide a more reliable picture of the nature of aphasic deficits in general. As syntactic movement is a well-studied phenomenon in syntactic theory and aphasia research, patterns of movement in Korean aphasia will be the focus of the investigation. In addition to describing patterns of comprehension in movement constructions, the patterns will be used to test both current accounts of aphasia and syntactic theories.

The dissertation has both empirical and theoretical goals. One empirical goal is to provide a systematic and linguistically oriented description of Korean aphasic comprehension on several syntactic constructions. Although Broca's aphasia has traditionally been defined as a deficit in production, systematic investigations of aphasic comprehension have revealed a subtle, syntactically selective impairment. Unfortunately, there are few studies on non-Indo-European languages and fewer concerning Korean aphasia. As syntactic movement is a well-studied phenomenon in syntactic theory and aphasia research, patterns of movement in Korean aphasia will be the focus of the investigation. Specifically, this dissertation will investigate the nature of the comprehension deficit in Korean Broca's aphasia on such syntactic constructions as active, passive, relative clauses, *wh*-questions and quantified sentences.

A second empirical goal is to investigate the dissociation of comprehension patterns in Broca's and Wernicke's aphasia. It has been argued that Broca's area in the left frontal lobe is responsible for syntactic processing, while Wernicke's area in the left temporal lobe is responsible for lexico-semantic processing. There is debate as to whether damage to these areas in the brain results in different language deficits. Thus this dissertation will compare the comprehension patterns of Korean Broca's and Wernicke's aphasics.

This dissertation also has two theoretical goals. The first is to test four current linguistic accounts of aphasia. Several hypotheses have been proposed to account for comprehension patterns in Broca's aphasia. Linguistic accounts have generally fallen within two major camps: linear and structural (Beretta, 2001). Linear accounts (e.g., Grodzinsky, 2000; Piñango, 2000) rely on linear word order in the assignment of thematic roles to noun phrases. These accounts argue that Broca's aphasics fail to interpret sentences with moved elements because canonical linear order is not preserved. Structural accounts (e.g., Mauner et al., 1993) rely not on linearity but on hierarchical structure. These accounts argue that Broca's aphasics fail to interpret the thematic relations of moved elements and their original positions. Thus, the empirical data from Korean Broca's comprehension will be brought to bear on four leading linguistic accounts of Broca's aphasia.

The second theoretical goal is to glean clues from aphasia as to the proper analysis in several Korean syntactic debates. Research over the last 20 years has shown that error types in aphasia are not only subtle but also vary across languages; however, this variation appears to be systematic and highly constrained. The nature and extent of aphasic errors seems to be constrained by the structure of each specific language. Given that patterns of sparing and loss in aphasia appear to be constrained by language structure, these patterns may in turn provide clues for language structure. That is, data from Broca's aphasia may be helpful precisely when there is no definitive evidence from syntactic arguments. In Korean syntax there are three areas in which there is disagreement over whether syntactic movement has occurred: passives (A-movement), relative clauses (A-bar movement) and *wh*-questions (LF movement). The arguments for each analysis will be considered and data from Korean Broca's aphasia will be used as clues to help discern the appropriate analysis.

Overall, this dissertation seeks to expand the knowledge base of the nature of aphasia by providing data from Korean aphasia. In addition to describing patterns of aphasic comprehension on selected movement constructions, this dissertation will test current aphasia accounts and syntactic theories by considering empirical data from Korean aphasia. The findings will contribute to linguistic theory by extending the range of cross-linguistic data on aphasia in specific syntactic areas, providing a crucial test of the four leading linguistic accounts of aphasia patterns, and, as Newmeyer (2000) points out, by extending the range of applicable methods used to investigate syntactic theories.

The dissertation is organized in the following manner. In Chapter 2, I discuss the background literature in Broca's aphasic comprehension. I will review the empirical data to be investigated in Korean, as well as the four linguistic accounts that attempt to explain these patterns. I also briefly characterize three debates in Korean syntax that may benefit from data in aphasia. I, then, provide the research questions for this study. Chapter 3 provides background on the subjects and the general methods and materials of the study.

Chapter 4 provides an investigation of A-movement by considering active and scrambled active constructions. Chapter 5 extends the findings from A-movement to include passive, scrambled passive, and truncated passive constructions. Chapter 6 considers A-bar movement and provides an experiment with subject and object relative clauses. Chapter 7 investigates LF movement by investigating *in-situ* subject and object *wh*-questions. Chapter 8 extends the study on LF by considering the effects of quantification in active and passive sentences. Chapter 9 concludes the dissertation with a summary of findings and discussion of the overall empirical and theoretical implications.

CHAPTER 2

BACKGROUND

2.1 Introduction

This chapter provides the empirical and theoretical background, as well as the research questions to be answered in this dissertation. The chapter is organized as follows. Section 2.2 will define aphasia and provide descriptions of Broca's and Wernicke's aphasia. Section 2.3 will provide the empirical background and review the core data for comprehension in Broca's aphasia. Section 2.4 provides the theoretical background by reviewing four linguistic accounts for patterns in Broca's comprehension. It will also characterize the debates in Korean syntax that will be investigated. In Section 2.5 I conclude the chapter by providing the research questions to be answered in this dissertation.

2.2 General Background

In this section I briefly define aphasia and discuss some physiological and linguistic characteristics of two specific types of aphasia: Broca's and Wernicke's. As this dissertation is an investigation of Broca's comprehension, I then provide the rationale for considering comprehension patterns in Broca's aphasia.

2.2.1 Aphasia

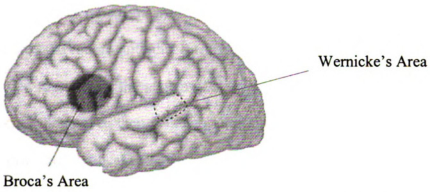
Aphasia is a disorder of the formulation and comprehension of language caused by dysfunction in specific brain regions, primarily located in the left cerebral hemisphere (Damasio, 1992). Although there are many sequelae associated with aphasia (e.g., hemiparesis and impaired short-term memory), it is important to note that aphasia is essentially a language disorder and not a disorder of perception. For example, Damasio (1992) points out that deafness caused by damage to the auditory cortex or associated efferent/afferent pathways precludes language comprehension via the auditory channel but it does not compromise language comprehension through vision. Similarly, aphasia is not a motor disorder. Incoordination of the speech mechanisms that impairs articulation and distorts speech sounds but leaves language formulation intact is called dysarthria; while the ordering of speech mechanism motor commands is called apraxia. Neither of these is aphasia, though they may accompany aphasia.

2.2.2 Broca's and Wernicke's Aphasia

Although there are many types of aphasia (e.g., conduction, global, transcortical motor, transcortical sensory), two of the most commonly investigated are Broca's and Wernicke's aphasia. Broca's aphasia results generally from damage to Broca's area in the inferior left frontal gyrus (pars opercularis and pars triangularis), which contains the cytoarchitectonic (Brodmann's) areas 44 and 45 (Figure 2.1). Broca's aphasia also results from damage to areas that extend beyond Broca's area to include the lower portion of the motor strip, the prefrontal cortex and the premotor cortex, as well as the underlying white matter and basal ganglia. Patients with Broca's aphasia display a severe loss of speech fluency. Although they retain their ability to communicate, their speech is slow, effortful and telegraphic (Goodglass, 1968, 1976; Jakobson, 1956, 1964; Luria, 1970; Pick, 1913; among others).

Figure 2.1

Broca's and Wernicke's areas



Adapted from Gazzaniga et al. (1999)

Wernicke's aphasia is most often caused by damage to the posterior section of the left superior temporal gyrus (area 22) (Figure 2.1). In many instances there is also involvement of the angular and supramarginal gyri (Damasio, 1992). Patients with

Wernicke's aphasia produce fluent speech at normal or even excessive rates. However, the content is often unintelligible, as there are frequent phonemic and semantic paraphasias and neologisms. Auditory comprehension is often severely impaired (Goodglass, 1976; Luria, 1970).

As this dissertation is an investigation of Korean Broca's aphasia, I will focus here only on Broca's. Although Broca's aphasia broadly consists of the characteristics briefly described above, there is argued to be a subset of Broca's aphasia called agrammatism. Agrammatism was first reported by Deleuze (1819) in an aphasic patient who used the infinitive form of verbs and never used pronouns (cited in Goodglass & Menn, 1985). Kussmaul (1876) later reported on brain-damaged patients who could not form words or arrange phrases grammatically (cited in Grodzinsky, 1990). However, it was Pick (1913) who noted that the patterns of production in some Broca's aphasics were ungrammatical (cited in Grodzinsky, 1990). Although not specific in his description, Pick was the first to note that there was selective syntactic impairment. That is, he was the first to note that the pattern of sparing and loss was to the system of grammar. He concluded that even though these patients knew what they wanted to say, they could not construct grammatical sentences. Pick thus termed this phenomenon *agrammatism.*

Characteristics of agrammatism include non-fluent, effortful speech at a slow rate; dysprosody; a telegraphic speech style characterized by a lack of functional elements such as auxiliaries, pronouns, determiners, prepositions and inflectional affixes; a preference for content words; and a lack of complex sentence structure (Fromkin, 1995; Goodglass, 1968; Grodzinsky, 1990; Tissot et al., 1973).

These characteristics appear to hold across languages. Menn, O'Connor, Obler, and Holland (1995) and Menn and Obler (1990) compared agrammatic data from fourteen languages and report the following summary results. Short phrase length, slow speech rate, reduced syntactic variety, and simplified syntax occurred in all of the languages studied. Most free grammatical morphemes such as articles, auxiliaries, and prepositions were omitted. Bound morphemes such as plural, tense, and agreement were omitted in languages where omission was possible but were incorrectly substituted in languages where omission was not possible. Certain free grammatical morphemes such as clause-initial "additive" conjunctions (e.g., *and*, *and then*, *and so*) and, in Japanese, sentence-final particles were used heavily. Modifiers of nouns were omitted. Finally, there was a reliance on canonical word order; in languages with relatively free word order, patients adopted a favorite word order.

These findings were replicated in Korean Broca's aphasia, as well. Halliwell (1998, 2000) and Kim S. (1997) found that Korean Broca's patients displayed the general properties reported in Menn and Obler (1990). Interestingly, those bound morphemes that may be omitted in Korean were indeed omitted, while those that cannot be omitted were incorrectly substituted.

2.2.3 Agrammatic Comprehension

Traditionally agrammatism was seen as a production deficit in which grammatical morphemes (bound and free) are impaired and in which comprehension was thought to be normal. Caramazza and Zurif's (1976) experimental study on comprehension in agrammatism changed this view. It was discovered that comprehension was indeed compromised when it depended primarily upon syntactic structure. Caramazza and Zurif argued that aphasics compensate for the loss of syntax in comprehension by using lexical semantics, context, and background knowledge to infer who is doing what to whom. Consider the example in (2-1).

(2-1) a. The boy kicked the ball

b. The boy was kicked by the girl

If the lexical items in (2-1a) were presented randomly rather than in a sentence, based upon the semantics of the words themselves (*boy*, *ball*, *kick*) and knowledge of how the world works (e.g., balls do not kick boys), it is clear that it is the boy who kicked the ball. However, in (2-1b) lexical semantics and context are not enough to discern who is doing what to whom. Caramazza and Zurif report that patients who were tested on semantically reversible stimuli such as (2-1b) were not able to use the coping strategy; and the syntactic deficits became quite visible. On semantically reversible sentences, they found that agrammatic comprehension of passives was at chance (i.e., random guessing). These results were confirmed in other such preliminary studies as Heilman & Scholes (1976).

Since the 1970s, systematic investigations of aphasic comprehension from a variety of structures (e.g., active, passive, subject and object relative clauses) have revealed a subtle, syntactically selective impairment. Research has shown that error types vary across languages; however, this variation is quite systematic and highly constrained. Unlike Menn and Obler (1990) and the research it sparked in production, research on aphasic comprehension has been carried out primarily in English. Because of this, it is difficult to separate universal mechanisms from language specific content. Cross-linguistic comparisons, however, allow us to separate these. Thus, by investigating the nature and range of variation of aphasia across languages, we may learn more about aphasia and its diagnosis, as well as gather clues regarding constraints on human language and brain organization.

2.3 Empirical Background

Research since the above comprehension studies on agrammatism has revealed a subtle yet systematic syntactic impairment. Although there are many deficits at many levels of representation in agrammatism, numerous studies reveal a core set of syntactic data.[1] These core findings are quite robust, and it is these data that much of the linguistic aphasia literature seeks to explain. It is also these data that this dissertation will investigate in Korean. This section will review the core data for agrammatic Broca's (henceforth Broca's) comprehension in actives, passives, subject relative clauses and object relative clauses reported in the literature, as well as findings in three other interesting areas of investigation: scrambling, *wh*-questions and quantified subjects constructions.

2.3.1 Core Data in Broca's Comprehension

Active and Passive

The most robust pattern that has emerged in Broca's aphasia is one in which Broca's patients have relatively intact (i.e., above chance) comprehension of active sentences (2-2a) but relatively poor (i.e., random or at chance) comprehension of passives (2-2b).

(2-2) a. The cat bit the dog *Active*

b. The dog was bitten by the cat *Passive*

[1] See Kirshner (1995) for a general review

This pattern is supported by Grodzinsky, Piñango, Zurif, and Drai (1999) and Piñango (1999), who both conducted meta-analyses with patients reported in the literature. Table 2.1 combines analyses from Piñango (1999, p. 168) and Grodzinsky et al. (1999, p. 145) and shows that the overall means for 42 patients are 84% correct performance on active sentences and 55% for passives (Table 2.1).[2]

Table 2.1

Performance on active and passive sentences (% correct)

Patient	Study	Active	Passive
AB	BHPP	80	40
AK	SCGT	79	42
AT	LSS, SLSP	67	35.5
B	G	100	29
BL	SSM	71	29
D	G	86	64
DM	SS, GPM	79	71
EB	LSS	67	54
ED	SCGT	71	29
EG	L	79	33
EM	SS	96.5	76
ER	BHPP	90	40
ES	GPM	85	35
FA	BG	70	70
FC	SS, BG, HA	85	73.5
FM	OS, SLSP, BSMB, BNC	52.6	56
GV	BHPP	90	50
HO	H	83	50
HR	SSM	96	42
HT	SSM	50	54
JG	BHPP	100	40
JR	SSM	67	71
LD	SS	88	63
LS	LSS, SLSP	83	57.5
MB	H	67	33
ME	OS, SLSP	92	95
MS	H	83	17

[2] See Beretta, Piñango, Patterson, & Harford (1999) for a presentation of performance on other syntactic constructions

Table 2.1 (cont'd)

NF	H	100	55
PJ	OS, SLSP	100	90.5
POE	KvG	100	100
RB	GPM, G	100	50
RD	SS, GPM, HA, G	100	72.38
ROO	KvG	90	45
SL	H	67	33
SP	CF	100	50
SY	H	100	67
TS	H	83	67
VS	SSM, LSS, SLSP,BSMB	86.8	59.75
WF	BG	100	100
YM	BHPP	80	50
YO	H	100	67
YY	H	100	66
	Mean	**84.9**	**55.3**

Note: BC, Badecker, Nathan, & Caramazza (1991); BG, Balogh & Grodzinsky (1996); BHPP, Beretta, Hartford, Patterson & Piñango (1996); BSMB, Berndt, Salasoo, Mitchum & Blumstein (1988); CF, Caplan & Futter (1986); G, Grodzinsky (1995); GPM, Grodzinsky, Pierce & Markovitz (1991); HA, Hickok & Avrutin (1995); H, Hagiwara (1993); KvG, Kolk & van Grunsven (1985); L, Linebarger (1990); LSS, Linebarger, Schwartz & Saffran (1983); OS, Ostrin & Schwartz (1986); SCGT, Shankweiler, Crain, Gorrell & Tuller (1989); SLSP, Schwartz, Linebarger, Saffran & Pate (1987); SS, Sherman & Schweickert (1989); SSM, Schwartz, Saffran & Marin (1980).

Table 2.2 provides data from 14 more patients and includes two recent studies from Korean. Beretta, Schmitt, Halliwell, Munn, Cuetos, & Kim (2001) report that three Korean and two Spanish patients had an overall mean of 82% correct on actives and 50% on passives. Cho and Kim (2002) describe four patients with an overall mean of 71% on actives and 39% on passives.

Table 2.2

Performance on active and passive sentences (% correct)

Patient	Study		Active	Passive
WR	B&M		95	60
BJ	B&M		80	55
MG	B&M		80	40
CI	B&M		100	65
KA	B&M		80	20
MN	B&M		90	45
JJP	HAL, BSHMCK		85	65
KTS	HAL, BSHMCK, CK		83	37
KKM	HAL, BSHMCK		90	35
FER	BSHMCK		70	60
FCO	BSHMCK		80	55
PSB	CK		50	55
PTH	CK		66	58
PKD	CK		80	22
		Mean	**80.6**	**48**

Note: B&M, Beretta & Munn (1998); HAL, Halliwell (2001); BSHMCK, Beretta, Schmitt, Halliwell, Munn, Cuetos & Kim (2001); KC, Cho & Kim (2002)

Table 2.2 shows that the 14 patients reveal an average performance of 80% on actives and 48% on passives. Combining data from Tables 2.1 and 2.2, the overall means are 83% on actives and 53% on passives, supporting the claim that there is a core pattern of above chance on active and chance on passives. Although not an exhaustive review, it is clear from the data that, even though not all 56 patients *individually* display the pattern of above chance on active and chance on passive, the overall *group* means do support the asymmetry.

Relative Clauses

In addition to the pattern described for active and passive sentences, another robust pattern involves subject and object relative clauses. Broca's aphasics are reported to be above chance on subject relative clauses (2-3a) but at chance on object relative clauses (2-3b).

(2-3) a. The cat that bit the dog was big *Subject Relative Clause*

b. The dog that the cat bit was big *Object Relative Clause*

Support for this pattern is again presented in Grodzinsky et al. (1999) and Piñango (1999), who analyzed data from 17 patients on subject and object relative clauses reported in the literature. Table 2.3 provides a summary of these analyses (Piñango, 1999, p. 171; Grodzinsky et al., 1999, p. 146). Together they find an overall mean of 84% on subject relatives and 58% on object relatives.

Table 2.3

Performance on subject and object relative clauses (% correct)

Patient	Study	Subject Relative	Object Relative
AB	BHPP	75	45
AT	LSC	85	65
DR	LSC	75	55
DT	LSC	80	40
EM	G	90	75
ER	G	85	60
ER	BHPP	90	60
GV	BHPP	60	40
JG	BHPP	85	75
LD	G	85	35
MJ	LSC	90	80
RD	G	90	35
SP	CF	100	66
SP	LSC	90	65
VM	LSC	95	80
VP	LSC	85	80
YM	BHPP	70	45
	Mean	**84.1**	**58.9**

Note: BHPP, Beretta, Hartford, Patterson, & Piñango (1996); CF, Caplan & Futter (1986); G, Grodzinsky (1989); LSC, Lukatela, Shankweiler & Crain (1995).

Table 2.4 adds data from three more recent studies. The mean for subject relative clauses is 83% and object relatives 62%.

Table 2.4

Performance on subject and object relative clauses (% correct)

Patient	Study		Subject Relative	Object Relative
BH	B&M, B		85	60
AE	B&M, B		80	35
GF	B&M, B		90	70
RH	B&M, B		85	65
QH	B&M, B		80	60
AK	B&M, B		75	75
PR	B&M, B		80	60
MK	B&M, B		95	80
JS	B&M, B		90	80
CB	BC, B		100	65
RH	BC, B		80	55
JM	BC, B		90	50
BY	BC, B		90	55
MH	BC, B		75	65
MP	BC, B		75	60
EM	BC, B		70	60
GW	BC, B		70	55
		Mean	**82.9**	**61.7**

Note: B, Beretta (2001); BC, Beretta & Campbell (2001); B&M, Beretta & Munn (1998)

Combining data from Tables 2.3 and 2.4, the overall means are 83% on subject relatives and 60% on object relatives, supporting the claim that there is a core pattern of above chance on subject and chance on object relatives. Again, although not an exhaustive review of relative clauses, it is representative data from 34 patients in several major studies.

2.3.2 Other Interesting Data

In addition to the core data above, there are a number of syntactic constructions whose patterns are not as robust but have interesting theoretical implications. This section will discuss three such constructions: scrambling, *wh*-questions, and quantified subject constructions.

Scrambling

One theoretically interesting syntactic variation within the active/passive paradigm is scrambling. Scrambling moves an element to sentence initial position. Although this is marginally possible in English in certain contexts (e.g., 'Fish, I like'), it is highly restricted. In languages like Korean and Japanese, however, it is quite common. Consider the Korean active and passive examples in (2-4) and (2-5).

(2-4)	a.	koyangi-ka	**kae-lul**	mwul-ess-ta	*Active*
		cat-nom	dog-acc	bite-past-decl	
		'The cat bit the dog'			
	b.	**kae-lul**	koyangi-ka	mwul-ess-ta	*Scrambled*
		dog-acc	cat-nom	bite-past-decl	
		'The cat bit the dog'			

(2-5) a. koyangi-ka **kae-eykey** mwul-hi-ess-ta *Passive*

cat-nom dog-by bite-pass-past-decl

'The cat was bitten by the dog.'

b. **kae-eykey** koyangi-ka mwul-hi-ess-ta *Scrambled*

dog-by cat-nom bite-pass-past-decl

'The cat was bitten by the dog.'

The examples (2-4a) and (2-5a) are in canonical order for active and passive, respectively (Sohn, 1999). In (2-4b), however, the object has been scrambled to sentence initial position, while in (2-5b) the by-phrase has scrambled.

This construction is particularly interesting for aphasia because it is an uncontroversial example of syntactic movement. Scrambling holds all elements in an active sentence constant, except the displaced element. Scrambling also has the effect of reversing thematic roles. It thus can be used as a baseline to test whether movement disrupts comprehension, as well as to test accounts that rely on linear assignment of thematic roles.

The preliminary pattern that has emerged is chance performance on scrambled sentences. Beretta, Schmitt, Halliwell, Munn, Cuetos, & Kim (2001) report that Korean and Spanish patients who are above chance on active and at chance on passive perform at chance on both scrambled active and scrambled passive. This same pattern is reported by Hagiwara and Caplan (1990) for Japanese.

Wh-Questions

Like scrambling, *wh*-questions also involve syntactic movement and are interesting theoretically for Broca's aphasia. They are particularly interesting in languages like Korean and Japanese, in which *wh*-phrases remain *in-situ* but move at the level of LF.

As mentioned above, there are fewer reports of data on *wh*-questions, and these are all from English. Hickok and Avrutin (1995, 1996) report that two agrammatic patients performed above chance on both subject and object *who*-questions (2-6a, b); yet, they performed above chance on subject *which-N* questions and at chance on object *which-N* questions (2-7a,b).

(2-6) a. Who bit the dog? *Subject Who-Question*

b. Who did the cat bite? *Object Who-Question*

(2-7) a. Which cat bit the dog? *Subject Which-N Question*

b. Which dog did the cat bite? *Object Which-N Question*

Tait, Thompson and Ballard (1995) and Thompson, Tait, Ballard and Fix (1999) argue that individually only one of their four Broca's patients fit the pattern reported in Hickok and Avrutin (1996). However, a closer examination of the data reveals that *as a group*, they displayed 78% correct performance on subject *wh*-questions, 78% on object *wh*-questions, 72% on subject *which-N* questions and 60% on object *which-N* questions. These data seem to support Hickok and Avrutin's claim that agrammatic patients show a subject/object asymmetry for *which-N* questions but not *wh*-questions. Table 2.5 presents all patients and overall means for questions.

Table 2.5

Performance on wh-questions (% correct)

Patient	Study	Subject Wh-Q	Object Wh-Q	Subject Which-N	Object Which-N
RD	HA	80	87	87	47
FC	HA	93	87	87	47
MD	TTB, TTBF	73	82	73	76
CH	TTB, TTBF	58	78	58	67
DL	TTB, TTBF	95	87	82	51
FP	TTB, TTBF	87	66	76	49
	Mean	**81**	**81.3**	**77.2**	**56.2**

Note: HA, Hickok & Avrutin (1995); TTB, Tait, Thompson & Ballard (1995); TTBF, Thompson, Tait, Ballard & Fix (1999).

The overall means given in Table 2.5 support Hickok and Avrutin's (1996) claim that *wh*-questions do not show the subject/object asymmetry, as both subject and object are above chance. The *which-N* questions do show the asymmetry, as subject questions are above chance and objects at chance.

Quantified Subjects

A final area to be considered here is constructions with quantified subjects. As will be discussed below, Grodzinsky (1995) argues that the reason Broca's patients display an asymmetry in *which-N* questions but not in *wh*-questions is that *which-N* questions are referential, while *wh*-questions are non-referential. Grodzinsky argues that this makes the prediction that other non-referential constructions should also be above chance. He cites Saddy (1995) in support of this. Saddy reports that, while Broca's perform at chance on passives (2-8a), their performance is lifted to above chance on the same stimuli if the subject of the passive is quantified (2-8b).

(2-8) a. The dog was bitten by the cat — *Passive*

b. Every dog was bitten by a cat — *Quantified Subject-Passive*

These results have been replicated in both Avrutin (2000) and Balogh and Grodzinsky (2000). Both studies find that patients who are above chance on actives and at chance on passives perform above chance on passives with quantified subjects.

Overall, based upon more than 25 years of research, the core syntactic data in Broca's aphasia can be summarized as follows.[3] The most stable comprehension patterns are above chance on actives and subject relative clauses and at chance on passive, and object relative clauses. Preliminary data that are less stable, but just as interesting theoretically, include above chance performance on subject and object *wh*-questions and quantified subjects and at chance performance on scrambled actives and scrambled passives.

Unfortunately, much of the data presented above is from English. Yet, in order to discern language specific from universal properties in aphasia, it is necessary to conduct cross-linguistic analyses. Korean contrasts with English and other languages studied to date in theoretically interesting ways. It is similar to English in some constructions and different in others; and because of this Korean is useful for teasing apart predictions for patterns of Broca's comprehension. For example, Korean is an SOV (head-final)

[3] See Grodzinsky (2000) for a review of other syntactic deficits

language, and this has consequences for phrase structure in terms of ordering elements within sentence types such as active, passive and relative clauses. Also, where there is movement in English, there is often none in Korean (e.g., *wh*-questions). Therefore, this dissertation will investigate the patterns presented above in Korean Broca's aphasia.

2.4 Theoretical Background

In addition to the empirical issues described above, this dissertation addresses two theoretical issues. First, the empirical data from Korean Broca's comprehension will be brought to bear on four leading accounts of Broca's aphasia to provide a further cross-linguistic test. As background to the predictions that the four accounts make in subsequent chapters, this section will characterize the four accounts and present their analyses of the core and additional data. Second, the empirical data will be used as clues to help discern appropriate syntactic analyses in three areas of debate in Korean syntactic theory. Although specific syntactic arguments will be provided in the appropriate chapter, this section will briefly characterize the debates.

2.4.1 Accounts for Comprehension Patterns in Broca's Aphasia

The core data presented above have contributed much to the study of aphasia. Although descriptions do allow for comparison of characteristics and possibly for classification of patients, they do not explain *why* some properties of the language system are impaired and some are not. Grodzinsky (1990) points out that understanding why involves several steps. The first step is to collect and examine a data set, describe it and state generalizations over the data. The second step is to use the description to derive predictions for the pattern of sparing and loss and to state these predictions within a theoretical framework (i.e., with reference to a normal language system). By modifying the normal system in specific ways, an *explanation* of the impaired system can be inferred. Without reference to a normal system, a description would simply be an unrelated and unnecessary theory of deficits; and there is no need to develop theories of systems that are broken. The third step is to test the predictions to further refine the description and to motivate further constraints on the theory.

Within this framework, accounts of aphasic comprehension attempt to explain the comprehension patterns described above. There are a number of general orientations from which to study aphasia (e.g., psychological, linguistic). Even within a linguistic orientation there are accounts of aphasia that approach the data from a number of different theoretical perspectives. These can be broadly divided into four categories: (i) non-linguistic deficit (e.g., Caplan and Waters, 1999; Kolk, 1998; Shapiro and Nagel, 1995), (ii) linguistic but not syntactic deficit (e.g., Kean, 1977; Lapointe, 1983), (iii) global syntactic deficit (e.g., Caplan and Futter, 1986; Caramazza and Zurif, 1976), and (iv) selective syntactic deficit (e.g., Grodzinsky 1995; Linebarger et al., 1995; Mauner et al., 1993; Piñango, 2000).

Although each of the four types of accounts is theoretically interesting, a thorough investigation of all is beyond the scope of this dissertation. As this study is a syntactic investigation of Korean Broca's aphasia, I will discuss only the selective syntactic accounts of aphasia. Furthermore, following Beretta (2001), I will limit the focus to two major strands of inquiry into Broca's aphasia: (i) those approaches that adopt a linear approach to thematic assignment in the interpretation of sentences, and (ii) those approaches that advocate a structural approach regarding the assignment of thematic roles (i.e., without resorting to linear order). In the following, I will briefly review four current accounts that fall within this linear versus structural dichotomy.

Linear Approaches

Trace Deletion Hypothesis

The Trace Deletion Hypothesis (TDH) (Grodzinsky, 1986b; 1990; 1995) sparked much of the recent syntactic research on agrammatism. Although there have been many accounts of agrammatism, since Grodzinsky's (1986b) original formulation of the TDH, the focus of investigation has shifted from lexical to sentence level impairments. In addition, Grodzinsky's work has helped sharpen the discussion of the nature of agrammatism, how it is constrained and how it may constrain current syntactic and linguistic theory.

Grodzinsky (1986b, 1990, 1995) argues that the locus of the agrammatic syntactic comprehension deficit is an impaired representation such that the language system cannot represent referential dependencies created by movement in a sentence (e.g., passives and relative clauses). Thus, the TDH holds that while syntactic representation remains intact, it is the traces in thematic positions that are impaired.

Within the Government and Binding framework, thematic relations encode the semantic role an argument plays with respect to a predicate. The position in a phrase structure in which a predicate assigns its arguments a thematic role is a theta-position. Traces in theta-positions are created when a noun phrase (NP) moves from its original position in the underlying D-structure to its final position in the S-structure. The TDH claims that these traces are deleted, or at least not accessible, in Broca's aphasia. Without traces, displaced NPs are left without a thematic role, and this has consequences for semantic interpretation.

The original formulation of the TDH consisted of two parts. First, as the name signifies, trace deletion occurs in an agrammatic representation. Second, a default strategy applies if there is an NP without a theta-role. The strategy assigns roles on the basis of linear position in a sentence. If the NP is in the first position of a sentence, it is assigned Agent, as most NPs in that position are agents (Grodzinsky, 1986b).

The TDH was revised to account for empirical and theoretical changes in the literature (Grodzinsky, 1995). This new account subsumes the TDH but adds that trace deletion does not apply equally to all traces. The new formulation, referred to as the Trace-Based Account (TBA), is more restrictive in that it further constrains which traces are deleted and when the strategy applies.[4] Grodzinsky argues that only traces in theta-positions are deleted, while all other empty categories are left intact. This constraint was prompted by the VP-Internal Subject Hypothesis (Kitagawa, 1986; and others) and the finding that traces left by head movement of verbs do not seem to present difficulties for agrammatic patients (e.g., Lonzi and Luzzati, 1993). Changes to the strategy will be discussed in detail below.

First, however, consider how the TDH operates with active sentences. As mentioned in the core data above, the TDH needs to account for above chance performance on actives. The example in (2-9) provides the normal thematic assignment in an active sentence, assuming the VP-Internal Subject Hypothesis. The NP *the cat* moves from [Spec VP] to subject position [Spec IP] and receives the role Agent via the referential chain that links it to its trace, represented by the coindexations. The NP *the dog* receives the role Theme via direct assignment from the verb.

[4] Although Grodzinsky referred to his most recent account as TBA, I will continue to refer to the hypothesis as the TDH as it is most often referred to in the literature.

(2-9) [The cat]$_i$ t_i bit [the dog] *Normal*

Agent Theme

In the agrammatic representation in (2-10a), the trace is deleted (represented by *). The chain between the moved NP and the thematic position is disrupted, and the NP *the cat* does not receive a theta-role. The default strategy thus assigns the Agent role in (2-10b), as the first NP is typically Agent. The NP *the dog* is assigned Theme syntactically from the verb. The strategy thus compensates the impaired representation by matching normal thematic assignment, and agrammatic performance is above chance.

(2-10) a. [The cat]$_i$ * bit [the dog] *Agrammatic*

????? Theme

b. [The cat]$_i$ * bit [the dog]

Agent Theme

(via strategy) (via syntax)

For passives, the TDH must account for chance performance. Consider the normal representation of a passive in (2-11).[5] The NP *the dog* moves from object position to subject position. This movement leaves a trace in object position. The moved NP receives the role Theme via the chain with the trace. The NP *the cat* in the by-phrase is assigned Agent.

[5] Grodzinsky (1986b, 1995) assumes the passive analysis of Baker, Johnson & Roberts (1989).

(2-11) [The dog]$_i$ was bitten t_i by [the cat] *Normal*

Theme Agent

In the agrammatic representation in (2-12a), the trace is deleted. The chain between the moved NP *the dog* and its trace is disrupted, and the NP *the dog* does not receive a theta-role. The strategy thus assigns the Agent role in (2-12b). The NP *the cat* in the by-phrase is assigned Agent syntactically. Thus, the strategy introduces an Agent into the sentence where an Agent has already been grammatically licensed. This creates competition between arguments for Agent. Facing two possible Agents of the action (i.e., the dog and the cat), the agrammatic patient is forced to choose, resulting in chance performance.

(2-12) a. [The dog]$_i$ was bitten * by [the cat] *Agrammatic*

????? Agent

(via syntax)

b. [The dog]$_i$ was bitten * by [the cat]

Agent Agent

(via strategy) (via syntax)

The TDH accounts for performance in subject and object relative clauses in a similar manner. In both constructions the trace is deleted, which forces the application of the strategy. Its application either compensates for the unassigned theta-roles or creates competition between the syntactically assigned theta role and the strategically assigned role. Consider the following examples. In (2-13) normal assignment is presented. Agent is assigned to *the cat* and Theme to *the dog*.

(2-13) [The cat]$_i$ Op$_i$ that t$_i$ bit [the dog] is big *Normal*

Agent Theme

In the agrammatic representation in (2-14a), the trace is deleted, resulting in no theta-role for the moved element. This triggers the strategy, which assigns Agent in (2-14b). As this matches the normal thematic assignment, performance is above chance.

(2-14) a. [The cat]$_i$ Op$_i$ that * bit [the dog] is big *Agrammatic*

????? Theme

b. [The cat]$_i$ Op$_i$ that * bit [the dog] is big

Agent Theme

In the object relative, there is movement from object position to clause-initial position (2-15). The moved element *the dog* is assigned Theme via the chain and *the cat* is assigned Agent.

(2-15) [The dog]$_i$ Op$_i$ that [the cat] bit t$_i$ is big *Normal*

Theme Agent

In an agrammatic representation, the trace is deleted, leaving the moved element without a theta-role (2-16a). The strategy assigns Agent in (2-16b). This again creates competition between arguments for Agent. The agrammatic patient is forced to choose, resulting in chance performance.

(2-16) a. [The dog]$_i$ Op$_i$ that [the cat] bit * is big *Agrammatic*

?????   Agent

b. [The dog]$_i$ Op$_i$ that [the cat] bit * is big

Agent   Agent

The TDH is successful in partitioning the core active/passive and subject/object relative data. However, some modifications were required. As mentioned above, one modification was to claim that trace deletion occurs only with traces in theta-positions. This allowed the TDH to adapt to changes in syntactic theory.

The second modification was to the default strategy. This modification was motivated by the asymmetry reported by Hickok and Avrutin (1995), who found that two agrammatic patients performed above chance on subject *which-N* questions and at chance on object *which-N* questions (2-17). However, these same patients performed above chance on both subject and object *wh*-questions (2-18).

(2-17) a. Which cat bit the dog? *Subject Which-N Question*

b. Which dog did the cat bite? *Object Which-N Question*

(2-18) a. Who bit the dog? *Subject Wh-Question*

b. Who did the cat bite? *Object Wh-Question*

The examples in (2-17a) and (2-18a) are subject extraction constructions similar to subject relative clauses. The examples in (2-17b) and (2-18b) are object extraction constructions similar to object relative clauses. The prediction of the TDH for these should be the same: agrammatic patients should perform above chance on (2-17a) and (2-18a) and at chance on sentences like (2-18b) and (2-18b). However, as described above the data reported by Hickok and Avrutin do not display this pattern. Whereas *which-N* question yield the predicted subject/object asymmetry, *wh*-questions do not.

Based on these data, Grodzinsky (1995) modifies the strategy by arguing that the strategy does not apply to non-referential NPs. Following Pesetsky (1987), the *which-N* examples in (2-17) presuppose a set of elements in the discourse. In (2-17a) the expression *which cat* presupposes a set of cats, one of which performed the biting. In (2-17b) the expression *which dog* presupposes a set of dogs, one of which got bitten. *Which-N* constructions are thus referential in that they are linked to the discourse (D-linked). However, the *wh*-questions in (2-18) are not referential because they do not presuppose elements in the discourse and are not D-linked. Thus, to account for the *wh-/which-N* asymmetry, Grodzinsky argues that referential (D-linked) *which-N* elements are implicated in the deficit while non-referential (non-D-linked) *wh*-elements are not. The strategy applies only to referential elements and is thus referred to as R(eferential)-strategy.

This modification prevents the R-strategy from applying in cases where it could create competition between two possible Agents in *wh*-questions but still allow competition in *which-N* constructions. In the cases where the *wh*-element is non-referential, Grodzinsky assumes that because lexical knowledge is intact, the correct role of the *wh*-element can be inferred. The TDH can then account for the *wh*-question data described above.

One consequence of this modification is that it makes the prediction that agrammatic patients should perform above chance on both active and passive sentences with quantified subjects such as those in (2-19), since quantification is argued to make the NP non-referential.

(2-19) a. Every cat bit a dog

b. Every dog was bitten by a cat

This prediction holds as Saddy (1995) reports that three subjects performed above chance on passives with quantified subjects. Thus, with these modifications to the strategy the TDH is successful in accounting for all of the data presented above.

One final modification to the TDH must also be considered. Grodzinsky (1995) reports that four agrammatic patients displayed the active/passive asymmetry in non-agentive sentences such as those in (2-20).

(2-20) a. The book covers the newspaper

b. The newspaper is covered by the book.

(Grodzinsky, 1995, p. 490)

This is a problem for the TDH given that the R-strategy assigns Agent to the first NP. As Agents are animate, the question is how the strategy can apply to inanimate NPs. Grodzinsky argues that the strategy applies regardless of animacy but assigns a thematic role from a set of possible roles compatible with its animacy. He points out that since Caramazza & Zurif (1976), studies have shown that background knowledge remains intact (e.g., plausibility in grammaticality judgments). Thus, knowledge that inanimate NPs cannot be Agents is spared in agrammatism and patients make the appropriate shift in thematic assignment. Therefore, rather than the strategy simply assigning Agent to all first NPs, thematic assignment is achieved by invoking the Thematic Hierarchy given in (2-21).

(2-21) Thematic hierarchy (Jackendoff, 1972)

1. Agent
2. Experiencer
3. Location, source, goal
4. Theme

Grodzinsky makes use of this hierarchy by positing that patients reinterpret the thematic representation. Thus, the R-strategy is unable to assign Agent to the non-agentive subject of the passive sentence in (2-20b). The agrammatic patient is forced to reinterpret the thematic representation and proceeds down the Thematic Hierarchy to assign the role appropriate to an inanimate NP. This then creates competition, as it is the same thematic role that happens to be assigned to the NP in the by-phrase. This results in chance performance just as it does in the agentive passive.

Argument Linking Hypothesis

Like the TDH, the Argument Linking Hypothesis (ALH) (Piñango, 1999, 2000) argues that linear order of arguments is key in accounting for patterns in Broca's comprehension. Like Grodzinsky, Piñango observes that movement of an object reverses the canonical order of thematic roles licensed by the verb. Unlike the TDH, however, it is not movement that is problem; it is the correspondence between argument structure and syntactic structure that is the locus of the impairment.

The ALH assumes that the language system has two linking mechanisms that establish a correspondence between arguments in semantic structure and syntactic representation. The first linking mechanism is semantic linking, which establishes a correspondence between arguments in argument structure (e.g., Agent, Theme) and linear positions in a sentence (e.g., first NP, second NP). The second linking mechanism is syntactic linking, which establishes a correspondence between arguments in argument structure and grammatical functions in a sentence (e.g., subject, object). In an intact system, Piñango argues that syntactic linking always takes precedence over semantic linking, called the linking constraint.

Piñango claims that the linking constraint is a temporal constraint that maintains a time differential in the processing of semantic and syntactic representations as comprehension progresses. In an intact system, syntactic mechanisms (including syntactic linking) take place before semantic ones. However, if this temporal constraint is delayed or inoperative, the two linking mechanisms are left to compete with each other. It is argued that the lexical slow down reported in Broca's aphasia (e.g., Zurif, Swinney, Prather, Solomon and Bushel, 1993; among others) may be the delay that affects the linking constraint and delays the construction of the syntactic mechanism, allowing the semantic mechanism to emerge off-line for the purposes of comprehension.

Broca's aphasia is thus an impairment of the linking constraint. The ALH claims that both argument structure and syntactic representation are intact. However, due to impairment to the linking mechanism, the language system has two active linking mechanisms operating simultaneously. This results in competition such that when the two linking mechanisms agree, patient performs normally, but when the two linking mechanisms conflict (i.e., whenever semantic roles are reversed) patients perform at chance.

Consider how the ALH accounts for the core data. The basic argument structure of the verb *bite*, along with an active and subject relative clause are given in (2-22).

(2-22) a. BITE: verb <Agent, Theme>

b. [The cat] bit [the dog]

c. [The cat] who bit [the dog] is big

As the order of arguments in the argument structure in (2-22a) is Agent and Theme, in the both the active (2-22b) and subject relative (2-22c) semantic linking would yield

Agent for the NP *the cat* in first position and Theme for the NP *the dog* in second position. Syntactic linking would link Agent to the NP *the cat* in subject position and Theme to the NP *the dog* in object position. This is represented in (2-23).

(2-23) a. [The cat] bit [the dog]

Agent	Theme	*Semantic Linking*
Agent	Theme	*Syntactic Linking*

b. [The cat] who bit [the dog] is big

Agent	Theme	*Semantic Linking*
Agent	Theme	*Syntactic Linking*

In both semantic and syntactic linking the Agent is linked to the NP *the cat* and the Theme is linked to the NP *the dog*. As both semantic and syntactic linking match, Broca's patients are correctly predicted to perform above chance on active and subject relative clauses.

Consider the passive and object relative in (2-24).

(2-24) a. [The dog] was bitten by [the cat]

Agent	Theme	*Semantic Linking*
Theme	Agent	*Syntactic Linking*

b. [The dog] who [the cat] bit is big

Agent	Theme	*Semantic Linking*
Theme	Agent	*Syntactic Linking*

Based upon the argument structure given above in (2-22a), in both the passive (2-24a) and object relative (2-24b) semantic linking would yield Agent for the NP *the dog* in first position and Theme for the NP *the cat* in second position. However, syntactic linking would link Theme to the NP *the dog* in subject position and Agent to the NP *the cat* in object position. There is a mismatch in thematic assignment. The NP *the dog* receives Agent from semantic linking and Theme from syntactic linking, while the NP *the cat* receives Theme from semantic linking and Agent from syntactic linking. Faced with this competition, Broca's patients are correctly predicted to perform at chance on passive and object relative clauses.

Although Piñango does not discuss *wh*-questions or quantified subjects, the ALH would make the following predictions concerning the English data. Consider the *wh*-question examples in (2-25).

(2-25) a. [Who] bit [the dog] ?

Agent	Theme	*Semantic Linking*
Agent	Theme	*Syntactic Linking*

b. [Who] did [the cat] bite ?

Agent	Theme	*Semantic Linking*
Theme	Agent	*Syntactic Linking*

Semantic linking in the subject *wh*-question in (2-25a) would yield Agent for the NP *who* in first position and Theme for the NP *the dog* in second position. Syntactic linking would link Agent to the NP *who* in initial position and Theme to the NP *the dog* in object position. As both semantic and syntactic linking match, Broca's patients are correctly predicted to perform above chance on subject *wh*-questions.

Semantic linking in the object *wh*-question in (2-25b) would yield Theme for the NP *who* in first position and Theme for the NP *the cat* in second position. However, syntactic linking would link Theme to the NP *who* in initial position and Agent to the NP *the cat* in object position. As there is a mismatch in thematic assignment Broca's patients are predicted to perform at chance on object *wh*-questions. Thus, the ALH would fail to account for the English *wh*-question data

The same analyses apply to quantified subjects. As quantification does not change the assignment of thematic roles, the ALH would correctly predict above chance on active sentences with quantified subjects. However, it would incorrectly predict at chance performance on passives with quantified subjects.

Overall, the ALH can account for the robust core data (i.e., active/passive, subject/object relative clause) but is less successful for the additional data such as *wh*-question and quantified subject.

Mapping Hypothesis

Like the ALH, the Mapping Hypothesis (MH) (Linebarger, 1990, 1995; Linebarger et. al., 1983a; Schwartz et. al., 1980) sees syntactic and semantic mapping as the locus of the impairment. The MH claims that agrammatic comprehension is not a result of a failure to compute syntactic structure but is rather a failure to exploit that structure for interpretive processes. That is, patients are able to construct a normal syntactic representation but are unable to exploit it for semantic interpretation.

Particularly important in this syntactic-semantic interface is the relationship between thematic roles and syntactic structure. Thematic assignment is seen as a process of coindexation between theta-grid positions in argument structure and syntactic argument positions. If the mapping between argument structure and argument position is complicated because of such processes as argument movement, comprehension breaks down. Due to the vulnerability of the mapping mechanism, even with unmoved elements, the patient becomes more dependent than normals on non-linguistic (extra-grammatical) strategies.

One strategy that is deployed is the canonical word order strategy. By mapping arguments that frequently occur in certain positions with theta-roles normally assigned to those positions, an interpretation may be constructed. This accounts for the difference between active and passive, as well as subject and object relatives. Patients map appropriate roles to appropriate arguments in active and subject relative sentences but not in the passive and object relatives, where they map the opposite. Thus, the mapping process is facilitated in canonical structures and 'garden-pathed' in non-canonical ones. Consider the active and subject relative sentences in (2-26).

(2-26) a. BITE: verb <Agent, Theme>

b. [The cat] bit [the dog]

Agent Theme

c. [The cat] who bit [the dog] is big

Agent Theme

In (2-26a) the theta-grid for the verb *bite* would be Agent and Theme. In a normal representation, Agent would be mapped to the NP in subject position and the Theme to the NP in object position. Thus, in (2-26b) and (2-26c) the NP *the cat* would be assigned the role of Agent and *the dog* would be assigned Theme.

In an agrammatic representation, the elements in the theta-grid would be assigned canonically, with Agent assigned to the first NP and Theme to the second. Thus, in actives and subject relatives, the order of the elements in the grid matches the order in a normal assignment. In canonical sentences such as this, the mapping process is facilitated and patients perform above chance.

By contrast, in passive and object relative sentences, the order of the theta-roles is reversed in the surface structure, and the mapping process is thereby complicated. Consider (2-27).

(2-27) a. BITE: verb <Agent, Theme>

b. [The dog] was bitten by [the cat]

Theme Agent

c. [The dog] who [the cat] bit is big

Theme Agent

In (2-27a), the theta-grid for the verb *bite* would again be Agent and Theme. The order of the elements in this grid, however, does not match the order of theta-roles for subject and object in the sentences in (2-27b) and (2-27c), as the object has moved to subject position. In a normal representation, Theme would be mapped to the NP in subject position, mediated by a trace in object position. Agent would be assigned to the oblique NP. Thus, in (2-27b) and (2-27c) the NP *the dog* would be assigned the role of Theme and *the cat* would be assigned Agent.

In an agrammatic representation, the elements in the theta-grid would be assigned canonically, with Agent assigned to the first NP and Theme to the second. Thus, the order of the elements in the grid would be reversed. In non-canonical sentences such as this, the mapping process is disrupted and performance is impaired. The MH predicts below chance performance on these sentences.

Although Linebarger does not discuss *wh*-questions or quantified subjects, the MH would make predictions similar to the ALH. Consider the *wh*-question examples in (2-28).

(2-28) a. BITE: verb <Agent, Theme>

b. [Who] bit [the dog] ?

Agent Theme

c. [Who] did [the cat] bite ?

Theme Agent

In (2-28a) the theta-grid for the verb *bite* would again be Agent and Theme. In a normal representation, Agent would be mapped to the NP *who* in subject position and the Theme to the NP *the dog* in object position. Thus, in (2-28b) *who* would be assigned the role of Agent and *the dog* would be assigned Theme. In an agrammatic representation, the elements in the theta-grid would be assigned canonically, with Agent assigned to the first NP and Theme to the second. Thus, the order of the elements in the grid matches the normal. The MH would correctly predict above chance performance on subject *wh*-questions.

In (2-28c), however, the order of the elements in the theta-grid does not match the order of theta-roles for subject and object, as the object *who* has moved to initial position. In a normal representation, Theme would be mapped to the NP in initial position and Agent would be assigned to the oblique NP. In an agrammatic representation, the elements in the theta-grid would be assigned canonically, with Agent assigned to the first NP and Theme to the second. Thus, the order of the elements in the grid would be reversed and the mapping process disrupted. The MH would incorrectly predict below chance performance on object *wh*-questions.

The same analyses would apply to quantified subjects. As quantification does not change the assignment of thematic roles, the MH would correctly predict above chance on the actives with quantified subjects but incorrectly predict at chance performance on passives with quantified subjects. Overall, like the ALH, the MH is successful in accounting for the robust core data but is less successful on the *wh*-question and quantified subject data.

A Structural Approach

The Double Dependency Hypothesis

The Double Dependency Hypothesis (DDH) (Mauner, Fromkin, and Cornell, 1993) attempts to account for the core data by relying on syntactic theory without reference to a non-linguistic heuristic. The DDH captures Grodzinsky's original intuition that agrammatic patients are faced with an ambiguity arising from the formation of syntactic chains, but it does so without reference to linear order or a heuristic strategy. The DDH instead relies on referential chains and their coindexation. Chance performance arises because of a deficit that presents the patient with "at least two alternative representations where the normal only has one" (Mauner et al., 1993, p. 348). The Double Dependency Hypothesis, then, claims:

(2-29) a. the deficit underlying asyntactic comprehension affects the processing of syntactic referential dependencies, and

b. when there is only one such dependency, the resulting syntactic representation, though abnormal, is not ambiguous, but when there are two such dependencies, the resulting representation is ambiguous.

(Mauner et al., 1993, p. 349)

The DDH assumes that patients cannot coindex dependencies in a chain. The elimination of the coindexation constraint increases the structural representations available to patients for interpretation. This loss of coindexation affects comprehension in that the dependency between a moved referential NP and the foot of its thematic chain (i.e., the trace) is disrupted. In sentences where there are *two* such dependencies (e.g., passives and object relatives), it is unclear which NP is coindexed with what. Since the coindexation is ambiguous, and since thematic role assignment is thus also ambiguous, patients must guess who is doing what to whom. However, when there is only *one* dependency (e.g., actives and subject relatives), there is no ambiguity; therefore interpretation is normal.[6]

Consider the normal active representation in (2-30). The active sentence in (2-30a) has one dependency, given in (2-30b). Removal of the constraint on coindexation in the agrammatic representation produces only one possible referential dependency (2-31).

(2-30) a. [The cat]$_i$ t_i bit [the dog]

b. < [the cat]$_i$, t_i >

Agent

The single dependency in (2-30) provides the agrammatic with a representation in which *the cat* is coindexed with the VP-internal subject trace (denoted by index $_i$ and assigned

[6] It should be noted that 'normal' does not necessarily mean that aphasic performance will be perfect. It is well known that aphasics suffer from attention and memory deficits, which may also impinge on performance.

Agent). The NP *the dog* has no dependency. As there is no ambiguity, patients perform normally.

In subject relatives, the normal representation would be that in (2-31). Again, removal of the constraint on coindexation in the agrammatic representation produces only one possible referential dependency (2-32b). As there is no ambiguity, patients perform normally.

(2-31) a. [The cat]$_i$ Op$_i$ that t$_i$ bit [the dog] is big

b. < Op$_i$, t$_i$ >

Agent

It is important to note that although the NP *the cat* in (2-31a) is coindexed with the operator and trace, it is not considered part of the chain in (2-31b). Mauner et al. (1993) assume that the dependency between an operator and a head NP of a relative clause is different than the dependency between a moved element and its trace, despite coindexation. They argue that there is a difference between non-thematic and thematic R-dependencies. In non-thematic R-dependencies, such as that between anaphors and antecedents, the coindexation of elements in the chain serves not to transmit a theta-role but to indicate co-reference in interpretation. For example, in the sentence *John hurt himself*, the NP *John* and anaphor *himself* each independently receive a theta-role from the verb but are still interpreted as co-referential. Thus, they are coindexed and form a non-thematic chain for interpretation. However, in thematic R-dependencies, such as that created by movement, the coindexation of a trace and its antecedent allows for the transmission of a single theta-role. For example, in passives the internal argument moves from object position to [Spec IP], leaving a trace. The chain created by this movement <NP, t> receives a single theta-role from the verb. Thus, the NP and trace are coindexed and form a thematic chain.

In this way Mauner et al. can distinguish between chains that consist of R-dependencies created by *syntactic movement* and R-dependencies based on *interpretation*. While they argue that Broca's aphasia affects all R-dependencies (e.g., agreement features in grammaticality judgments), they also argue that only disruption to thematic R-dependencies leads to disruption in thematic interpretation. Thus, although the head NP *the cat* in (2-31a) is coindexed with the operator, this coindexation would constitute a non-thematic R-dependency and is not considered part of the chain in (2-31b).

Additionally, Mauner et al. (1993) note that it may be argued that an alternative coindexation may be possible in (2-30a) and (2-31a) for agrammatics. In both actives and subject relatives, the trace in VP-internal subject position could be assigned an index *j*, creating a chain with the NP [*the dog*]$_j$. However, this would lead to a deviant semantic interpretation in both cases with a reading equivalent to (2-32).

(2-32) x is the dog and x bit x

This is anomalous not only because the NP *the dog* binds both thematic roles (Agent and Theme), but also because the NP *the cat* is left without a role. Thus, the syntactic output with this coindexation is not interpretable by the semantics. It is thus ruled out as a possible representation and not even considered in agrammatic interpretation.

Consider now the passive in (2-33). The normal passive representation in (2-33a) has two dependencies (assuming the analysis of Baker, Johnson and Roberts, 1989). The dependencies (represented by <brackets>) are given in (2-33b).

(2-33) a. $[\text{The dog}]_i$ was bite $+[\text{en}]_j$ t_i by $[\text{the cat}]_j$

b. $< [\text{the dog}]_i, t_i >$ and $< [\text{the cat}]_j, \text{en}_j >$

Theme Agent

Removal of the coindexation constraint in an agrammatic representation, however, yields two possible sets of dependencies (2-34).

(2-34) a. $< [\text{the dog}]_i, t_i >$ and $< [\text{the cat}]_j, \text{en}_j >$

Theme Agent

b. $< [\text{the dog}]_i, t_j >$ and $< [\text{the cat}]_j, \text{en}_i >$

Agent Theme

The agrammatic representation in (2-34) permits two interpretations. The correct interpretation is given in (2-34a), in which *the dog* is coindexed with the trace in object position (denoted by index *i* and, therefore, assigned Theme) and *the cat* is coindexed with the passive morpheme (denoted by index *j* and assigned Agent). The incorrect interpretation is given in (2-34b), in which *the dog* is coindexed with the passive morpheme and assigned Agent and *the cat* is coindexed with the trace in object position and assigned Theme. Faced with this ambiguity, patients guess and perform at chance.

The analysis of object relatives is similar. In object relatives there are two dependencies. Consider the normal representation in (2-35).

(2-35) a. [The dog]$_i$ Op$_i$ that [the cat]$_j$ t_j bit t_i is big

b. $< Op_i , t_i >$ and $<$ [the cat]$_j$, $t_j >$

Theme Agent

The normal object relative representation in (2-35) has two dependencies (assuming the VP-Internal Subject Hypothesis). These dependencies are given (2-35b). Again, elimination of the constraint on coindexation in the agrammatic representation produces two possible sets of dependencies (2-36).

(2-36) a. $< Op_i , t_i >$ and $<$ [the cat]$_j$, $t_j >$

Theme Agent

b. $< Op_i , t_j >$ and $<$ [the cat]$_j$, $t_i >$

Agent Theme

In the correct interpretation given in (2-36a), the relative Operator (which is coindexed with *the dog*) is coindexed with the object trace (denoted by index *i* and assigned Theme) and *the cat* is coindexed with the VP-internal subject trace (denoted by index *j* and assigned Agent). In the incorrect interpretation in (2-36b), the Operator is coindexed with the VP-internal subject trace and assigned Agent and *the cat* is coindexed with the object trace and assigned Theme. Faced again with this ambiguity, patients guess and perform at chance.

As is the case for the ALH and MH, the DDH has not been tested in the case of *wh*-questions. Despite this, the DDH would make the following predictions for subject and object *wh*-questions. Consider the subject *wh*-question in (2-37).

(2-37) a. $\text{who}_i \; t_i$ bit the dog?

b. $< \text{who}_i ,\ t_i >$

Agent

In the subject *wh*-question, the *wh*-phrase raises from IP to [Spec CP]. There is thus one referential dependency between *who* and its trace. As this is the only dependency, the DDH correctly predicts Broca's patients to be above chance on subject *wh*-questions.

For object *wh*-questions, the normal representation would be that in (2-38a,b).

(2-38) a. who_i did $[\text{the cat}]_j \; t_i$ bite t_j ?

b. $< \text{who}_i ,\ t_i >$ and $< [\text{the cat}]_j ,\ t_j >$

Theme Agent

c. $< \text{who}_i ,\ t_j >$ and $< [\text{the cat}]_j ,\ t_i >$

Agent Theme

In (2-38a) there is movement of the *wh*-phrase from object position to [Spec CP] and movement of the subject from its VP-internal position to [Spec IP]. There are thus two referential dependencies. These are given in (2-38b). Given two dependencies in the normal representation, an anomalous coindexation is possible (2-38c). Within this analysis, then, the DDH incorrectly predicts that Broca's comprehension will be at chance on object *wh*-questions.

The same analyses for the active/passive would apply to actives with quantified subjects and passives with quantified subjects. As quantification does not change the number of dependencies, the DDH would correctly predict above chance on the active data but incorrectly predict at chance performance on passives with a quantified subject.

As is the case with the ALH and MH, overall, the DDH can account for the robust core data but fails to account for *wh*-question and quantified subject data.

2.4.2 Syntactic Debates in Korean

Linguistic investigations of syntactic impairment in Broca's aphasia have revealed interesting details about aphasia. Research over the last 20 years has shown that error types in aphasia are not only subtle but also vary across languages; however, this variation appears systematic and highly constrained. The nature and extent of aphasic errors seems to be constrained by the structure of each specific language. Given that patterns of sparing and loss in aphasia appear to be constrained by language structure, these patterns may in turn provide clues for language structure. That is, data from Broca's aphasia may be helpful precisely when there is no definitive evidence from syntactic arguments. There are many areas of disagreement in the descriptive and theoretical Korean syntax literature. This dissertation will consider three areas in which there is disagreement over movement and will look to the data from Korean aphasia to provide further clues. These areas are passives (A-movement), relative clauses (A-bar movement) and *wh*-questions (LF movement). The three areas can be briefly characterized as follows.

In the passive, there is a debate as to whether Korean *–hi* passives are derived via syntactic movement. It is argued that the *–hi* passive is lexical (Park, 1991) and, like English adjectival passives, involves not syntactic movement but a shift in the lexicon resulting in the passive construction. It is also argued, however, that the passive passes many diagnostic tests for movement and should be analyzed as involving movement similar to the passive in English (Cho, 1995; Halliwell, 2001).

A similar debate arises in relative clauses. There are analyses that support movement and others that support base generation. Non-movement hypotheses (e.g., Saito, 1985; Sohn, 1999) argue that movement analyses cannot account for several types of relative clause that do not obey movement constraints (e.g., Subjacency) seen in English-type relative clauses. It is argued that the gap in a relative clause is created by a base-generated *pro*. Movement analyses (e.g., Han, 1990; Kaplan and Whitman, 1995) argue that the apparent exceptions can be explained by syntactic movement and that movement constraints do in fact operate in Korean relativization. It is argued that the gap in a relative clause is a trace created by movement of an empty operator.

Finally, *wh*-phrases in Korean remain *in situ*, and thus do not move overtly at S-structure. In the literature there are two general analyses of *in-situ wh*-questions. One argues that the *in-situ wh*-phrases move at the syntactic level of LF (e.g., Huang 1982, Cheng 1991). The second account argues that no LF movement is required to account for syntactic behavior (Aoun and Li 1993, Yoon, S., 1997).

In the three debates above, there is syntactic evidence in favor of each of the positions. Therefore, data from Korean Broca's aphasia will be brought to bear on the debates to help discern clues as to the proper analysis. Details concerning these three areas of dispute will be provided in the appropriate chapter.

2.5 Research Questions

Very little is known about the nature of the syntactic deficits in Korean aphasia. Yet, Korean contrasts with the languages studied to date in theoretically interesting ways and, therefore, may provide important information about the impairment. Thus, this dissertation seeks to provide a systematic and linguistically oriented description of Korean aphasic comprehension and, in doing so, help to provide a more reliable picture of the nature of aphasic deficits in general. As syntactic movement is a well-studied phenomenon in syntactic theory and aphasia research, patterns of movement in Korean aphasia will be the focus of the investigation. In addition to describing patterns of comprehension in movement constructions, the patterns will be used to test current aphasia accounts, as well as syntactic theories.

This section will present two general types of research questions to be addressed in the dissertation: empirical and theoretical. The empirical questions will be concerned with the nature of Broca's aphasia by describing comprehension patterns in Korean Broca's aphasia. The theoretical questions will be concerned with accounts of Broca's aphasia and debates within Korean syntax in terms of movement analyses.

2.5.1 Empirical Research Questions

The first empirical research question asks what the nature of the syntactic comprehension deficit is in Korean Broca's aphasia. To answer this question, patients will be tested on such syntactic constructions as active, passive, relative clauses, *wh*-question and quantified subject constructions.

As assumed in the discussion above, there is a general consensus that Broca's and Wernicke's aphasia are distinct impairments. Wernicke's aphasic performance is thus often reported in studies as a 'control.' However, a few researchers have argued that the two aphasias are quantitatively different but qualitatively the same (e.g., Blumstein and Milberg, 2000; Lukatela, Shankweiler, and Crain, 1995; Luzzati, Toraldo, Guasti, Ghiradi, Lorenzi, and Guarnaschelli, 2001). Thus, the second empirical research question asks whether there is a dissociation in the comprehension patterns of Korean Broca's and Wernicke's aphasics. To answer this question, comprehension patterns of Korean patients with damage to Broca's area and diagnosed as Broca's agrammatics will be compared to patients with damage to Wernicke's area who have been diagnosed as fluent aphasics.

2.5.2 Theoretical Research Questions

As described above, several hypotheses have been proposed to account for the core patterns described briefly in section 2.3. The third research question asks which of the accounts (Trace Deletion Hypothesis, Argument Linking Hypothesis, Mapping Hypothesis, Double Dependency Hypothesis), better explains the empirical patterns in Korean. To answer this question, sentence-picture-matching tasks, which target interpretive processes involving movement, will be used.

In addition to accounting for patterns, the aphasic patterns may help to distinguish between the syntactic analyses in each of the three debates described above. Therefore, the fourth research question asks whether aphasic data supports a movement or non-movement analysis for Korean passives, relative clauses and *wh*-questions. To answer this question, data from Broca's patients in these constructions will be used. Those patients who show sensitivity to scrambling in active sentences, where movement is clear, will be tested to see if they show a dissociation in the sentence types under investigation.

2.5.3 Summary of Research Questions

This dissertation will test the hypothesis that damage to Broca's area in the left frontal cortex of the brain results in a selective syntactic comprehension deficit involving displaced constituents in sentences. Comprehension studies of patients with this type of damage have been conducted in many languages, but very few studies have been done in Korean, a language that contrasts syntactically with English in theoretically interesting ways. This dissertation will ask two general types of questions: empirical and theoretical. These are summarized below.

Empirical

(i) Do Korean Broca's aphasics exhibit the same patterns reported in other languages in constructions such as active/passive, subject/object relative clause, subject/object *wh*-question, and quantified subjects constructions?

(ii) Is there a dissociation in the comprehension patterns of patients clinically classified as Broca's aphasia and Wernicke's aphasia?

Theoretical

(iii) Is the impairment in Broca's aphasia best characterized as a linear assignment deficit or a structural deficit? How does each of the linguistic accounts (e.g., TDH, ALH, MH, DDH) explain the data?

(iv) Do data from Korean Broca's provide evidence for syntactic movement or non-movement analyses for Korean passives, relative clauses, and *wh*-questions, in which there are disagreements in the theoretical literature?

Each of the following chapters will address these four questions within a specific construction (i.e., active, passive, relative clause, *wh*-question, quantified subject), while the final chapter will draw larger conclusions regarding these questions. The next chapter will provide background on the subjects and the general methods and materials used in the dissertation.

CHAPTER 3

METHODS AND MATERIALS

3.1 Introduction

This chapter will describe in general the methods and materials used for the experiments in this dissertation. The chapter is organized as follows. Section 3.2 will provide background information on the subjects who participated in the experiments. Section 3.3 will describe the general materials used. Section 3.4 describes the procedures used for presenting the materials. Finally, Section 3.5 will summarize the analyses used throughout the dissertation.

3.2 Subjects

This section will describe the backgrounds of all the subjects that participated in the experiments. Section 3.2.1 will describe the Broca's patients. Section 3.2.2 will provide information about the Wernicke's patients. Section 3.2.3 will describe the control subjects that were matched for each of the patients.

3.2.1 Broca's Subjects

There were several criteria for inclusion of Broca's subjects in this study. Neurological criteria included a lesion in the left frontal lobe involving Broca's area, not extending into the temporal lobe, and confirmed by CT or MRI. Subjects must also have been at least three months post onset prior to participation in the study. Neuropsychological criteria included speech pathologist's diagnosis of Broca's aphasia based on scores on the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1972), Kyunghee University Medical Center (KHMC) Aphasia Examination or other batteries such as auditory memory retention span, and speech production. Linguistic criteria required subjects to be monolingual speakers of Korean born and raised in the Seoul dialect. Additionally, Broca's subjects must have scored above chance in the comprehension of active sentences.

Four Broca's subjects met the criteria for inclusion in this study. Subject 1 (CDK) was 28 at the time of testing. She suffered a hemorrhagic cerebral vascular accident (CVA) due to an arteriovenous malformation (AVM) resulting in aphasia and severe right hemiplegia. The MRI revealed an area of hypodensity in the left frontal lobe and the underlying gray matter. Diagnosis was made by a team of neurologists and speech pathologists based upon an MRI, neurological examination and standardized tests. Performance on the KHMC battery and the Korean BDAE indicated Broca's aphasia and agrammatism. Although detailed information on these tests was not available, her auditory retention span was 2 out of 5 words. CDK participated in this study six months post onset.

Subject 2 (KTS) was 54 at the time of testing. He suffered an infarction due to an ischemic CVA in the left middle cerebral artery resulting in aphasia and right hemiplegia. The CT revealed an area of hypodensity in the left frontal lobe. Diagnosis was made by a team of neurologists and speech pathologists based upon a CT, neurological examination and standardized tests. Performance on the KHMC battery and the Korean BDAE indicated Broca's aphasia and agrammatism. Detailed information on these tests was not available. His auditory retention span was 2 out of 5. KTS participated in this study nine years post onset.

Subject 3 (JJP) was 41 at the time of testing. He suffered an infarction due to an ischemic CVA in the left middle cerebral artery, resulting in aphasia and right hemiplegia. The CT revealed an area of hypodensity in the left frontal lobe. Diagnosis was made by a team of neurologists and speech pathologists based upon a CT, neurological examination and standardized tests. Performance on the Korean BDAE indicated Broca's aphasia and agrammatism. Detailed information on these tests was not available. His auditory retention span was also 2 out 5. JJP participated in this study eight years post onset.

Subject 4 (KKM) was 56 at the time of testing. He suffered an infarction due to an ischemic CVA in the left middle cerebral artery resulting in aphasia and right hemiplegia. The CT-scan revealed a large, low attenuation in the left posterior frontal and anterior parietal regions. Diagnosis was made by a team of neurologists and speech pathologists based upon a CT scan, neurological examination and standardized tests. Performance on the Korean version of the Western Aphasia Battery (Kertesz, 1983) indicated Broca's aphasia and agrammatism. Detailed information on this test was not available. His auditory retention span was also 2 out of 5. KKM participated in this study nine years post onset. Table 3.1 summarizes the background data on the four Broca's subjects.

Table 3.1

Background information for Broca's subjects

	CDK	KTS	JJP	KKM
Age	28	54	41	56
Sex	Female	Male	Male	Male
Years of Education	12	16	16	16
Handedness	Right	Right	Right	Right
Etiology	Hemorrhagic CVA	Ischemic CVA	Ischemic CVA	Ischemic CVA
Year of onset	2002	1993	1994	1989
Years post-onset	.5	9.25	8.5	9
Aphasia Type	Broca's	Broca's	Broca's	Broca's
Hemiplegia	Right	Right	Right	Right

3.2.2 Wernicke's Subjects

The criteria for inclusion of Wernicke's subjects in the study included a lesion in the left temporal lobe, not extending into the frontal lobe, and confirmed by CT or MRI. Wernicke's subjects must also have been at least three months post onset prior to participation in the study. Neuropsychological criteria included speech pathologist's diagnosis of Broca's aphasia based on scores on the Korean BDAE or KHMC batteries. To allow for comparison with Broca's subjects, Wernicke's were matched in auditory memory retention span. Subjects were monolingual speakers of Korean born and raised in the Seoul dialect.

Two Wernicke's subjects met the criteria for inclusion in this study. Subject 1 (HCJ) was 49 at the time of testing. She suffered an ischemic CVA resulting in aphasia. Diagnosis was made by a team of neurologists and speech pathologists based upon an MRI, neurological examination and standardized tests. Performance on the BDAE and KHMC batteries indicated Wernicke's aphasia. Detailed information on these tests was not available. Her auditory retention span was 2 out of 5, and she participated in this study six months post onset.

Subject 2 (KYA) was 44 at the time of testing. He suffered an ischemic CVA resulting in aphasia. Diagnosis was made by a team of neurologists and speech pathologists based upon an MRI, neurological examination and standardized tests. Performance on the BDAE and KHMC indicated Wernicke's aphasia. Detailed information on these tests was not available. His auditory retention span was also 2 out of 5, and he participated in this study nine months post onset. Table 3.2 summarizes the background data on the two Wernicke's subjects.

Table 3.2

Background information for Wernicke's subjects

	HCJ	KYA
Age	49	44
Sex	Female	Male
Years of education	12	9
Handedness	Right	Right
Etiology	Ischemic CVA	Ischemic CVA
Year of onset	2002	2002
Years post-onset	.5	.75
Aphasia	Wernicke's	Wernicke's

3.2.3 Control Subjects

Six normal control subjects were also tested. The controls were monolingual speakers of Korean born and raised in the Seoul dialect and matched with Broca's and Wernicke's patients for age, sex and educational background. Summaries are provided in Tables 3.3 and 3.4.

Table 3.3

Background information for control subjects (Broca's)

	JBA	DCM	KDS	JGF
Age	28	54	41	56
Sex	Female	Male	Male	Male
Years of Education	12	16	16	16

Table 3.4

Background information for control subjects (Wernicke's)

	SHB	OKT
Age	49	44
Sex	Female	Male
Years of Education	12	9

3.3 Materials

A total of 220 grammatical sentences were used in sentence-picture matching tasks to test comprehension. 20 semantically reversible sentences in each of 11 conditions were presented to subjects. Verbs and nouns used in the experimental sentences were chosen from the same set of nouns and two-place, transitive verbs given in (3-1).

(3-1) *Nouns*: dog, cow, zebra, giraffe, camel, man, woman, police, doctor, baker

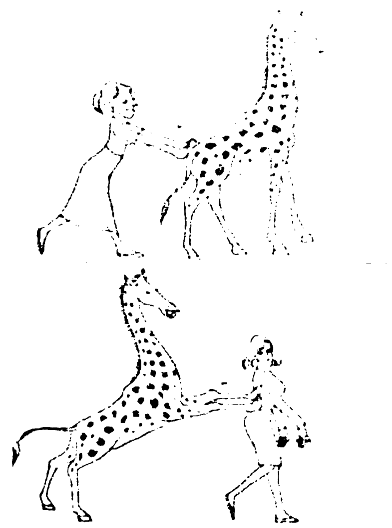
Verbs: kick, push, photograph, drag, bite, bind, carry, lift, cover, chase

Each of the 10 verbs was used twice in each condition to yield 20 sentences: once with two nouns in a particular thematic relation and once with the same nouns in the inverse thematic relation. The order of presentation of sentences was pseudorandomized such that sentences of the same type were not adjacent to one another.

Each condition used one of two types of pictures. The first type consisted of a series of two black and white line-drawing pictures representing actions between two actors (one Agent and one Theme), both of whom could perform the action with equal plausibility (Figure 3.1). Among the actors in the picture, one matched the corresponding test sentence; the second picture represented the same actors in the inverse thematic relation.

Figure 3.1

Two-picture matching stimulus

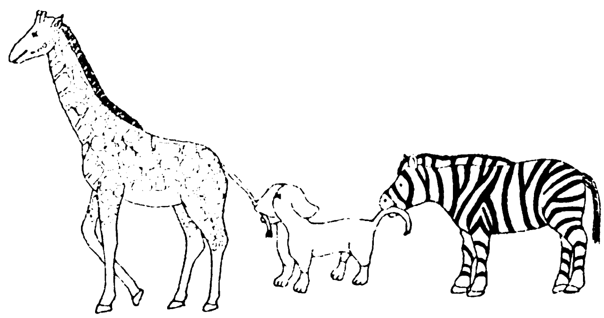


The second type of picture consisted of a single black and white line-drawing picture representing simultaneous actions among three actors, two of which could perform the action with equal plausibility (Figure 3.2).[1] Among the actors in the picture, one actor is the correct answer to the corresponding test question; the second possible actor represented the inverse thematic relation.

[1] Pilot studies tested patients using figurines, two pictures, and single pictures. No significant differences were found among the three methods. This confirms the pattern reported in Thompson et al. (1999), who also found no significant difference between figurines and single pictures. As single pictures seem more pragmatically appropriate, they were used in the *wh*-question experiment.

Figure 3.2

One-picture matching stimulus



Pictures were counterbalanced so that each picture occurred equally in both positions. For the two-picture tasks, pictures were counterbalanced between top and bottom position. For the one-picture tasks, actors are counterbalanced between right and left position and right and left facing. Details concerning stimuli for each condition will be discussed in the appropriate chapter.

3.4 Procedures

Subjects were tested individually in a familiar treatment setting. For each experiment, task instructions and test sentences were presented in Korean by a native speaker of Korean over several sessions. Each session occurred at the same time of day for each patient and took approximately 20 minutes. This was to help control for any attention deficits.

Prior to the experiment, lexical comprehension of all nouns and verbs used in the stimuli were tested to ensure that all subjects were familiar with the vocabulary. All subjects obtained 100% accuracy on this task.

Verbal instructions were given prior to the practice trials and experimental task. At the beginning of each session, subjects received two practice trials using non-experimental stimuli to orient themselves to the task. All subjects demonstrated understanding of the task requirements after these trials. In both the practice and experimental trials involving two pictures, the subjects were instructed to look at a card with two pictures mounted in a vertical arrangement, listen to a sentence and point to the picture that best matches the sentence. In the one-picture matching task, subjects were instructed to look at the picture with three actors and point to the actor that best answers the question. During the experiment, repetitions of a sentence were permitted if requested by a subject. Subjects were asked to respond to all test items.

3.5 Analyses

Three types of statistical analyses were conducted in this study. The first sought to determine performance levels within lesion type, as well as differences among sentence types within a lesion type. To determine levels of performance, subjects were collapsed within lesion type and paired samples, two-tailed t-tests were used to compare performance to a hypothetical data set representing chance, set at 50%. To determine differences among three sentence types within a lesion type, a one-way analysis of variance (ANOVA) was used; post hoc analyses used Bonferroni for multiple comparisons. To determine differences between two sentence types within a lesion type, two-tailed t-tests were used.

A second type of analysis was used to determine subject eligibility in the study. Although the primary focus of this study is on group analyses, to ensure that subjects selected are sensitive to movement, individual analyses were conducted in Chapter 4. As this study seeks to test movement, only those Broca's subjects who were individually above chance on active sentences and at chance on active scrambled sentences participated in further experiments. In Chapter 4, Broca's subjects were thus treated as separate case studies. Paired samples, two-tailed t-tests compared each subject's performance to a hypothetical data set representing chance, set at 50%.

Finally, as one of the research questions asks whether a difference in comprehension performance patterns exists between Broca's and Wernicke's patients, two-way ANOVA analyses (Sentence x Lesion) were conducted. Post hoc analyses used Bonferroni for multiple comparisons.

CHAPTER 4

ACTIVES

4.1 Introduction

In Chapter 2 I presented four accounts that attempt to explain the core pattern of agrammatic comprehension. It was noted that these four accounts generally fall within two major camps: linear and structural. The linear accounts (TDH, ALH, MH) rely on linear word order in the assignment of thematic roles to noun phrases. These accounts argue that Broca's aphasics fail to interpret sentences with moved elements because canonical linear order is not preserved. The structural account (DDH) relies not on linearity but on hierarchical structure. It argues that the deficit is due to structural relations or dependencies within a sentence. Although the four models differ in assumptions and implementation, they all agree that displacement in a sentence presents a problem for comprehension in Broca's patients.

Also as noted in Chapter 2, among the languages studied a robust finding is that simple active sentences present little problem for Broca's patients. If the basic hypothesis is that movement disrupts comprehension, then the simplest test would be one in which patients are presented with an active sentence that they have shown they can comprehend but with one element moved. If displacement is the locus of impairment, this should disrupt interpretation. Because word order in English is relatively fixed, the opportunities to test this are rather few. However, in Korean, which has comparatively free word order, there is such an opportunity. Korean, unlike English, marks subject and object NPs for Case and allows them to 'scramble' in order relative to the verb such that an NP may be moved to a sentence initial position.

This chapter, then, will present an experiment that tests Korean aphasic comprehension on active and scrambled active sentences. The Broca's data will then be brought to bear on the predictions that the four aphasia accounts make.

The chapter is organized as follows. Section 4.2 will provide the theoretical background for the chapter. It will present a description of active and scrambled active sentences in Korean and briefly provide a syntactic analysis for these constructions. It will also provide the predictions that the four Broca's aphasia accounts make for the two active constructions in Korean. Section 4.3 will describe the methods and materials for the active experiment, and in Section 4.4 I present the results from the experiment. In Section 4.5 I discuss the implications of the results for the aphasia accounts. Section 4.6 concludes the chapter.

4.2 Theoretical Background

This section will provide a brief description of Korean active and scrambled active sentences and will serve as background for the experiment. Additionally, this section will provide the predictions that the four agrammatic accounts make for Korean active and scrambled active sentences.

4.2.1 Traditional Description

This section will briefly characterize active and scrambled active sentences as described in the traditional descriptive literature. Korean is described as a head-final, SOV language (Sohn, 1999). Subjects normally come at the beginning of the sentence and are marked with the nominative Case markers *–i* /*-ka*.[1] Objects normally follow the subject and are marked with the accusative markers *–ul* /*-lul*. Verbs appear at the end of a sentence or clause. Consider the example in (4-1).

(4-1)	koyangi-ka	kae-lul	mwul-ess-ta
	cat-nom	dog-acc	bite-past-decl
	'The cat bit the dog'		

The subject *koyangi* 'cat' is marked with the nominative affix *–ka* and occurs sentence-initial. The object *kae* 'dog' occurs after the subject and is marked with the accusative affix *–lul*. The verb occurs in sentence final position.

[1] The nominative affix has two allomorphs: *–ka* is used following a vowel and *–i* following consonants. The accusative affix also has two allopmorphs: *-lul* following a vowel and *–ul* following consonants.

In addition to Case markers, postpositions affix to nominals. Postpositions function in much the same way that English prepositions do. Some examples are: *-ey* 'in' or 'to' (a place), *-eyse* 'at' or 'from' (a place), *-hanthey* 'to' (a person), and *-hantheyse* 'from' (a person). Two examples are given in (4-2) and (4-3).

(4-2)	Mary-ka	cip-**ey**	ka-ess-ta.
	Mary-nom	home-**to**	go-past-decl
	'Mary went home'		

(4-3)	Mary-ka	John-**hanthey**	cheyk-ul	cu-ess-ta.
	Mary-nom	John-**to**	book-acc	give-past-decl
	'Mary gave a book to John'			

In general, preverbal constituents can be moved around (i.e., scrambled) as long as the verb is in final position (Sohn, 1999). The example in (4-4) is a scrambled version of (4-1), in which the object *kae-lul* 'dog-acc' has moved from object position to sentence initial position with no change in meaning.

(4-4)	**kae-lul**	koyangi-ka	mwul-ess-ta
	dog-acc	cat-nom	bite-past-decl
	'The cat bit the dog'		

Thus, there are two possible word orders for a Korean active sentence: SOV and OSV. As Korean is a head-final language, SOV is considered the canonical order and OSV the scrambled order. Important for this experiment is that scrambling has the effect that the relative order of thematic roles is reversed and non-canonical.

4.2.2 A Syntactic Account of Actives and Scrambling

The preceding section briefly characterized actives and scrambled actives as described in the traditional descriptive literature. The following provides the syntactic analyses assumed in this dissertation.[2]

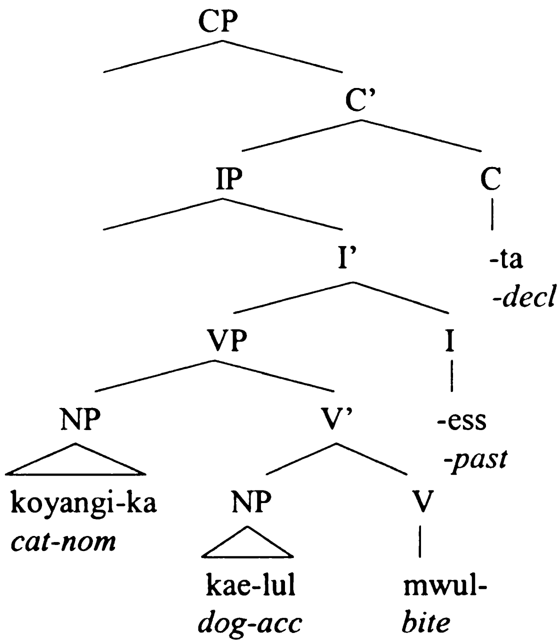
Actives

As described in Section 4.2.1, Korean is an SOV language in which lexical and functional heads follow the complements that they select (i.e., head-final). The D-structure of the active sentence given above in (4-1), repeated here as (4-5a), would be that in (4-5b). The S-structure of this sentence would be (4-5c).

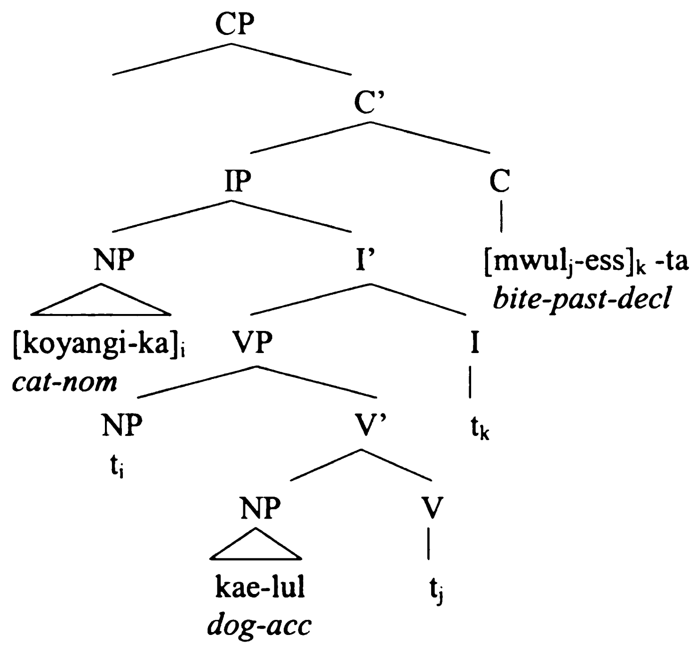
(4-5) a.	koyangi-ka	kae-lul	mwul-ess-ta
	cat-nom	dog-acc	bite-past-decl
	'The cat bit the dog'		

[2] A Principles and Parameters analysis will be presented here, and in subsequent chapters, for two reasons: (i) the syntactic debates have been framed primarily within this framework, and (ii) cross-linguistic studies in linguistic aphasia and models to account for aphasic patterns have assumed analyses within this framework. Therefore, analyses here in Principles and Parameters will allow for better comparison in both theoretical areas.

b.



c.



Following Ahn and Yoon (1989) and Whitman (1989), I will assume the VP-Internal Subject Hypothesis (e.g., Kitagawa, 1986; Koopman and Sportiche, 1991) for Korean, in which the VP-internal subject raises to [Spec IP]. Thus, in (4-5c) the external argument *koyangi-ka* 'cat-nom' begins in [Spec VP] and moves to subject position [Spec IP]. Also following Ahn and Yoon (1989) and Whitman (1989), I assume incorporation, in which the verb undergoes head movement to I and the complex [V+I] further moves to C at S-structure. In (4-5c) the verb *mwul-* 'bite' moves from V to I to merge with tense and create the complex *mwul-ess* 'bite-past' [V+I]. This complex then moves from I to C, creating the inflected predicate *mwul-ess-ta* 'bite-past-decl' [V+I+C].

Scrambling

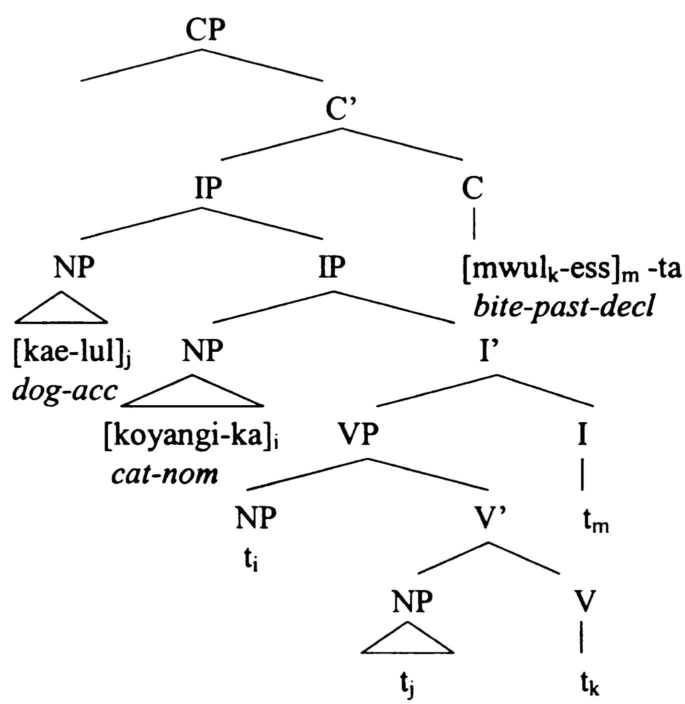
As discussed in Section 4.2.1, NPs in Korean sentences may be 'scrambled.' This was seen in pairs like (4-1) and (4-4) above, repeated here as (4-6).

(4-6)	a.	koyangi-ka	**kae-lul**	mwul-ess-ta
		cat-nom	**dog-acc**	bite-past-decl
		'The cat bit the dog'		
	b.	**kae-lul**	koyangi-ka	mwul-ess-ta
		dog-acc	cat-nom	bite-past-decl
		'The cat bit the dog'		

In (4-6b), the internal argument *kae-lul* 'dog-acc' scrambles to sentence-initial position. Although these two sentences differ in word order, they are identical in grammatical relations, morphology and truth conditions, as evidenced in the morpheme translation and gloss.

Syntactically, Bailyn (2001) notes that starting with Ross (1967), many researchers have taken examples like those in (4-6) to be related by a 'scrambling' transformation that derives (4-6b) from (4-6a). Within this view, arguments and modifiers begin in a local relation with their associated predicates and are later scrambled to other positions. Given this analysis, it must be the case that only in (4-6a) does *kae-lul* 'dog-acc' stand in a local structural relation with its predicate *mwul-ess-ta* 'bit.' The example in (4-6b) is then derived from (4-6a) by scrambling *kae-lul* 'dog-acc' out of its base position to a sentence initial position. The S-structure of (4-6b) would be that in (4-7).

(4-7)



Within the Principles and Parameters framework, scrambling is generally agreed to be an instance of Move α, constrained by universal principles such as Subjacency and the Empty Category Principle (ECP). Indeed, Saito and Fukui (1998) claim that scrambling is a "paradigm case of Move" (p. 452).

The most common analyses follow Saito (1985), who argues that scrambling is an adjunction operation involving A-bar movement. As the scrambled element is assigned Case and theta-role in its original position (i.e., A-position), movement is to a non-Case, non-theta position (A-bar position). This analysis seeks to account not only for the clause-internal scrambling examples given above but also for Japanese examples like (4-8), in which a scrambled element is interpreted in its base position despite long-distance movement.

(4-8)	a. **nani-o**$_i$	John-ga	[Mary-ga	**e**$_i$	katta	ka]	sitteiru
	what-acc	John-nom	Mary-nom		bought	Q	knows

'John knows what Mary bought'

(Bailyn, 2001, p. 637)

b. **[Mary-ga**	**nani-o**	**katta**	**to]**$_i$	John-ga	[Bill-ga	**e**$_i$	itta	ka]	sitteiru
Mary-nom	what-acc	bought	that	John-nom	Bill-nom		said	Q	knows

'John knows what Bill said that Mary bought'

(Bailyn, 2001, p. 637)

In (4-8a) the scrambled *wh*-phrase takes embedded scope, despite its position in the matrix clause. Similarly, in (4-8b) an entire CP containing the *wh*-phrase is scrambled; yet the *wh*-phrase contained in it is interpreted in the embedded position. To account for this, scrambling has been argued to be a form of A-bar movement that reconstructs at LF to base position, where interpretation occurs (Bailyn, 2001). The example in (4-8) can be represented as (4-9), in which *sono hon-o* 'that book' is scrambled from its base position to a sentence-initial position and reconstructed at LF for interpretation.

(4-9)	**sono**	**hono-o**	John-ga	[Mary-ga	**t**	katta	to]	omotteiru
	that	book-acc	John-nom	Mary-nom		bought	that	thinks

Movement

Reconstruction

(Bailyn, 2001, p. 637)

For Korean, I will assume a similar analysis. Cho, J.H. (1994), following Saito (1992), argues that, based upon evidence from reconstruction and weak crossover (WCO), scrambling in Korean is non-operator A-bar movement. I will briefly review his main arguments here.

Cho's first argument is that scrambling displays patterns of reconstruction effects consistent with A-bar movement. He argues that A-bar movement shows reconstruction effects with respect to Binding Condition C, whereas A-movement does not. Consider the contrast between A-bar movement and A-movement in the examples in (4-10).

(4-10) a. * [John$_i$'s brother]$_j$, he$_i$ likes t$_j$

b. [John$_i$'s brother]$_j$ seems to him$_i$ [t$_j$ to be smart]

(Cho, 1994, p. 256)

In the example of A-bar movement in (4-10a), topicalization of the NP *John's brother* triggers the reconstruction of the topicalized phrase to its D-structure position. After reconstruction, the R-expression *John* is A-bound by the pronoun *he*, which results in a Binding Condition C violation. However, in the example of A-movement in (4-10b) raising does not trigger reconstruction and thus there is no violation of Condition C.

This contrast can be seen in Korean clause-internal scrambling as well. Cho (1994) compares scrambling to passive constructions. Scrambling is argued to be A-bar movement, while passives, like raising constructions, involve A-movement. Consider the examples in (4-11).

(4-11) a. * [John$_i$-uy atul]$_j$ –ul ku$_i$-ka t$_j$ ttaeli-ess-ta

John-gen son-acc he-nom hit-past-decl

'[John$_i$'s son]$_j$ he$_i$ hit t$_j$'

(Cho, 1994, p. 257)

b. [John$_i$-uy sensaeng]$_j$-i ku$_i$-eykey t$_j$ sokae-toy-ess-ta

John-gen teacher-nom he-dat introduce-become-past-decl

'[John$_i$'s teacher]$_j$ was introduced to him$_i$ t$_j$ '

(Cho, 1994, p. 257)

Scrambling in (4-11a) forces reconstruction of the NP *John-uy atul* 'John's son' to its D-structure position. This creates a Binding Condition C violation, as the R-expression *John* is now A-bound by the pronoun *ku* 'he.' On the other hand, as in the English example, A-movement in (4-11b) does not force reconstruction and thus no binding violation.

Cho claims that reconstruction effects are also observed with regard to Binding Condition A. He argues that in some sentences scrambling forces reconstruction and this saves the construction from unacceptability. However, A-movement in a passive does not trigger reconstruction and thus in some sentences creates a Binding Condition A violation. Consider examples of this in (4-12).

(4-12) a. [caki$_i$-uy atul]$_j$ –ul ku$_i$-ka t$_j$ ttaeli-ess-ta

self-gen son-acc he-nom hit-past-decl

'[self$_i$'s son]$_j$ he$_i$ hit t$_j$'

(Cho, 1994, p. 257)

b. *[caki$_i$-uy haksaeng]$_j$-i ku$_i$-eykey t$_j$ sokae-toy-ess-ta

self-gen student-nom he-dat introduce-become-past-decl

'[self$_i$'s student]$_j$ was introduced to him$_i$ t$_j$ '

(Cho, 1994, p. 257)

Scrambling in (4-12a) triggers reconstruction and the NP *caki-uy atul* 'self's son' reconstructs back to its D-structure position. This movement satisfies Binding Condition

A, as the anaphor is now bound. On the other hand, the passive example in (4-12b) does not exhibit this reconstruction effect. The NP *caki-uy haksaeng* 'self's students' does not reconstruct, and therefore the anaphor remains unbound, violating Condition A. Cho concludes that these reconstruction effects demonstrate that scrambling shows characteristics of A-bar movement.

Cho's second argument comes from weak crossover (WCO), in which again there are contrasts between A-bar movement and A-movement. Mahajan (1989) argues that one characteristic of A-bar movement is the existence of WCO effects, whereas characteristic of A-movement is the lack of these effects. Cho points out that Korean clause-internal scrambling does not trigger WCO effects; yet, he argues that scrambling is still an instance of A-bar movement. He proposes that in general WCO effects follow from a distinction between operator and non-operator A-bar movement: operator A-bar movement shows WCO effects but non-operator A-bar movement does not. As scrambling is argued to be an instance of non-operator A-bar movement, WCO effects are not to be expected. Consider the example in (4-13).

(4-13) nwukwu$_i$-lul ku$_i$-uy sensaeng-i t_i ttaeli-ess-ni?

who-acc he-gen teacher-nom hit-past-Q

'Who$_i$, his$_i$ teacher hit t_i ?'

(Cho, 1994, p. 259)

If scrambling is A-bar movement that creates a variable, WCO effects would be expected in (4-13) because the A-bar bound trace t_i is a variable that does not c-command the coindexed pronoun. However, (4-13) is acceptable and there is no WCO effect.

Cho accounts for this lack of WCO effects by positing that scrambling must be distinguished from other kinds of A-bar movement such as *wh*-movement and Quantifier Raising (QR), both of which are triggered by scope requirements and create operator-variable relations. He argues that, following Saito (1989) and Webulhuth (1989), scrambling to an IP-adjoined position in Korean is non-operator A-bar movement. He distinguishes the two types of A-bar movement. These are summarized in (4-14).

(4-14) (i) Operator movement moves a quantified NP to an operator position.

(ii) Non-operator A-bar movement moves a non-quantified NP to an operator position or any NP to an non-operator position.

(Cho, 1994, p. 261)

Cho bases this operator/non-operator distinction on Lasnik and Stowell (1991), who argue that WCO effects do not show up in English Tough Movement, parasitic gaps or topicalization constructions. Lasnik and Stowell attribute the lack of WCO effects to the semantically non-quantificational status of the operator in A-bar position and propose a new empty category: a null epithet that shares binding properties with names and definite descriptions rather than with variables.

Cho (1991, 1994) proposes that while both *wh*-movement and QR as instances of operator movement create variables, scrambling as non-operator A-bar movement generates a null epithet. He argues, then, that the trace created by operator A-bar movement is a true variable and is subject to the WCO effect. On the other hand, the trace created by non-operator A-bar movement is a null epithet and does not show the WCO effect. As the scrambled NP is not quantified, as there is no WCO effect, and as shown earlier A-bar movement is involved, Cho concludes that it must be that scrambling is non-operator A-bar movement.

Thus, following Cho (1994) and others (e.g., Lee, Y.S., 1993; Yoon, S.H., 1997), I will assume that in Korean, scrambling an object over a subject to an adjoined sentence-initial position is syntactic movement. This is a crucial point because this distinction between active (no syntactic movement) and scrambled active (syntactic movement) will serve as the crux of the argument that Broca's aphasics are impaired in constructions that involve syntactic movement. The following section will provide the predictions that each of the four aphasia accounts make for Korean active and scrambled active constructions based upon the syntactic analyses provided above.

4.2.3 Predictions

As described in Chapter 2, the four hypotheses can account for the above chance comprehension patterns in the English active. However, scrambling holds all elements in an active sentence constant, except the displaced element, and thus can be used as a baseline to test whether movement disrupts comprehension. This section will present predictions that each aphasia account makes for Korean active and scrambled active.

Trace Deletion Hypothesis

Active

Assuming the VP-Internal Subject Hypothesis (e.g., Kitagawa, 1986; Koopman and Sportiche, 1991) described in the previous section, the NP *yeca-ka* 'woman' in the active sentence in (4-15) moves from its VP-internal position to [Spec IP], leaving a trace. The TDH claims that in the agrammatic representation, the trace is deleted (represented by *). Thus, the agrammatic representation would be that in (4-15b).

(4-15) a. [yeca-ka]$_i$ t_i kirin-ul mil-n-ta *Normal*

woman-nom giraffe-acc push-pres-decl

Agent **Theme**

'The woman pushes the giraffe'

b. [yeca-ka]$_i$ * kirin-ul mil-n-ta *Broca's*

woman-nom giraffe-acc push-pres-decl

Agent **Theme**

(via strategy) ***(via syntax)***

'The woman pushes the giraffe'

The chain between the moved NP and the thematic position is disrupted, and the NP *yeca-ka* 'woman' does not receive a theta-role. The R-strategy thus assigns the Agent role to the NP in (4-15b), as the first NP is typically Agent. The NP *kirin-ul* 'giraffe' is assigned Theme syntactically from the verb. The R-strategy thus compensates the impaired representation by matching normal thematic assignment. Performance is predicted to be above chance.

Scrambled Active

In the scrambled sentence in (4-16), the NP *yeca-ka* 'woman' moves from its VP-internal position to [Spec IP], leaving a trace. Additionally, the NP *kirin-ul* 'giraffe' moves from object position to an adjoined sentence-initial position, also leaving a trace. As trace is deleted in agrammatism, the agrammatic representation would be that in (4-16b).

(4-16) a.	[kirin-ul]$_j$	[yeca-ka]$_i$	[$_{VP}$	t_i	t_j	mil-n-ta]	*Normal*
	giraffe-acc	woman-nom				push-pres-decl	
	Theme	**Agent**					
	'The woman pushes the giraffe'						

b.	[kirin-ul]$_j$	[yeca-ka]$_i$	[$_{VP}$	*	*	mil-n-ta]	*Broca's*
	giraffe-acc	woman-nom				push-pres-decl	
	Agent	**Theme**					
	(via strategy)	***(via strategy)***					
	'The woman pushes the giraffe'						

The chains between the moved NPs and the thematic positions are disrupted, such that neither NP receives a theta-role. The R-strategy thus assigns the Agent role to the very first NP *kirin* 'giraffe' in (4-16b), as the first NP is typically Agent, and Theme to *yeca* 'woman', which is the next role down in the Thematic hierarchy. The R-strategy thus reverses thematic assignment, and performance is predicted to be below chance.

Argument Linking Hypothesis

Active

The basic argument structure of the verb *mil-ta* 'to push' is given in (4-17). The active representation would be that in (4-18). The NP *yeca-ka* 'woman' moves from its VP-internal position to [Spec IP], leaving a trace.

(4-17) MIL-TA: verb <Agent, Theme>

'to push'

(4-18)	[yeca-ka]$_i$	t_i	[kirin-ul]	mil-n-ta
	woman-nom		giraffe-acc	push-pres-decl
Semantic:	**Agent**		**Theme**	
Syntactic:	**Agent**		**Theme**	
	'The woman pushes the giraffe'			

Based upon the argument structure in (4-17), semantic linking in (4-18) would canonically link Agent to the NP *yeca* 'woman' in first position and Theme to the NP *kirin* 'giraffe' in second position. Syntactic linking would link Agent to the NP *yeca* 'woman' in subject position and Theme to the NP *kirin* 'giraffe' in object position. In both semantic and syntactic linking the Agent is linked to the NP *yeca* 'woman' and Theme to the NP *kirin* 'giraffe.' As both semantic and syntactic linking match, Broca's patients are predicted to perform above chance.

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Scrambled Active

In the scrambled condition, based upon the argument structure in (4-17), semantic linking in (4-19) would link Agent to the NP *kirin* 'giraffe' in first position and Theme to the NP *yeca* 'woman' in second position. Syntactic linking would link Theme to the NP *kirin* 'giraffe' in sentence-initial position and Agent to the NP *yeca* 'woman' in subject position.

(4-19)	[kirin-ul]$_j$	[yeca-ka]$_i$	[$_{VP}$ t_i t_j	mil-n-ta]
	giraffe-acc	woman-nom		push-pres-decl
Semantic:	**Agent**	**Theme**		
Syntactic:	**Theme**	**Agent**		
	'The woman pushes the giraffe'			

As semantic and syntactic linking are not the same, there is a mismatch in thematic assignment in (4-19). Faced with this competition, Broca's patients are predicted to perform at chance.

Mapping Hypothesis

Active

The MH claims that the mapping process is facilitated in canonical structures and 'garden-pathed' in non-canonical ones. As mentioned above, active sentences are canonical SOV word order, while scrambled OSV sentences are non-canonical. As given in (4-17), the theta-grid for the verb *mil-ta* 'to push' would be Agent and Theme. The normal representation is given in (4-20a). Agent is assigned to the NP in subject position and Theme to the NP in object position.

(4-20) a. yeca-ka kirin-ul mil-n-ta *Normal*

woman-nom giraffe-acc push-pres-decl

Agent **Theme**

'The woman pushes the giraffe'

b. yeca-ka kirin-ul mil-n-ta *Broca's*

woman-nom giraffe-acc push-pres-decl

Agent **Theme**

'The woman pushes the giraffe'

In the agrammatic representation in (4-20b), the elements in the theta-grid would be correctly assigned canonically, with Agent assigned to the first NP *yeca* 'woman' and Theme to the second NP *kirin* 'giraffe.' Thus, the order of the elements in the grid matches the normal. In canonical sentences such as this, the mapping process is facilitated in agrammatism and Broca's patients are predicted to perform above chance.

Scrambled Active

In scrambled active sentences, the normal representation would be that in (4-21a). Agent is assigned to the NP *yeca* 'woman' in subject position and Theme to the NP *kirin* 'giraffe' in sentence-initial position.

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(4-21) a. kirin-ul yeca-ka mil-n-ta *Normal*

giraffe-acc woman-nom push-pres-decl

Theme **Agent**

'The woman pushes the giraffe'

b. kirin-ul yeca-ka mil-n-ta *Broca's*

giraffe-acc woman-nom push-pres-decl

Agent **Theme**

'The woman pushes the giraffe'

However, in the Broca's representation, the elements in the theta-grid would be assigned canonically, with Agent assigned to the first NP *kirin* 'giraffe' and Theme to the second NP *yeca* 'woman' (4-21b). Thus, the order of thematic roles would be reversed. In non-canonical sentences such as this, the mapping process is disrupted Broca's patients are predicted to perform below chance.

Double Dependency Hypothesis

Active

In the active sentence in (4-22), the NP *yeca-ka* 'woman' moves from its VP-internal position to [Spec IP], leaving a trace. Removal of the constraint on coindexation in the agrammatic representation of (4-22) produces only one possible referential dependency (4-23).[3]

[3] Although there are R-dependencies created by verb movement in Korean sentences as represented in (4-5c) above, they do not disrupt thematic interpretation. Mauner et al. (1993) make a distinction between

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(4-22) [yeca]$_i$-ka t_i [kirin]$_j$-ul mil-n-ta

woman-nom giraffe-acc push-pres-decl

'The woman pushes the giraffe'

(4-23) < [yeca-ka]$_i$, t_i >

Agent

The only possible interpretation in (4-22) provides the agrammatic with a representation in which *yeca* 'woman' is coindexed with the VP-internal subject trace and *kirin* 'giraffe' has no dependency. As there is no ambiguity, Broca's patients are predicted to perform above chance.

Scrambled Active

In the scrambled active sentence in (4-24), there are two dependencies. The subject has moved from its VP-internal position to [Spec IP] and the object has moved from object position to an adjoined sentence-initial position. The correct interpretation is given in (4-25a), in which *yeca* 'woman' is coindexed with the trace in [Spec VP] position (denoted by index *i* and therefore assigned Agent) and *kirin* 'giraffe' is coindexed with the trace in object position (denoted by index *j* and assigned Theme).

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thematic and non-thematic R-dependencies. Thematic R-dependencies are created by such processes as argument movement, and chains based on these R-dependencies allow for the transmission of a single theta-role. Non-thematic R-dependencies are created by such processes as verb movement or anaphor-antecedent coindexation, and chains based on these do not involve the transmission of a single theta-role. While Mauner et al. argue that Broca's aphasia affects all R-dependencies (e.g., agreement features in grammaticality judgments), they claim that only disruptions to thematic R-dependencies lead to disruption in thematic interpretation.

(4-24) [kirin]$_j$-ul [yeca]$_i$-ka [$_{VP}$ t_i t_j mil-n-ta]

giraffe-acc woman-nom push-pres-decl

'The woman pushes the giraffe'

(4-25) a. $<$ [yeca]$_i$, t_i $>$ and $<$ [kirin]$_j$, t_j $>$

Agent **Theme**

b. $<$ [yeca]$_i$, t_j $>$ and $<$ [kirin]$_j$, t_i $>$

Theme **Agent**

The incorrect interpretation is given in (4-25b), in which *kirin* 'giraffe' is coindexed with the subject trace (denoted by index *i* and thus assigned Agent) and *yeca* 'woman' is coindexed with the trace in object position (denoted by index *j* and thus assigned Theme). Faced with this ambiguity, Broca's patients are predicted to perform at chance. A summary of the predictions for active and scrambled active sentences is given in Table 4.1.

Table 4.1

Summary of predictions for actives

Structure	TDH	ALH	MH	DDH
Active	Above	Above	Above	Above
Scrambled Active	Below	Chance	Below	Chance

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4.3 Methods and Materials

This section will describe the methods and materials for the active and scrambled active experiment. Section 4.3.1 will discuss the procedure used for the experiment. Section 4.3.2 will describe the stimuli used. Section 4.3.3 will provide the subjects who participated in the experiment.

4.3.1 Method

This experiment used the two-picture sentence-picture matching task. As described in Chapter 3, subjects were instructed to look at a card with two pictures mounted in a vertical arrangement, listen to a sentence and point to the picture that best matches the sentence.

4.3.2 Materials

A total of 40 sentences were developed to comprise the experimental stimuli. There were 20 semantically reversible sentences in each of two conditions: active and scrambled active. As noted in Chapter 3, the verbs, nouns and verb-noun pairings used in the experimental sentences were chosen from a common set of nouns and two-place, transitive verbs used in all experiments. The verb and noun pairings for this experiment are given in (4-26).

(4-26) push (woman, giraffe) chase (cow, dog) photograph (dog, man)
drag (baker, camel) bite (zebra, baker) bind (policeman, cow)
carry (camel, doctor) lift (camel, doctor) cover (man, woman)
kick (policeman, giraffe)

Each verb in (4-26) was used four times: active, semantically reversed active, scrambled and semantically reversed scrambled. Examples are given in (4-27) and (4-28).

(4-27) a. yeca-ka kirin-ul mil-n-ta *Active*
woman-nom giraffe-acc push-pres-decl
'The woman pushes the giraffe'

b. kirin-i yeca-lul mil-n-ta *Reversed*
giraffe-nom woman-acc push-pres-decl
'The giraffe pushes the woman'

(4-28) a. kirin-ul yeca-ka mil-n-ta *Scrambled*
giraffe-acc woman-nom push-pres-decl
'The woman pushes the giraffe'

b. yeca-lul kirin-i mil-n-ta *Reversed*
woman-acc giraffe-nom push-pres-decl
'The giraffe pushes the woman'

A complete list of stimuli is given in Appendix A.

A set of 80 black and white line-drawing pictures was used in this experiment. The pictures were arranged vertically two per page. Each of the 40 pages thus consisted of a series of two pictures representing actions between two actors (one Agent and one Theme), both of whom could perform the action with equal plausibility. Among the actors in the picture, one matched the corresponding test sentence; the second picture represented the same actors in the inverse thematic relation. The pictures were counterbalanced between top and bottom position.

4.3.3 Subjects

All four Broca's patients (CDK, KTS, JJP, KKM) and two Wernicke's patients (HCJ, KYA) participated in this experiment. Six neurologically intact control subjects were also tested.

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4.4 Results

This section provides the results of the active and scrambled active experiment. Section 4.4.1 describes the results for Broca's aphasics. Section 4.4.2 provides the analyses for Wernicke's aphasics. Section 4.4.3 compares performance by Broca's and Wernicke's.

4.4.1 Broca's Results

Tables 4.2 and 4.3 present the raw scores for Broca's subjects and their matched controls. Controls performed without error, so they are not discussed further. Figure 4.1 provides individual percent scores for Broca's subjects.

Table 4.2

Raw scores for Broca's on actives (correct out of 20)

Structure	CDK	KTS	JJP	KKM	Avg	%
Active	15	16	17	18	16.5	83%
Scrambled	11	11	11	13	11.5	58%

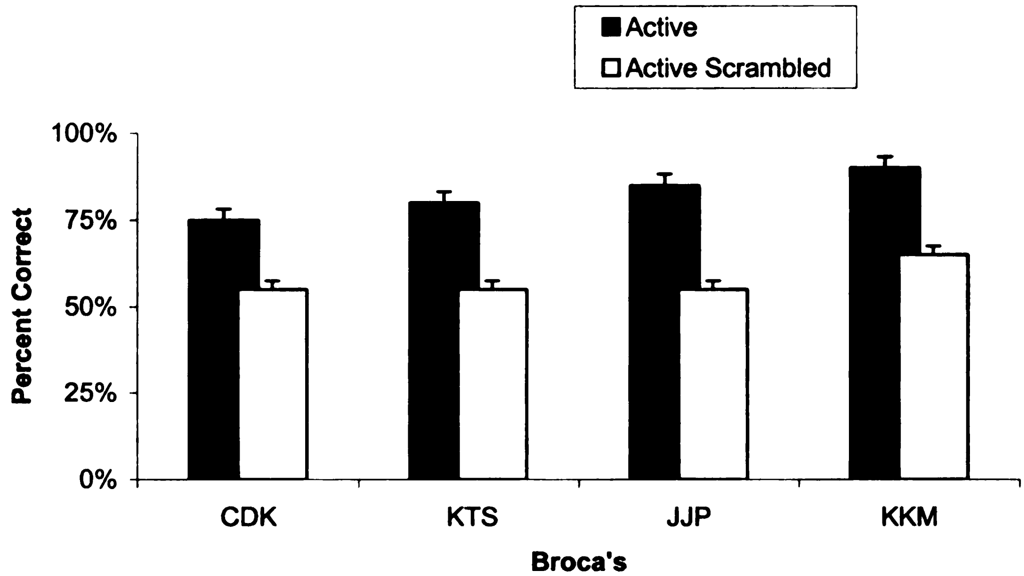
Table 4.3

Raw scores for controls on actives (correct out of 20)

Structure	JBA	DCM	KDS	JGF	Avg	%
Active	20	20	20	20	20	100%
Scrambled	20	20	20	20	20	100%

Figure 4.1

Percent correct for Broca's on actives



As can be seen in Table 4.2 and Figure 4.1, there is a clear active-scrambled asymmetry in Broca's subjects. Performance on active sentences was 83% correct and scrambled active sentences 58%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance on actives was significantly above chance ($t(3) = 10.07$, $p = .002$) while performance on scrambled active was at chance ($t(3) = 3.00$, $p = .06$). This pattern is summarized in Table 4.4.

Table 4.4

Significance patterns for Broca's on actives compared with chance (50%)

Sentence Type	Significance
Active	$p < .002$
Scrambled Active	ns

To determine whether there is a significant difference between conditions, a two-tailed t-test was conducted. Analysis reveals a significant difference between performance on active and scrambled active sentences ($t(3) = 12.25$, $p = .001$).

As this is a baseline experiment, it is necessary to ensure that subjects selected for the following experiments display consistent patterns. Thus, individual analyses were conducted on active and scrambled active performances. Individual analyses reveal that all four subjects showed the asymmetry. CDK performed above chance performance on actives (75% correct, $t(19) = 2.517$, $p = .02$) but chance on scrambled sentences (55% correct, $t(19) = 1$, $p = .329$). KTS was above chance on actives (80% correct, $t(19) = 2.854$, $p = .01$) and at chance on scrambled (55% correct, $t(19) = 1$, $p = .329$). JJP also showed the asymmetry with above performance on actives (85% correct, $t(19) = 3.199$, $p = .004$) and chance on scrambled (55% correct, $t(19)= 1$, $p = .329$). Finally, KKM performed above chance on active (90% correct, $t(19) = 3.559$, $p = .002$) and at chance on scrambled actives (65% correct, $t(19) = 1.83$, $p = .082$).

To determine whether there is a significant difference between conditions for each subject, two-tailed t-tests were conducted. Analysis reveals a significant difference between performance on active and scrambled active sentences for each subject.

4.4.2 Wernicke's Results

Tables 4.5 and 4.6 present the raw scores for Wernicke's subjects and their matched controls. Controls performed without error, so they are not discussed further. Figure 4.2 provides individual percent scores for Wernicke's subjects.

Table 4.5

Raw scores for Wernicke's on actives (correct out of 20)

Structure	HCJ	KYA	Avg	%
Active	10	15	12.5	63%
Scrambled	11	13	12	60%

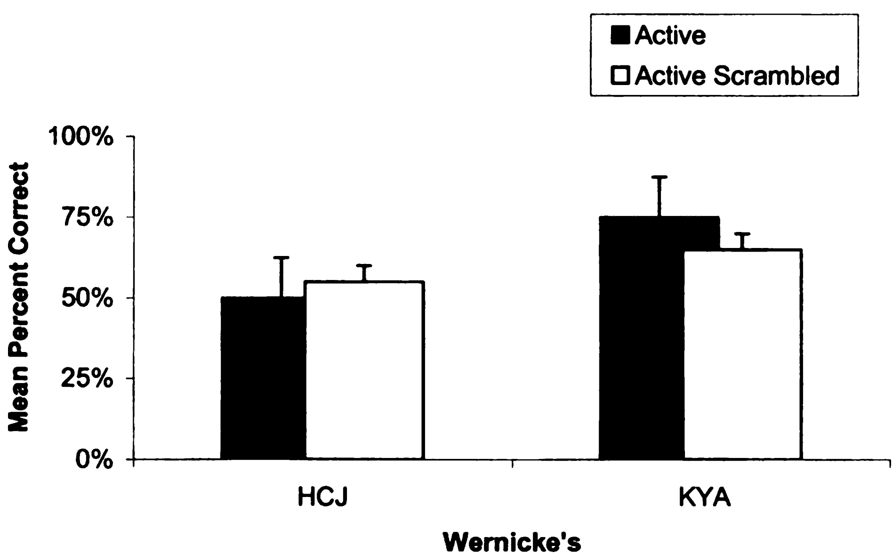
Table 4.6

Raw scores for controls on actives (correct out of 20)

Structure	SHB	OKT	Avg	%
Active	20	20	20	100%
Scrambled	20	20	20	100%

Figure 4.2

Percent correct for Wernicke's on actives



As can be seen in Table 4.5 and Figure 4.2, there is no clear active-scrambled asymmetry in Wernicke's subjects. Performance on active sentences was 63% correct and scrambled active sentences 60%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance on actives was at chance ($t(1) = 1.00$, $p = .5$), and performance on scrambled actives was also at chance ($t(1) = 2.00$, $p = .295$). This pattern is summarized in Table 4.7.

Table 4.7

Significance patterns for Wernicke's on actives compared with chance (50%)

Sentence Type	**Significance**
Active	ns
Scrambled Active	ns

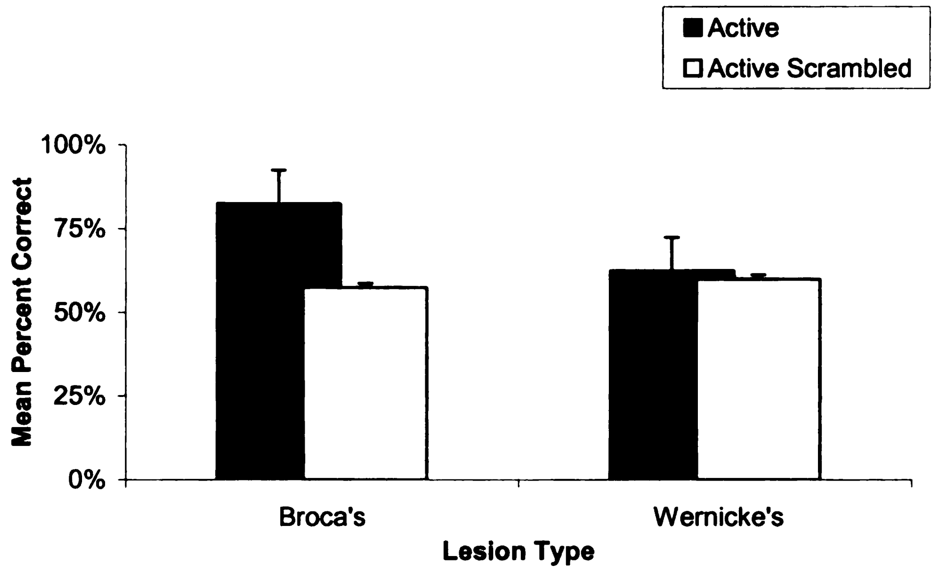
Individual analyses reveal that one subject showed an active-scrambled asymmetry and one did not. HCJ performed at chance on actives (50% correct, $t(19) = 0$) and chance on scrambled sentences (55% correct, $t(19) = 1$, $p = .329$). KYA performed above chance on actives (75% correct, $t(19) = 2.517$, $p = .02$) and at chance on scrambled (65% correct, $t(19) = 1.831$, $p = .082$). However, two-tailed t-tests reveal that there is no significant difference in performance between the two conditions for each subject.

4.4.3 Broca's versus Wernicke's

Group scores for Broca's and Wernicke's reported above are repeated in Figure 4.3. As noted above, Broca's performed above chance on actives (75% correct) and at chance on scrambled (55% correct). Wernicke's performed at chance on both active and scrambled sentence (63% and 60%, respectively).

Figure 4.3

Percent correct on actives for each lesion type



Results from a 2 X 2 (Lesion x Sentence Type) analysis of variance (ANOVA) reveal a main effect for sentence type ($F(1, 8) = 7.710$, $p < .028$) but no main effect for lesion type ($F(1, 8) = 2.90$, $p = .126$). Although there was no significant interaction ($F(1, 8) = 4.80$, $p = .058$), results approached significance, indicating that performance of Broca's and Wernicke's is not the same at each sentence type. Bonferroni posttests reveal a significant difference between Broca's and Wernicke's in the active condition ($p<.05$) but no significant difference in the scrambled condition.

4.5 Discussion

This section summarizes the empirical findings presented in the previous section. It also relates these findings to the predictions made in the theoretical background in Section 4.2.3. Finally, in this section I will discuss some of the theoretical implications based upon the above analyses.

4.5.1 Empirical Findings

The findings of this experiment indicate that as a group and as individuals, the four Korean Broca's patients demonstrate an active-scrambled asymmetry. These findings confirm the patterns discussed in Chapter 2 reported by Beretta et al. (2001) for Korean and Spanish and Hagiwara and Caplan (1990) for Japanese.

The two Wernicke's patients, however, did not display this asymmetry. It should be noted that one of the Wernicke's patients, KYA, appears to be slightly less severe than the other Wernicke's patient. Although it appears that KYA does show the asymmetry, there is in fact no significant difference between conditions, which was found in the Broca's patients. This suggests that KYA is less severe than HCJ, and the improved performance in actives is followed by concomitant improvement in scrambled actives. Even though the scrambled scores appear to be lower than active scores, statistically there is no difference. Important is the consistency of performance in each condition for Wernicke's that is not seen in Broca's; Wernicke's patients perform the same in each of the conditions. Therefore, despite KYA's improved performance, Wernicke's as a group will be considered at chance in both conditions.

The finding of a main effect for sentence type and not for lesion type is to be expected if Broca's patients perform above chance on active and at chance on scrambled active sentences. This is because Broca's performance in the active condition increases the mean for active despite Wernicke's chance performance. A look at row and column means in Table 4.8 confirms this.

Table 4.8

Group column and row means for actives

	Broca's	**Wernicke's**	
Active	83%	63%	*73%*
Scrambled	58%	60%	*59%*
	70%	*62%*	

The higher scores on active sentences for Broca's combined with KYA's higher scores for Wernicke's pushes the active row mean to 73%, while chance performance by Broca's in the scrambled condition strengthens the chance level of scrambled sentences. Comparing sentence type (active73% versus scrambled 59%), there is a significant difference. This difference in actives is enough to create a main effect for sentence type. Additionally, the fact that interaction approached significance is indicative of the high score for Broca's in the active condition. However, the same is not true for lesion type. The higher score for Broca's in the active condition is not enough to offset the chance score in the scrambled condition. Comparing column means (Broca's 70% versus Wernicke's 62%), there is no significant difference.

4.5.2 Theoretical Implications

Table 4.9 provides a summary of the predictions made for Broca's in Section 4.3 and the findings from Section 4.4. As described above, Broca's patients performed above chance on simple active sentences, which do not involve overt movement. These same patients performed at chance on scrambled active sentences, which do involve overt movement from object position to sentence-initial position.

Table 4.9

Summary of predictions and results for actives

Structure	TDH	ALH	MH	DDH	Result
Active	Above	Above	Above	Above	Above
Scrambled Active	Below	Chance	Below	Chance	Chance

All four of the accounts correctly predict performance on active sentences. However, only the ALH and DDH correctly predict performance on scrambled actives. The TDH and MH both incorrectly predict below chance performance.

The reason for the TDH's failure in scrambled actives is its reliance on the Thematic Hierarchy, especially in conjunction with linear assignment. In syntactic constructions involving movement of an object to subject position (e.g., English passive), the TDH creates a situation in which the Broca's patient is faced with an ambiguity: two Agents performing the action indicated by the predicate. Agent is assigned to the first NP by the default strategy because Agent is highest/first on the hierarchy. Thus, the combination of Thematic Hierarchy and linear order help to explain why Agent is assigned as a strategy. However, for scrambling, the TDH loses its ability to present the patient with an ambiguity precisely because of the hierarchy and linear assignment. The default strategy selects one role (Agent) for the NP in sentence-initial position. Because another movement has occurred (from VP-internal position to subject position), the strategy must again refer to the hierarchy and select the next role down (Theme). As there is now no ambiguity, the TDH makes the wrong prediction: below chance. The data presented above thus confirm data presented for Spanish and Korean in Beretta et al. (2001).

In addition to the above empirical problem, the TDH suffers from a serious conceptual problem because of its reliance on the hierarchy. Both Beretta (2001) and Piñango (1999) point out that the Thematic Hierarchy is simply a *generalization* that describes the relation between thematic roles and grammatical relations for the purpose of mapping onto syntactic structure (Grimshaw, 1990; Jackendoff, 1972, 1990). As such, it is not intended to be an independent syntactic construct.

The MH fails for reasons similar to the TDH. Although the MH does not rely on the Thematic Hierarchy, it does rely on canonical assignment. Patients are argued to deploy an extragrammatical heuristic in order to cope with a difficulty in mapping thematic roles from argument structure to arguments in syntactic structure. It is this canonicity that forces the MH to predict below chance performance, as thematic role assignment is reversed. Thus, although one linear account and the structural account correctly predict the Korean data, the TDH and MH have serious flaws.

4.6 Conclusion

Cross-linguistically simple active sentences present little problem for Broca's patients. It should be noted that patients do not perform normally, as factors such as possible impaired working memory may affect performance. It was argued that if the basic hypothesis is that movement disrupts comprehension, then the simplest test would be one in which patients are presented with an active sentence that they have shown they can comprehend but with one element moved. This type of construction did indeed disrupt interpretation in Korean patients. As scrambling in a simple active sentence is a construction in which it is widely agreed that movement occurs, it can be concluded that movement disrupts comprehension in Korean Broca's aphasia.

Scrambling, then, can be used as a baseline experiment in which to test whether other syntactic constructions have movement in Korean. Patients who have no difficulty comprehending active sentences but have difficulty comprehending scrambled actives will be tested on other constructions purported to have movement. Additionally, to facilitate comparison for passive and relative clauses, patients will be tested on the same set of noun/verb combinations and pictures. Thus, patients will be presented with the same pictures and the same sentences transformed into passives and relative clauses. Two additional experiments will adapt materials to facilitate comparison. The quantified subject experiment will use the same set of noun/verb combinations as active, passive and relative clause but with modified pictures. The *wh*-question experiment will draw from the same set of verbs as the other experiments but will use different nouns and pictures in order to make the stimuli more pragmatically appropriate for questions. The next chapter will present an experiment involving passives in Korean.

CHAPTER 5

PASSIVES

5.1 Introduction

In this chapter I will present empirical data from Korean aphasia on three variations of the Korean morphological *–hi* passive: full *–hi* passive, scrambled *–hi* passive and truncated *–hi* passive. In Chapter 4 I presented data from Broca's aphasia on active and scrambled active sentences. Four Korean patients were seen to perform above chance on actives and at chance on scrambled actives. It was argued that these sentences differ only in that the internal argument in the scrambled active sentence has moved to a sentence-initial position. Given that it is syntactic movement that distinguishes the two constructions and that the performance by the Broca's patients was impaired in the movement construction, it was concluded that these four patients are sensitive to syntactic movement. The experiment reported in this chapter will further investigate this claim by testing these same patients in a different construction involving syntactic movement: passive.

As described in Chapter 2, there is a robust pattern of above chance performance on actives and at chance on passives in Broca's aphasia. However, there is little data from head-final, SOV languages. This chapter, then, will present empirical findings from three variations of the Korean morphological *–hi* passive: full *–hi* passive, scrambled *–hi* passive and truncated *–hi* passive. As in Chapter 4, empirical data from Wernicke's aphasia will also be presented.

This chapter will also present two important theoretical issues and confront each with the Broca's data from the three versions of the *–hi* passive in Korean. The first theoretical issue is the syntactic debate concerning the proper analysis of the Korean morphological *–hi* passive. There are strong syntactic arguments for both a lexical and a derived analysis of the *–hi* passive. Given the controversy, this chapter will look to language deficit to help discern the proper analysis.

The second theoretical issue concerns the extent to which the four aphasia accounts can explain Broca's performance patterns on the Korean passives. Two versions of the Korean *–hi* passive (full and scrambled) are crucial because they confront the accounts with data on passive structures that vary in the order of arguments. As with active sentences, Korean allows for scrambling in passives. This in turn allows for an interesting ordering of arguments in which the construction remains passive but the order of arguments is transformed into canonical linear order (i.e., Agent Theme). These Korean passive constructions, then, will help to tease apart the linear and structural accounts, as both make the same predictions for passive but different predictions for the scrambled and truncated passive.

The organization of the chapter is as follows. Section 5.2 will provide the theoretical background for the chapter. It will outline the syntactic debate concerning morphological passives in Korean and present arguments for both the lexical and derived analyses. It will also provide the predictions of the four Broca's accounts for passives in Korean. Section 5.3 will describe the methods and materials for the passive experiment. Section 5.4 presents the results from the experiment. In Section 5.5 I discuss the implications of the results in terms of the two theoretical issues. Section 5.6 concludes the chapter.

5.2 Theoretical Background

This section will provide a brief description of Korean passives and two competing syntactic analyses for the morphological *–hi* passive. Predictions for testing these two analyses in Korean aphasia will also be presented. Finally, this section will provide the predictions that the four agrammatic accounts make for the Korean *–hi* passive.

5.2.1 Korean Passive

This section will provide a brief description of Korean passives as presented in the descriptive linguistic literature. Following this description, I will present two syntactic analyses of one of the passives: the morphological *–hi* passive: a lexical analysis and a derived analysis. I will argue that although arguments for both analyses are strong, the derived analysis is to be preferred.

It is generally held that there are three kinds of passives in Korean, all in complementary distribution: morphological, periphrastic, and lexical (Cho, 1995; Lee H., 1989; Sohn, 1999). The following illustrate these three types.

(5-1) Morphological (*-hi*)

a. kyengchal-i   totwuk-ul   cap-ess-ta

police-nom   thief-acc   catch-past-decl

'The police caught the thief.'

b.

totwuk-i	kyengchal-eykey	cap-hi-ess-ta
thief-nom	police-by	catch-pass-past-decl

'The thief was caught by the police.'

(5-2) Periphrastic (*-e ci-ta*)

a.

Mary-ka	ywulichang-ul	kkay-ess-ta
Mary-nom	window-acc	break-past-decl

'Mary broke the window.'

b.

ywulichang-i	Mary-ey uyey	kkay-e ci-ess-ta
window-nom	Mary-by	break-pass-past-decl

'The window was broken by Mary.'

(5-3) Lexical

a.

Mary-ka	John-ul	ttayri-ess-ta
Mary-nom	John-acc	hit-past-decl

'Mary hit John.'

b.

John-i	Mary-eykey	mac-ess-ta
John-nom	Mary-acc	receive hit-past-decl

'John was hit by Mary.' (lit. John received a hit by Mary)

It is also generally held that the periphrastic passive in (5-2b) is derived via syntactic movement and that the lexical passive in (5-3b) is not derived by movement. It is assumed that the passive-like meanings in (5-3b) come from the lexical properties of these verbs and not suppression of the agent as in derived passives. However, there is disagreement on the proper analysis of the morphological *–hi* passive (5-1b). As this is the focus of this experiment, I will deal only with the morphological passive.

Traditional Description of Morphological *–hi* Passive

Korean *–hi* passives are traditionally described along the lines of English verbal passives (Cho, 1995; Lee H., 1989; Sohn, 1999). Active sentences are transformed into passive sentences by adding passive morphology to the verb, moving the internal argument to subject position and placing the external argument in a by-phrase. Examples are given in (5-4) through (5-6).

(5-4)	Subject $_{\text{(Agent)}}$	+	Object $_{\text{(Theme)}}$	+	Predicate $_{\text{(Transitive)}}$
	Subject $_{\text{(Theme)}}$	+	by-phrase $_{\text{(Agent)}}$	+	Predicate $_{\text{(Passive)}}$

(5-5)	koyangi-ka	kae-lul	mwul-ess-ta
	cat-nom	dog-acc	bite-past-decl
	'The cat bit the dog.'		

(5-6) kae-ka koyangi-eykey mwul-hi-ess-ta

dog-nom cat-by bite-pass-past-decl

'The dog was bitten by the cat.'

The passive affix *–hi* has four allomorphs: *-hi*, *-i*, *-li*, *-ki*. These are conditioned largely by the verb stem final segment. Some examples of verbs and allomorphs are given in (5-7).[1]

(5-7) a. mek 'eat' → mek-hi 'be eaten'

b. camku 'lock' → camk-i 'be locked'

c. phal 'sell → phal-li 'be sold'

d. kam 'wind' → kam-ki 'be wound'

The affix *–hi* does not attach to (i) ha-verbs: *kongbwu ha-* 'study'; (ii) dative verbs: *cwu-* 'give', *pat-* 'receive'; (iii) cognitive verbs: *al-* 'know', *molu-* 'not know'; and (iv) symmetrical verbs: *manna-* 'meet', *ssawu-* 'fight' (Sohn, 1999).

Additionally, there is an idiomatic use of *–hi*, in which the verb exhibits exclusively passive morphology but functions as an active verb. Consider the examples in (5-8) and (5-9) from Sohn (1999).

[1] I will represent the morphological *–hi* passive on all verbs with the *–hi* morpheme rather than the allomorphs throughout this dissertation

(5-8) a. nalssi-ka phwul-hi-ess-ta

weather-nom clear-pass-past-decl

'The weather cleared up.' (lit. The weather was cleared)

b. *nalssi-lul phwul-ess-ta

weather-acc clear-past-decl

'(Something) cleared the weather' (with the meaning 'the weather cleared up')

(5-9) a. appa-ka kamki-ey kel-hi-ess-ta

dad-nom cold-by hang-pass-past-decl

'Dad caught a cold.' (lit. Dad was hooked by a cold)

b. *kamki-ka appa-lul kel-ess-ta

cold-nom dad-acc hang-past-decl

'The cold caught Dad' (with the meaning 'Dad caught a cold')

Whereas the relationship between the Agent and Theme remains the same in (5-5) and (5-6), this relation does not hold in (5-8) and (5-9). That is, it is possible to use 'clear' and 'hang' in the passive with the intended meaning but not in the active alternation. Sohn (1999) notes that all of these occurrences are quite idiomatic.

Korean passives, like their English counterpart, contain an optional by-phrase (5-10a,b). As described in Chapter 4, Korean uses postpositions, which function much like English prepositions. These include the following: *-kkey* 'by' (human), *-ey key* 'by' (animate, formal), *-hanthey* 'by' (animate, informal) *-ey uyeyse* 'by'(animate, formal). The by-phrase in a passive may be omitted (5-10b).

(5-10) a. kae-ka koyangi-eykey mwul-hi-ess-ta

dog-nom cat-by bite-pass-past-decl

'The dog was bitten by the cat.'

b. kae-ka mwul-hi-ess-ta

dog-nom bite-pass-past-decl

'The dog was bitten (by the cat).'

Finally, as is the case for active sentences, preverbal constituents can be scrambled (Sohn, 1999). The sentence in (5-11) is a scrambled version of (5-10a).

(5-11) koyangi-eykey kae-ka mwul-hi-ess-ta

cat-by dog-nom bite-pass-past-decl

'The dog was bitten by the cat.'

Thus, there are two possible word orders for a Korean passive sentence: [Subject-ByPhrase-Verb] and [ByPhrase-Subject-Verb]. [Subject-ByPhrase-Verb] is considered the canonical order (Sohn, 1999).

Syntactic Accounts of Korean Passive

In this section I present two syntactic analyses of the morphological *–hi* passive. The first is a lexical analysis in which there is no syntactic movement and NPs are base generated in their surface positions. The second is a derived analysis that argues that the subject of the passive is derived by syntactic movement of the internal argument. I will argue that although arguments for both analyses are strong, the derived analysis is to be preferred.

Much current syntactic research claims that the view of traditional descriptive grammars is simplistic and flawed (Hong, K.S., 1991; Lee, K.D., 1987; Lee, Y.O., 1998; Park, 1991; and many others).[2] It is argued that an English-type movement analysis does not account for all of the Korean data. In particular, the passive morpheme *-hi* cannot attach to all verbs, there are idiosyncrasies, seen in (5-8) and (5-9), and English and Korean passives differ too greatly in distribution facts. Thus, English and Korean passives should not be afforded the same analysis. Park (1991) offers one such analysis in what I will call the Lexical Passive Hypothesis. She argues that passive formation is simply a lexical process.[3] However, Cho (1995) and Halliwell (2001) argue that a syntactic movement analysis, along the lines of the English passive, may well be preferred. The following will provide arguments for both analyses.

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[2] As noted in Chapter 4, a Principles and Parameters analysis will be presented here to allow for better comparison among analyses in the syntactic debate and the aphasia accounts.
[3] Although there are more recent analyses within different frameworks, Park provides the most recent and clearest syntactic analysis of the *–hi* passive within the Principles and Parameters framework. It is this analysis that I will focus on in this experiment.

1. A Non-Movement Analysis: The Lexical Passive Hypothesis

Park (1991) argues that the morphological *–hi* passive is lexical, much like the adjectival passive in English. Citing Levin and Rappaport (1986), she argues that adjectival passive formation in English involves a category shift in the lexicon from [+V, -N] to [+V, +N] and a concomitant change in stativity from [-stative] to [+stative]. An automatic consequence of these shifts is the deletion of the external theta-role in (5-12a) and the externalization of the internal argument (5-12b). Park argues for the same analysis of Korean *–hi* passives except that, unlike English, the Korean verb does not undergo a category shift from verb to adjective (possibly because adjectives are verbs in Korean). However, the verb does undergo a shift in stativity from [-stative] to [+stative]. This shift triggers externalization of the internal argument such that the internal argument becomes the surface subject of the passive verb while the external argument, if present, is generated in a by-phrase as an adjunct.

(5-12) a. $Verb_{transitive}$: (Agent, (Theme))

b. $Verb_{passive}$: (0, (Theme)) → (Theme)

This lexical analysis is based upon three major arguments: (i) lack of implicit argument effects, (ii) numeral quantifier effects, and (iii) distribution problems. The following will characterize Park's three main arguments.

(i) Lack of implicit argument effects

Park's first argument is that Korean *–hi* passives do not display implicit argument effects. She provides two areas of evidence for this argument. First, she argues that 'agent-oriented' adverbs such as 'intentionally,' which require an explicit or implicit agent, are not licensed in *–hi* passives. Second, she argues rationale clauses, which also require agents to be licensed, are not licensed in *-hi* passives. The following will discuss each of these in more detail.

First, Jaeggli (1986), citing Chomsky (1981), points out that there is reason to believe that passive constructions without a by-phrase are still agentive in that an external agent theta-role is present even in the absence of the by-phrase. The effects that non-overt agents (implicit arguments) have within a sentence are considered strong diagnostics for movement in passive. It is argued that if a construction does not show an implicit argument effect, then there must be no implicit (external) argument. That is, the external argument must have been deleted and the verb has become intransitive.

Park provides two examples in which the *–hi* passive does not show implicit argument effects. First, she argues that 'agent-oriented' adverbs such as 'intentionally' are not licensed in *–hi* passives. For these adverbs to be licensed in a sentence, an agent must be present. The example in (5-13) provides an acceptable passive sentence, while (5-14) provides the same sentence with the adverb.

(5-13)	ku-engtwunghan	somwun-i	mit-hi-ess-ta
	that-ridiculous	rumor-nom	believe-pass-past-decl
	'That ridiculous rumor was believed.'		

(5-14) *ku-engtwunghan somwun-i **uytocekulo** mit-hi-ess-ta

that-ridiculous rumor-nom intentionally believe-pass-past-decl

'That ridiculous rumor was believed intentionally.'

(Park, 1991)

It is argued that the unacceptability in (5-14) results from there being no agent to license the adverb.

Second, Park argues that *-hi* passives cannot license rationale clauses. Baker, Johnson, and Roberts (1989) claim that the implicit arguments are necessary in order to control PRO subjects of rationale clauses. In (5-15) PRO is controlled by the implicit agent responsible for the bribing.

(5-15) This bureaucrat was bribed [PRO to avoid the draft].

(Baker, Johnson and Roberts, 1989)

This pattern does not occur with *–hi* passives. Consider (5-16).

(5-16) *ku-somwun-i [PRO ansim ha-ki wuyhayse] mit-hi-ess-ta

that-rumor-nom relief do-to believe-pass-past-decl

'That rumor was believed in order to feel relief.'

(Park, 1991)

It is argued that there is no implicit argument to control the PRO subject of the rationale clause in (5-16). From the above data, she concludes that *–hi* passives do not have implicit (external) arguments.

(ii) Numeral Quantifier effect

The second major argument Park offers in support of a lexical analysis is the Numeral Quantifier (NQ) effect. Following Miyagawa (1989), Park argues that a Numeral Quantifier (NQ) can only be construed with an NP if the NQ and NP meet a mutual c-command condition at some level of representation. Park argues that this can be a test for syntactic movement in a passive. That is, if an NQ is associated with a distant subject NP in a passive, it must be the case that the NP began in a local, c-command relation and moved. Thus, if an NQ cannot be associated with an NP in subject position of a passive, Park concludes, it must be that the subject NP is base generated in subject position and not derived via syntactic movement.

Consider NQ and NP construal in the active examples in (5-17).

(5-17)	a.	aitul-i	**somwun**-ul	**3-kay**	mit-ess-ta
		children-nom	rumor-acc	3-things	believe-past-decl
		'The children believed 3 rumors'			
		(Park, 1991)			

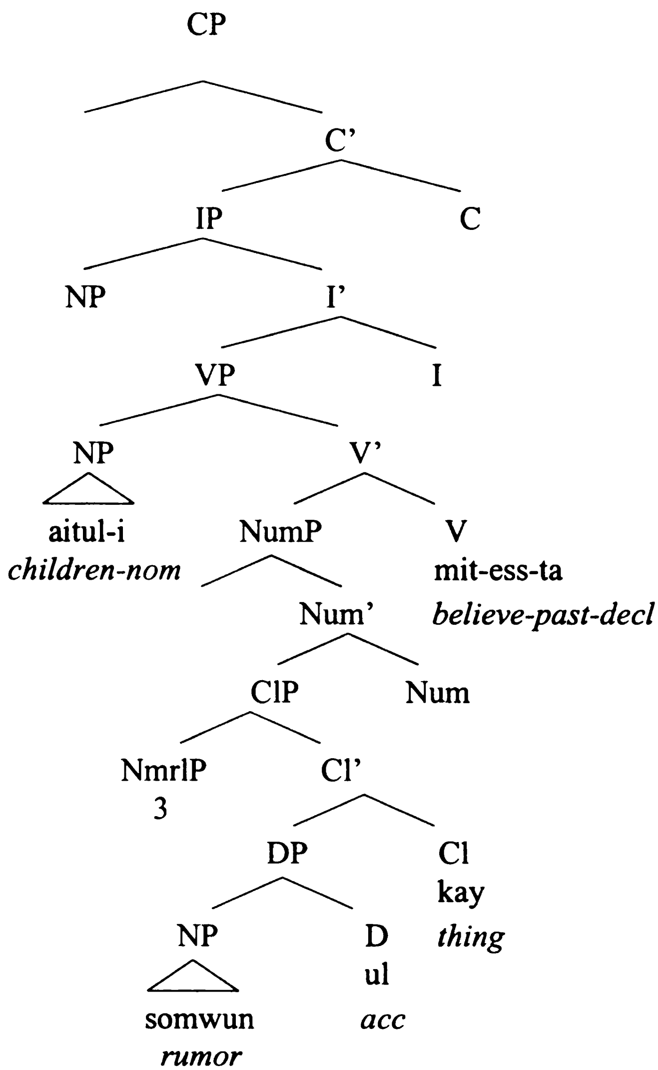
b. kyengchal-i **totwuk-tul**-ul **3 myeng** cap-ess-ta

police-nom thief-pl-acc 3 people catch-past-decl

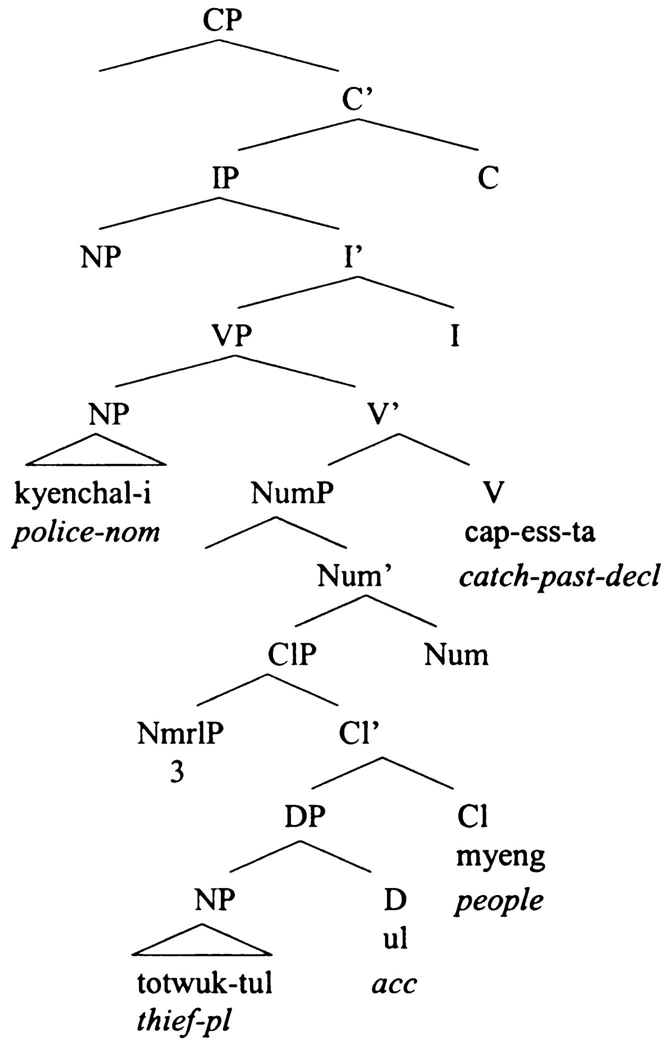
'The police caught 3 thieves'

In both (5-17a) and (5-17b) the NP *somwun* 'rumor' and the NP *totwuk-tul* 'thieves' enter into a mutual c-command relation with their respective classifiers (NQ). Thus, in (5-17a) *3-kay* '3 things' is construed with *somwun* 'rumor' such that the meaning is there are three rumors. In (5-17b) *3 myeng* '3 people' is construed with *totwuk-tul* 'thieves' such that the meaning is there are three thieves. In both examples, the NPs and NQs enter into a local c-command relation. Consider the D-structure representations of (5-17) given in (5-18).

(5-18) a.


CP
C'
IP
C
NP
I'
VP
I
NP
V'
aitul-i
children-nom
NumP
V
mit-ess-ta
believe-past-decl
Num'
ClP
Num
NmrlP
3
Cl'
DP
Cl
kay
thing
NP
D
ul
acc
somwun
rumor

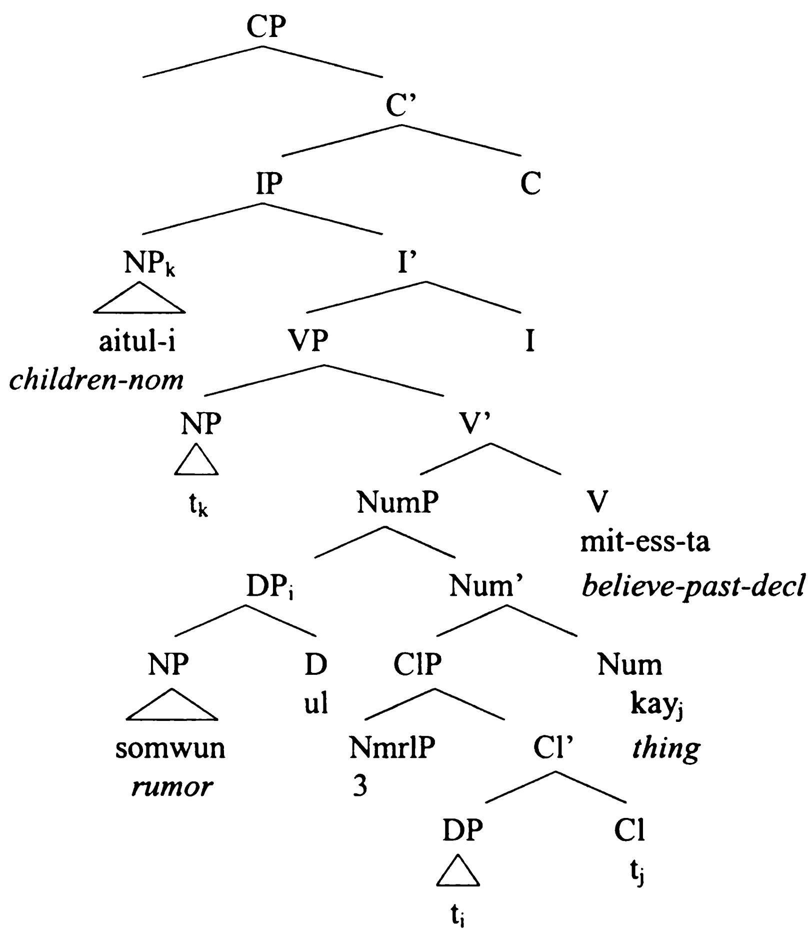
b.



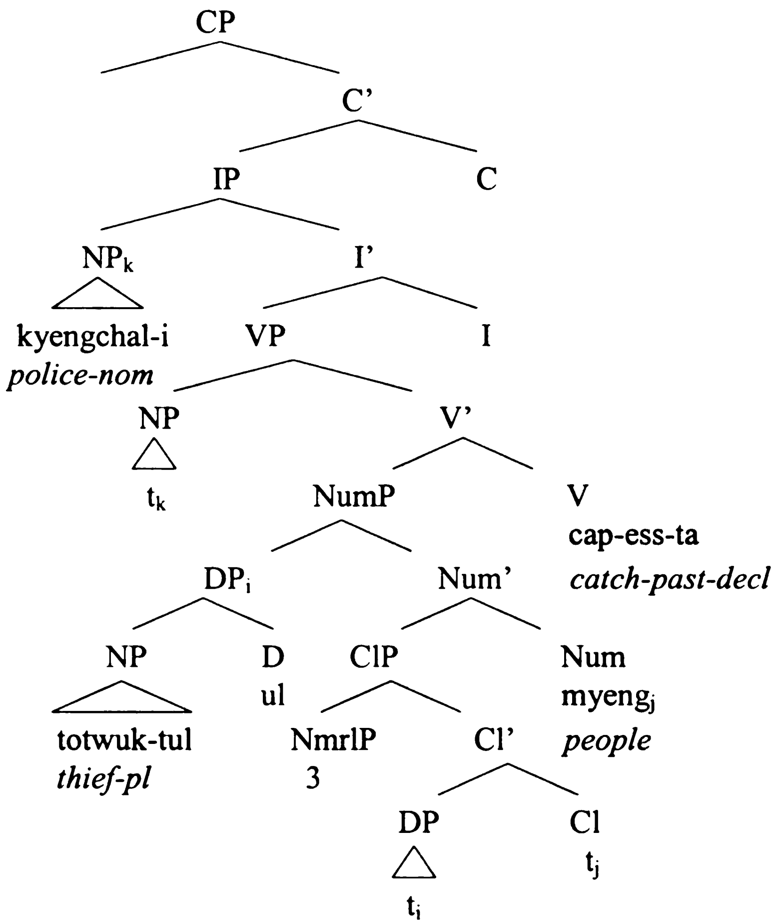
Assuming the analysis of Kakegawa (2000) for numeral classifiers, the verb selects a number phrase (NumP) as its complement. The numeral classifiers in both examples c-command their respective DPs. In (5-18a), the classifier *kay* 'thing' c-commands the DP *somwun-ul* 'rumor,' and thus means three rumors. In (5-18b), the classifier *myeng* 'people' c-commands the DP *totwuk-tul-ul* 'thieves-pl-acc' and means three thieves.

In both examples, the DPs in NumP then raise to [Spec NumP] and the classifiers raise to Num, yielding the surface order in (5-17). The S-structure representations of (5-17) and (5-18) are given in (5-19).

(5-19) a.



b.



Park argues that in the case of further NP movement (e.g., scrambling), the construal will remain intact, as the NP trace will maintain the c-command relation. Thus, scrambling an NP associated with a classifier to a sentence-initial position is acceptable, as the trace of the moved NP mediates this relationship. Consider the example in (5-20).

(5-20)	a.	**somwun$_i$**-ul	aitul-i	t_i	**3-kay**	mit-ess-ta
		rumor-acc	children-nom		3-things	believe-past-decl

'The children believed 3 rumors'

(Park, 1991)

b. **totwuk-tul$_i$**-ul   kyengchal-i t_i **3 myeng**   cap-ess-ta

thief-pl-acc   police-nom   3 people   catch-past-decl

'The police caught 3 thieves'

In (5-20a) *somwun-ul* 'rumor-acc' has scrambled from object position to an adjoined sentence-initial position. In (5-20b), *totwuk-tul-ul* 'thief-pl-acc' is scrambled from object position to sentence-initial position. Despite this scrambling, the sentences are acceptable because a trace mediates the relation between the NP and the NQ.

In contrast, consider the example in (5-21), in which an NP that does not enter into a c-command relation with the NQ cannot be construed with that NQ.

(5-21) * **kyengchal-tul**-i   totwuk-tul-ul   **3 myeng**   cap-ess-ta

police-pl-nom   thief-pl-acc   3 people   catch-past-decl

'3 policemen caught the thieves'

The NP *kyengchal-tul* 'thieves' in (5-21) does not enter into a c-command relationship with the classifier (NQ). Thus, the sentence is unacceptable with the meaning that there are three policemen. [4]

Park then uses these data to argue that if a distant NP cannot be construed with the NQ, then it must be the case that there is no trace mediating the relation between the NP

[4] Note that the example in (5-21) is acceptable with the meaning that there were 3 thieves and the police caught them.

and the NQ. That is, the NP must not have moved; rather it must have been generated in that distant position. Consider the examples in (5-22).

(5-22)	a.	* **somwun**-i	[aitul-eykey	**3-kay**	mit-hi-ess-ta]
		rumor-nom	children-by	3 things	believe-pass-past.decl

'Three rumors were believed by the children.'

(Park, 1991)

b.	***totwuk-tul**-i	[kyengchal-eykey	**3-myeng**	cap-hi-ess-ta]
	thief-pl-nom	police-by	3 people	catch-pass-past-decl

'Three thieves were captured by the police.'

If *somwun-i* 'rumor-nom' in the passive example in (5-22a) had moved from object position in VP to [Spec IP], a trace would have mediated the relation between the classifier *3-kay* '3-things' and the NP *somwun-i* 'rumor-nom.' This is the case in the scrambled active example in (5-20a), in which the object *somwun-ul* 'rumor-acc' is scrambled to sentence-initial position. The fact that the passive in (5-22a) is unacceptable suggests that NP *somwun-i* 'rumor-nom' in [Spec IP] does not form a chain with a trace in object position. Because there is no trace mediating the relation between the NP *somwun* 'rumor' and the NQ *3 key* '3 things,' the NQ cannot be associated with the NP.

The same is true of the passive example in (5-22b). If *totwuk-tul-i* 'thief-pl-nom' had moved from object position to [Spec IP], it would have left a trace to mediate the relation between the NP and the NQ. The fact that the sentence is unacceptable suggests that there has been no movement of the NP and that the NP and the NQ cannot be associated. Park, therefore, argues that the S-structure subject in the Korean *–hi* passive must have been base-generated as subject and not derived by syntactic movement.

(iii) A change in stativity

The third argument that Park offers is that passive verbs become stative with the addition of *–hi* passive morphology, and this is very similar to the behavior of adjectival passives in English. As evidence for this claim, she argues that the *mos* form of 'not' and the resultative affix are licensed only with non-stative verbs; neither is licensed with *–hi* passive verbs.

First consider Korean some basic characteristics of Korean negation. Sohn (1999) points out that there are two general types of negation: constituent and sentential. Constituent negation can be classified into predicate negation and nominal negation. This type of negation includes verbs that are inherently negative such as *epsta* 'not exist' and *moluta* 'not know.' It also includes Sino-Korean nouns such as *kanung* 'possibility' that may be negated by Sino-Korean prefixes such as *pul-* as in *pwul-kanung* 'impossibility.' These derivational affixes include such prefixes as *pi-*, *pwu-*, *mwu-*, *mol-*, and *mi-*, which are similar to English affixes *in-*, *dis-*, *un-*, *non-*, etc. (Sohn, 1999).

Sentential negation can be classified into two types: short and long. The most common way of negating a sentence is the short form, which involves placing a negative adverb immediately before the predicate. Negative adverbs used in declarative and interrogative sentences are *an* 'not' (5-23a) and *mos* 'not possibly, cannot, unable' (5-23b).

(5-23) a. Mary-ka hakkyo-ey **an** ka-ess-ta

Mary-nom school-to **not** go-past-decl

'Mary did not go to school'

b. Mary-ka hakkyo-ey **mos** ka-ess-ta

Mary-nom school-to **cannot** go-past-decl

'Mary could not go to school'

In both examples in (5-23), the negative adverb precedes the verb. As seen in the examples, simple negation is expressed by *an* 'not', whereas inability or impossibility is expressed by *mos* 'cannot' (Sohn, 1999). Additionally, while *an* 'not' is used widely with any predicate, *mos* 'cannot' does not occur with adjectives (5-24).

(5-24) a. Mary-ka yeyppu-ta

Mary-nom pretty-decl

'Mary is pretty.'

b. Mary-ka **an** yeyppu-ta

Mary-nom **not** pretty

'Mary is not pretty'

c.	*Mary-ka	**mos**	yeyppu-ta
	Mary-nom	**cannnot**	pretty-decl

'Mary is not pretty.

The long form of sentential negation is created by attaching the nominalizer *–ci* to the predicate (5-25), which produces a nominalized clause (Lee H, 1989; Sohn, 1999). A negative adverb is then attached to the main clause *ha-* 'do' verb, which is inserted as the matrix verb and often contracted to *h* (5-25a). An optional accusative, nominative or delimiter particle, which is attached to the nominalized *–ci* clause, may intervene (5-25c).

(5-25)	a.	Mary-ka	hakkyo-ey	ka-**ci**	**an**-h-ess-ta
		Mary-nom	school-to	go-**nom**	**not**-do-past-decl

'Mary did not go to school'

b.	Mary-ka	hakkyo-ey	ka-**ci**	**mos**	ha-ess-ta
	Mary-nom	school-to	go-**nom**	**cannot**	do-past-decl

'Mary could not go to school'

c.	Mary-ka	hakkyo-ey	ka-**ci-lul**	**an**-h-ess-ta
	Mary-nom	school-to	go-**nom-acc**	**not**-do-past-decl

'Mary did not go to school'

Again, while *an* 'not' is used widely with any predicate, *mos* 'cannot' does not occur with adjectives (5-26).

(5-26) a. Mary-ka yeyppu-ci an-h-ess-ta

Mary-nom pretty-nom not-do-past-decl

'Mary is not pretty'

b. * Mary-ka yeyppu-ci mos ha-ess-ta

Mary-nom pretty-nom cannot do-past-decl

'Mary could not be pretty'

Sohn (1999) points out that in general, the long and the short form share the same meaning, with slight stylistic difference: the long form is more formal than the short.

Park (1991) argues that the distribution of Korean *–hi* passives is similar to that of the negative adverb *mos* 'cannot.' As described above in (5-23) and (5-25), *mos* 'cannot' is licensed by the non-stative verb 'go.' However, as seen in examples (5-24) and (5-26), *mos* 'cannot' is not licensed by adjectives, which are stative verbs in Korean. Park then argues that *mos* 'cannot' is not licensed with a passive verb (5-27).

(5-27) *ku-engtwunghan somwun-i **mos** mit-hi-ess-ta

that-ridiculous rumor-nom not believe-pass-past-decl

'That ridiculous rumor was not believed.'

(Park, 1991)

In (5-27) *mos* is not licensed by the *–hi* form of the verb *mit-* 'believe.' As *mos* 'cannot' is not licensed by stative verbs and as it is also not licensed by *-hi* passive verbs, Park concludes that the passive *–hi* verb is stative.

This same pattern is argued to occur with resultatives. With the non-stative verb 'go' in (5-28a) the resultative affix *e-iss* is licensed; however, with the stative verb in (5-28b) it is not licensed. It is clear in (5-28c) that the resultative is unacceptable with a passive *–hi* verb as well.

(5-28) a. Mary-ka ka-**e** **iss**-ta

Mary-nom go-**resultative**-decl

'Mary has gone (and is still there)'

b. *Mary-ka yeyppu-**e** **iss**-ta

Mary-nom pretty-**resultative**-decl

'Mary is pretty.'

c. *ku-engtwunghan somwun-i mit-hi-**e** **iss**-ta

that-ridiculous rumor-nom believe-pass-**resultative**-decl

'That ridiculous rumor has been believed.'

(Park, 1991)

Based upon the data from short negation and resultatives, Park concludes that passive *–hi* verbs are stative and pattern much like Korean adjectives.

(iv) Distribution problems

The final argument is that a movement analysis of *–hi* passives does not capture distribution facts in Korean. First, Park argues that cross-linguistically passives are quite productive; however, *-hi* passives in Korean are not. That is, the distribution is restricted to a limited set of verbs, as described in Section 5.2.1. Second, there are passives with no active counterparts. A movement-based algorithm would not be able to account for these because there is no active from which to derive the passive.

Given the above arguments, Park concludes that *–hi* passives are best analyzed as lexically formed. Based upon Levin and Rappaport's (1986) analysis for adjectival passives in English, Park argues that Korean *–hi* passivization involves a shift in stativity in the lexicon from [-stative] to [+stative]. This shift triggers externalization of the internal argument such that the internal argument becomes the surface subject of the passive verb while the external argument, if present, is generated in a by-phrase as an adjunct. Crucially, this entails that no traces or argument chains arise in the formation of the *–hi* passive construction.

2. A Movement Analysis: The Derived Passive Hypothesis

In this section I will argue in the Derived Passive Hypothesis that the Korean *–hi* 'passive construction' is derived via syntactic movement and that this movement is the result of an interaction of syntactic constraints (e.g., Case theory and Theta theory). This section will first address each of Park's (1991) arguments and then provide an analysis within the Government and Binding framework along the lines of Baker, Johnson and Roberts (1989).

(i) Implicit argument effects

There are indeed implicit argument effects in the areas described by Park. First, 'Agent-oriented' adverbs do co-occur with *–hi* passives. Consider (5-29).

(5-29)	a.	kyengchal-i	totwuk-ul	**uytoccekulo**	cap-ess-ta
		police-nom	thief-acc	intentionally	catch-past-decl

'The police intentionally caught the thief.'

b.	totwuk-i	**uytoccekulo**	cap-hi-ess-ta
	thief-nom	intentionally	catch-pass-past-decl

'Intentionally the thief was caught by the police.'

(interpretation: The thief let himself be caught by the police)

Simply changing the verb from 'believe' to 'catch' saves the construction. It is important to note, however, that although 'intentionally' is associated with the external (agent) argument in (5-29a), this is not the case in (5-29b). In (5-29b) 'intentionally' is associated with the subject. This is even clearer in a passive with the by-phrase. Consider (5-30).

(5-30)	totwuk-i	kyengchal-eykey	**uytoccekulo**	cap-hi-ess-ta
	thief-nom	police-by	intentionally	catch-pass-past-decl

'Intentionally the thief was caught by the police.'

(interpretation: The thief let himself be caught by the police)

There is no reading such that 'intentionally' is associated with the police. This is not a good test for agenthood or implicit argument. In fact, Baker, Johnson and Roberts (1989) in using this test refer to adverbs like 'intentionally' as 'subject-oriented adverbs.'

However, rationale clauses do provide a better test for implicit argument. Rationale clauses require the syntactic presence of an argument. Again, Park (1991) provides an example with the verb 'believe.' Changing the verb results in an acceptable sentence. Cho (1995), in distinguishing passives from middles in Korean, and Hong (1991) in discussing semantic constraints of passives, both point out that *–hi* passives do license rationale clauses (5-31).

(5-31) a. nay nonli-lul ihayhaki-wihayse i-chayk-i manhi

my theory-acc understand-to this-book-nom a lot

ilk-hi-n-ta

read-pass- pres-decl

'This book is read a lot [PRO to understand my theory].'

(Cho, 1995)

b. John-i [Mary-lul kwuha-lyeko] swunkyeng-eykey

John-nom Mary-acc save-to police-by

cap-hi-ess-ta

catch-pass-past-decl

'John was caught by the police [PRO to save Mary]'

(Hong, 1991)

It is clear in (5-31) that some implicit argument is controlling PRO and licenses the rationale clause.

Park, then, presents two arguments for no implicit arguments: 'intentionally' and rationale clauses. However, 'agent-oriented' adverbs like 'intentionally' are in fact subject-oriented. This is not a sound test for implicit argument. Additionally, although not lexically present, the implicit (external) argument can be modified by rationale clauses. This suggests that there is indeed an implicit (external) argument.

(ii) Numeral Quantifier effects

Park's second argument is that if there is movement then there is no reason why the NP trace cannot mutually c-command the classifier. Examples (5-20b) and (5-22b) are repeated here as (5-32) and (5-33), respectively.

(5-32) **totwuk-tul**$_i$-ul kyengchal-i t_i **3 myeng** cap-ess-ta

thief-pl-acc police-nom 3 people catch-past-decl

'The police caught 3 thieves'

(5-33) ***totwuk-tul**$_i$-i kyengchal-eykey t_i **3 myeng** cap-hi-ess-ta

thief-pl-nom police-by 3 people catch-pass-past-decl

'Three thieves were captured by the police.'

It was argued that the NP 'thieves' in (5-33) does not move from Object position as it does in (5-32). If it has moved, the trace should be able to enter into a mutual c-command relationship with the classifier and result in an acceptable construction. However, consider (5-34).

(5-34) kyengchal-eykey **totwuk-tul**-i **3 myeng** cap-hi-ess-ta

police-by thief-pl-nom 3 people catch-pass-past-decl

'Three thieves were captured by the police.'

It appears that by scrambling the by-phrase to sentence-initial position, the construction is saved. If the structure is as Park suggests, then the NP should still not meet the mutual c-command constraint and should still be unacceptable.

One possibility that needs to be ruled out is that the NP and the NQ form a constituent in (5-34), as this may what is saving the construction. However, this is not a possible analysis for three reasons. First, patterns in nominative case assignment suggest that the NP and the classifier do not form a constituent. Consider (5-35).

(5-35) * [**totwuk-tul-i 3 myeng**]$_i$ kyengchal-eykey t_i cap-hi-ess-ta

thief-pl-nom 3 people -nom police-by catch-pass-past-decl

'Three thieves were captured by the police.'

If the entire constituent *[totwuk-tul-i 3 myeng]* '3 thieves' in (5-34) moves from its VP-internal position to subject position, it is unacceptable even though the c-command constraint is satisfied. The problem is of a different nature. Nominative case in Korean attaches to the entire NP constituent. Attaching the morpheme to a part of an NP is not acceptable. However, when the nominative morpheme is attached to the constituent *[totwuk-tul 3 myeng]* '3 thieves' as in (5-36), then it is acceptable.

(5-36) [**totwuk-tul 3 myeng**]$_i$-i kyengchal-eykey t_i cap-hi-ess-ta

thief-pl 3 people - nom police-by catch-pass-past-decl

'Three thieves were captured by the police.'

Given that it is acceptable for *totwuk-tul-i 3 myeng* '3 thieves' to occur, as in (5-34), it must be concluded that *totwuk-tul-i* 'thieves' and *3 myeng* '3 people' are separate constituents.

A second argument that *totwuk-tul-i* 'thieves' and *3 myeng* '3 people' do not form a constituent comes from adverbials. Consider (5-37).

(5-37) kyengchal-eykey **totwuk -tul**-i ecey **3 myeng** cap-hi-ess-ta

police-by thief-pl-nom yesterday 3 people catch-pass-past-decl

'Three thieves were caught by the police yesterday.'

As an adverbial can intervene between *totwuk-tul-i* 'thieves' and *3 myeng* '3 people' it must be that they do not form a constituent. From this we can conclude that the NP and the NQ are adjacent but not a constituent.

It is clear then that the unacceptability in (5-32) cannot be explained by the c-command argument. Although the solution to this problem is beyond the scope of this paper, an important conclusion from this discussion is that the Numeral Quantifier effect is not a good argument for distinguishing movement from non-movement.

(iii) -hi passives not stative

The third argument for a movement analysis is that *–hi* passives are not similar to adjectival passives in English. Not only do *–hi* passive verbs not change category from verb to adjective (possibly because adjectives are verbal in Korean), but they also do not undergo a change in stativity.

Cho (1995), in arguing that passives are non-stative while middles are stative, provides four arguments that *–hi* passives are in fact eventive. First, only non-statives can license rationale clauses. It was shown above that passives do in fact license these clauses. Consider again (5-31), repeated here as (5-38).

(5-38) a. nay nonli-lul [PRO ihayhaki-wihayse] i-chayk-i manhi

my theory-acc understand-to this-book-nom a lot

ilk-hi-n-ta

read-pass- pres-decl

'This book is read a lot [PRO to understand my theory].'

(Cho, 1995)

b. John-i [Mary-lul kwuha-lyeko] swunkyeng-eykey

-nom -acc save-in order to police-by

cap-hi-ess-ta

catch-pass-past-decl

'John was caught by the police in order to save Mary'

(Hong, 1991)

Second, the fact that passives can occur in pseudoclefts while adjectives cannot suggests passives are not stative.[5]

[5] As the English gloss is unacceptable, it is clearly that the passive in English is more stative than in Korean. The stative auxiliary in English may play a role in this difference.

(5-39) a.

chayk-i	ha-nun-il-un	salam-tul-eykey
book-nom	do-pres-thing-top	person-pl-by

ilk-hi-nun-kes-ita

read-pass-pres-thing-decl

'What the book does is be read by people.'

(Cho, 1995)

b.

*ku-yeca-ka	ha-nun-il-un	yeyppu-n-kes-ita
that-woman-nom	do-pres-thing-top	pretty-pres-thing-decl

'What that woman is is pretty.'

Third, passive verbs occur with progressive aspect while adjectives do not.

(5-40) a.

i-sosul-i	cikum	celchanliey	ilk-hi-ko iss-ta
this-novel-nom	now	greatly	read-pass-prog-decl

'This novel is being widely read now.'

(Cho, 1995)

b.

*ku-yeca-ka	yeyppu-ko iss-ta
that-woman-nom	pretty-prog-decl

'* That woman is prettying.'

It is important to note here that passives may not be completely non-stative because the progressive does occur in certain stative verbs like 'know'.

(5-41) ku-kes-ul al-ko iss-ta

that-thing-acc know-prog-decl

'I know that' (lit: I am knowing that)

Although the progressive may not be a good test for stativity, it certainly is for adjective. It is clear from (5-40) that *–hi* passives are not adjectival.

Third, passives are eventive and not stative because sentences with *happen* can refer back to passive sentences.

(5-42) a. ku-chayk-un best seller –lo ilk-hi-n-ta.

that-book-top -as read-pass-pres-decl

ku-il-un ecey illena-ci anh-ess-ta

that-thing-top yesterday happen-neg-past-dec

'That book is read as a best seller; that didn't happen yesterday'

(Cho, 1995)

b. ku-yeca-nun yeyppu-ta.

That-girl-top pretty-dec

* ku-il-un ecey illena-ci anh-ess-ta

that-thing-top yesterday happen-neg-past-decl

'That girl is pretty; that didn't happen yesterday.'

Given these data, it is clear that not only do *–hi* passive verbs not undergo a shift in category from verb to adjective, they also do not undergo a shift in stativity.

(iv) Distribution of *–hi* passives

The final argument Park offers against a movement analysis is distribution facts. It is argued that the distribution of *–hi* is quite restricted. This is true. However, the three Korean passives (morphological, periphrastic, and lexical) are in complementary distribution as described in the descriptive literature and Section 5.2.1; and this certainly is not an unusual distribution. The same can be said of passives with no active counterpart in (5-8) and (5-9) above. Sohn (1999) points out that these passives are simply idiomatic uses. Thus, it is not clear how distribution relates to the issue of movement.

Therefore, the lexical analysis has difficulty accounting for implicit effects. It also has difficulty explaining a lack of shift from verb to adjective, as well as a lack of shift in stativity as argued in Levin and Rappaport (1986).

The Derived Passive Hypothesis provides an analysis based upon that proposed for English passives. In the standard Government and Binding analysis, the major syntactic properties of passivization can be summarized as follows:

(5-43) a. Verb morphology is affected

b. External theta role of the verb is absorbed

c. Structural case of the verb is absorbed

d. NP assigned the internal theta–role from the passive verb moves to a position where it can be assigned case

e. Movement of the object NP is obligatory to satisfy the Case filter

f. Movement of the object NP is allowed because the subject position is empty

(Haegeman, 1994, p. 185)

These properties are argued to result from the interaction of general syntactic constraints.

(5-44) a. Projection Principle:

A word’s lexical properties must be manifested at each level of structure

b. Theta Criterion:

Each argument is assigned one and only one theta role

Each theta-role is assigned to one and only one argument

c. Case Filter:

Every phonetically realized NP must be assigned (abstract) case

(Chomsky, 1981, p. 29)

The most commonly assumed analysis of passives is that of Baker Johnson, and Roberts (1989). They argue that the above properties can be derived by analyzing the passive morpheme as an argument generated in Infl. As it is an argument, it must be in a theta-marked position. Since the transitive verb assigns a theta-role to only one argument outside VP (i.e., Agent in subject position), the passive morpheme receives the external argument role. Thus, the logical subject is not realized on an NP in passive constructions. Yet, implicit argument effects suggest that rationale clauses and subject-oriented adverbs require the syntactic presence of the external argument. Thus, the presence of an external argument realized in the passive morpheme satisfies this constraint.

Additionally, Case-marking patterns follow those found in English. Consider (5-45).

(5-45) a. kyengchal-i totwuk-ul cap-ess-ta

police-nom thief-acc catch-past-decl

'The police caught a thief'

b. * kyengchal-i totwuk-ul cap-hi-ess-ta

police-nom thief-acc catch-pass-past-decl

'The police caught a thief'

c. totwuk-ul cap-ess-ta

thief-acc catch-past-decl

'(Someone) caught a thief'

d. *totwuk-ul cap-hi-ess-ta

thief-acc catch-pass-past-decl

'(Someone) caught a thief'

e. totwuk$_i$-i [t$_i$ cap-hi-ess-ta]

thief-nom catch-pass-past-decl

'The thief was caught'

In Korean *–hi* passives, like in English, affixation of the passive morpheme makes the verb unable to assign accusative case (5-45b) and (5-45d). As such, it can be argued that the internal argument must move to surface subject position to get case (5-45e).

Given the arguments presented for Korean, the analysis provided in Baker, Johnson and Roberts (1989) can account for implicit argument effects (rationale clauses), Case marking patterns (5-45), and internal argument realized in S-structure subject position. The derived passive hypothesis, then, argues that the passive morpheme *–hi* is an argument and thus needs a theta-role. Accusative case cannot be assigned by the passive verb to the internal argument. Since the NP in object position does not receive case it moves to subject position. This is represented in (5-46) and (5-47).

(5-46) a. [e] was bite-en the dog

b. [The dog]$_i$ was bite-en$_j$ t$_i$

(5-47) a. [e] [$_{VP}$ [kae mwul-hi-ess-ta]]

dog bite-pass-past-decl

b. [kae$_i$ -ka] [$_{VP}$ [t$_i$ mwul- hi$_j$ -ess -ta]]

dog-nom bite-pass-past-decl

'The dog was bitten'

One theoretically favorable consequence of the movement analysis is that there is no need to specify construction-specific rules for Korean *–hi* passives. Passives can be explained simply by government, Case theory, Theta theory and movement chains. The passive construction arises when certain conditions are simultaneously in effect.

Overall, arguments against a movement analysis are not strong. Evidence in support of a movement analysis is quite strong but not thoroughly convincing, as there are nagging problems of productivity and idiosyncrasies. Looking to language deficits may help discern the proper analysis. Therefore, to better distinguish between the two competing analyses, the passive experiment will test how Broca's aphasics treat *–hi* passives. The next section will provide the predictions that the two competing syntactic analyses make.

5.2.2 Accounts of Aphasia

As described in Chapter 2, the four aphasia accounts attempt to explain comprehension patterns in Broca's aphasia by minimally altering an intact representation. The accounts are successful in explaining the comprehension patterns in the English passive. This section will present predictions that each makes for Korean morphological *–hi* passive, scrambled *–hi* passive and truncated *–hi* passive. In testing the four aphasia accounts, I will assume a movement syntactic analysis because, with the exception of the DDH, the predictions made by the accounts are the same for movement and non-movement analyses of the passive.

In addition to predictions for testing the four accounts, this section will present predictions that the two competing syntactic analyses make. As all three of the linear accounts failed to make correct predictions for movement in scrambled actives, the DDH will be used to make predictions for the two syntactic analyses. For all predictions, it is important to note that each of the aphasia accounts targets different syntactic features as the locus of the impairment. Thus, while one account may base predictions upon referential dependencies that include the passive morpheme, another may base predictions upon dependencies created only by certain types of syntactic movement. The four accounts will be evaluated on how well each performs in relation to Broca's data, despite differences in the syntactic theory assumed in each model.

Trace Deletion Hypothesis (TDH)

Passive

In the normal passive sentence in (5-48a), the NP *yeca* 'woman' moves from object position to [Spec IP], leaving a trace. The passive morpheme *–hi* is assigned the external role. The Agent role is then assigned to the PP, which percolates to the head of the PP (*by*). The head of PP then assigns the role to the object NP. Thus the NP *kirin* 'giraffe' in the passive by-phrase is assigned the Agent theta-role via the passive morpheme *–hi*.[6]

In the agrammatic representation the trace is deleted, resulting in the representation in (5-48b).

(5-48) a.	$[\text{yeca}]_i$-ka	$[\text{kirin-eykey}]_j$	t_i	mil-$[\text{hi}]_j$-ess-ta
	woman-nom	giraffe-by		push-pass-past-decl
	Theme	**Agent**		
	'The woman was pushed by the giraffe.'			

b.	[yeca]-ka	$[\text{kirin-eykey}]_j$	*	mil-$[\text{hi}]_j$-ess-ta
	woman-nom	giraffe-by		push-pass-past-decl
	Agent	**Agent**		
	(via strategy)	***(via syntax)***		

The chain between the moved NP *yeca* 'woman' and its trace is disrupted, and the NP does not receive a theta-role. The R-strategy thus assigns the Agent role in (5-48b). The

[6] Jaeggli (1986) argues that the preposition *by* on its own is capable of assigning only locative and instrumental roles. Given this, it must be the case that agentivity of the oblique NP comes from the passive morpheme, which is assigned the external role.

NP *kirin* 'giraffe' in the by-phrase is assigned Agent syntactically. Thus, the R-strategy introduces an Agent into the sentence where an Agent has already been grammatically licensed. This creates competition between arguments for Agent. Facing two possible Agents of the action (i.e., the woman and the giraffe), the agrammatic subject is forced to choose, resulting in chance performance.

Scrambled Passive

In the scrambled passive in (5-49a), the NP *yeca* 'woman' moves from object position to [Spec IP], leaving a trace. Additionally, the NP *kirin* 'giraffe' moves to an adjoined sentence-initial position, also leaving a trace. As trace is deleted in agrammatism, the agrammatic representation would be that in (5-49b).

(5-49) a. [kirin$_j$-eyke]$_k$ [yeca]$_i$ -ka t_k t_i mil-[hi]$_j$-ess-ta

giraffe-by	woman-nom			push-pass-past-decl
Agent	**Theme**			

'The woman was pushed by the giraffe'

b. [kirin-eyke] [yeca]-ka * * mil-[hi]$_j$-ess-ta

giraffe-by	woman-nom			push-pass-past-decl
Agent	**Theme**			
(via strategy)	***(via strategy)***			

'The woman was pushed by the giraffe'

The chains between both of the moved NPs and their thematic positions are disrupted, such that neither NP receives a theta-role. The R-strategy thus assigns the Agent role to the NP in first position, the NP *kirin* 'giraffe' in (5-49b), and Theme to the NP in second position, *yeca* 'woman.' As the first NP is assigned agent, the second NP is assigned Theme because that is the next role down in the Thematic Hierarchy that matches semantic features. The R-strategy thus compensates the impaired representation by matching normal thematic assignment. Thus, performance is predicted to be above chance.

Truncated Passive

In the truncated passive, the normal representation would be (5-50a). In the normal truncated passive, the NP *yeca* 'woman' moves from object position to [Spec IP], leaving a trace. The Agent role is assigned to the passive morphology (see Baker, Johnson and Roberts, 1989) and is thus implicit even though there is no by-phrase present. In the agrammatic representation the trace is deleted, resulting in the representation in (5-50b).

(5-50) a.	[yeca]$_i$-ka	t_i	mil-[hi]$_j$-ess-ta
	woman-nom		push-pass-past-decl
	Theme		**Agent**

'The woman was pushed (by the giraffe).'

b. [yeca]$_i$-ka * mil-[hi]$_j$-ess-ta

woman-nom push-pass-past-decl

Agent **Agent**

(via strategy) ***(via syntax)***

As in the full passive, the chain between the moved NP *yeca* 'woman' and its trace is disrupted, and the NP does not receive a theta-role. The R-strategy assigns the Agent role in (5-50b). This creates competition between arguments for Agent, resulting in chance performance.

Argument Linking Hypothesis (ALH)

Passive

The basic argument structure of the verb *MIL-TA* 'to push' is given in (5-51). Based upon this argument structure, semantic linking in (5-52) would yield Agent for the NP *yeca* 'woman' in first position and Theme for the NP *kirin* 'giraffe' in second position. However, syntactic linking would link Theme to the NP *yeca* 'woman' in subject position and Agent to the NP *kirin* 'giraffe' in the by-phrase. There is thus a mismatch in thematic assignment. Faced with this competition, Broca's patients are predicted to perform at chance on passive.

(5-51) MIL-TA: verb <Agent, Theme>

to push

(5-52)	[yeca-ka]	[kirin-eykey]	mil-hi-ess-ta
	woman-nom	giraffe-by	push-pass-past-decl
Semantic:	**Agent**	**Theme**	
Syntactic:	**Theme**	**Agent**	
	'The woman was pushed by the giraffe.'		

Scrambled Passive

Given the argument structure in (5-51), the scrambled passive would have the representation in (5-53). Both semantic and syntactic linking would yield Agent for the first NP and Theme for the second. As both semantic and syntactic linking match, Broca's patients are predicted to perform above chance on scrambled passive.

(5-53)	[kirin-eyke]	[yeca-ka]	mil-hi-ess-ta
	giraffe-by	woman-nom	push-pass-past-decl
Semantic:	**Agent**	**Theme**	
Syntactic:	**Agent**	**Theme**	
	'The woman was pushed by the giraffe'		

Truncated Passive

Piñango (1999) cites Grimshaw's (1990) analysis of passive for the ALH. Based upon this, the representation of the truncated passive would be that in (5-54). According to Grimshaw (1990), the Agent in a passive is suppressed.[7] Thus, the only argument to be assigned in semantic and syntactic linking is Theme.

(5-54)	[yeca-ka]	mil-hi-ess-ta
	woman-nom	push-pass-past-decl
Semantic:	**Theme**	
Syntactic:	**Theme**	
	'The woman was pushed by the giraffe.'	

As both semantic and syntactic linking match, Broca's patients are predicted to perform above chance on truncated passive.

Mapping Hypothesis

Passive

Although passive sentences appear in the canonical SOV word order, thematically they are non-canonical. The argument structure of the predicate in (5-51) is repeated here as (5-55). The theta-grid for the verb would be Agent and Theme. The normal representation is given in (5-56a). Theme is assigned to the NP in subject position and Agent to the NP in the by-phrase.

[7] Piñango's assumption that the external argument is suppressed in a passive poses well-known problems such as implicit argument effects (e.g., licensing of certain adverbs and rationale clauses). See for example Baker, Johnson, and Roberts (1989).

(5-55) MIL-TA: verb <Agent, Theme>

to push

(5-56) a. [yeca-ka] [kirin-eykey] mil-hi-ess-ta

woman-nom giraffe-by push-pass-past-decl

Theme **Agent**

'The woman was pushed by the giraffe.'

b. [yeca-ka] [kirin-eykey] mil-hi-ess-ta

woman-nom giraffe-by push-pass-past-decl

Agent **Theme**

'The woman was pushed by the giraffe.'

As thematic assignment does not match the order of the elements in the grid, assignment is non-canonical. The MH predicts that mapping process will be disrupted. Thematic roles would thus be assigned canonically, with Agent assigned to the first NP and Theme to the second. The order of thematic roles would be reversed and Broca's patients are predicted to perform below chance.

Scrambled Passive

In scrambled sentences, the normal representation would be that in (5-57). Agent is assigned to the NP in initial position and Theme to the NP in subject position.

(5-57) [kirin-eykey] [yeca-ka] mil-hi-ess-ta

giraffe-by woman-nom push-pass-past-decl

Agent **Theme**

'The woman was pushed by the giraffe.'

The by-phrase has been scrambled to a sentence-initial position, creating a non-canonical word order. In non-canonical sentences the mapping process is disrupted. Broca's patients are predicted to assign thematic roles canonically according to the theta-grid. They would thus correctly assign Agent to the first NP and Theme to the second. Broca's patients then are predicted to perform above chance on scrambled passive.

Truncated Passive

The argument structure of the predicate in (5-55) above would be Agent and Theme. In the normal representation given in (5-54a) above, Theme is assigned to the NP in subject position (5-58).

(5-58) [yeca-ka] mil-hi-ess-ta

woman-nom push-pass-past-decl

Theme

"The woman was pushed.'

Following Grimshaw (1990), the external argument (Agent) in (5-58) is suppressed. Thus, the only argument to be assigned is Theme. As there is only one argument, the sentence is canonical and the mapping process is not disrupted. Broca's patients are predicted to assign thematic roles canonically according to the theta-grid. They would thus correctly assign Theme to the NP in subject position. Broca's patients then are predicted to perform above chance on truncated passive.

Double Dependency Hypothesis

As described at the beginning of this section, the DDH will be used not only to make predictions about patterns of Broca's comprehension but also to test the two competing syntactic analyses of *–hi* passives. Thus, I will present both movement and non-movement analyses for the full passive. For the scrambled and truncated passives, I will assume a movement analysis, as there are no differences in predictions.

Passive

(i) Non-movement Analysis

The Lexical Passive Hypothesis argues that passive verbs are essentially intransitive verbs. Passivization involves the suppression of the external argument and the externalization of the internal argument, which is generated in subject position. Additionally, because Park assumes suppression of the external argument, there is no assignment of the external role to the passive morpheme as is the case with the TDH. The Agent role is assigned in the adjunct by-phrase and not from the passive morpheme. Thus, unlike the movement analysis, there is no referential dependency between the passive morpheme and the by-phrase. The normal representation would be that in (5-59).

(5-59) $[\text{yeca}]_i$-ka kirin-eykey t_i mil-hi-ess-ta

woman-nom giraffe-by push-pass-past-decl

'The woman was pushed by the giraffe.'

(5-60) < yeca_i, t_i >

woman

In (5-59) the NP *yeca-ka* 'woman-nom' moves from [Spec VP] position to [Spec IP]. As there is only one movement, there is only one dependency (5-60). Thus, within the non-movement passive analysis the DDH predicts that Broca's comprehension of *–hi* passives will be above chance.

(ii) Movement Analysis

The Derived Passive Hypothesis argues that there is overt movement of the internal argument from object position to subject position and that the passive morpheme is assigned the external theta-role, which then transmits this role to the NP in the by-phrase. The normal representation would be that in (5-61).

(5-61) $[\text{yeca}]_i$-ka $[\text{kirin}]_j$ -eykey t_i mil-$[\text{hi}]_j$ -ess-ta

woman-nom giraffe-by push-pass-past-decl

'The woman was pushed by the giraffe.'

(5-62) a. $< yeca_i, \quad t_i >$ and $< kirin_j , \; hi_j >$

woman giraffe pass

b. $< yeca_i, \quad t_j >$ and $< kirin_j , \; hi_i >$

woman giraffe pass

In the (5-61) there are two referential dependencies. The NP *yeca-ka* 'woman-nom' moves from object position to [Spec IP], leaving a trace. Additionally, the verb assigns the external role of Agent to the passive morpheme *–hi*, which then transmits it to the NP in the by phrase. This creates the dependencies in (5-62a). Therefore an anomalous coindexation is possible (5-62b). Within this analysis, then, the DDH predicts that Broca's comprehension will be at chance.

Scrambled Passive

As in the passive, in a scrambled passive there would be two dependencies. In the normal representation in (5-63), there is overt movement of the internal argument *yeca-ka* 'woman-nom' from object position to subject position, leaving a trace. There is also movement of the by-phrase *kirin-eykey* 'giraffe-by' to sentence-initial position, also leaving a trace.

(5-63) $[kirin]_j$ -eykey $[yeca]_i$-ka t_j t_i mil-$[hi]_j$ -ess-ta

giraffe-by woman-nom push-pass-past-decl

'The woman was pushed by the giraffe.'

(5-64) a. $< yeca_i,\ \ t_i >$ and $< kirin_j,\ hi_j,\ t_j >$

woman giraffe pass

b. $< yeca_i,\ \ t_j >$ and $< kirin_j,\ hi_i,\ t_i >$

woman giraffe pass

As there are two referential dependencies in the normal representation in (5-64a), an anomalous coindexation is possible in (5-64b). Within this analysis, then, the DDH predicts that Broca's comprehension will be at chance.

Truncated Passive

Mauner (1995) argues that the truncated passive representation would be that in (5-65). In the normal truncated passive the NP *yeca* 'woman' moves from object position to [Spec IP], leaving a trace. Additionally, following Baker, Johnson, and Roberts (1989) the passive morpheme –hi is assigned the external role. The first chain in (5-66a) receives the role Theme, while the second Agent.

(5-65) $[yeca]_i$-ka t_i mil-$[hi]_j$ -ess-ta

woman-nom push-pass-past-decl

'The woman was pushed (by the giraffe).'

(5-66) a. $< yeca_i,\ \ t_i >$ and $< hi_j >$

woman pass

b. $< \text{yeca}_i , t_j >$ and $< \text{hi}_i >$

woman pass

Since there are two referential dependencies in the normal representation in (5-66a), an anomalous coindexation is possible (5-66b). Within this analysis, then, the DDH predicts that Broca's comprehension will be at chance.

A summary of predictions for the two competing syntactic analyses is given in Table 5.1.

Table 5.1

Predictions for passive

Structure	**Lexical Passive**	**Derived Passive**
Active (control)	Above	Above
Scrambled Active (control)	Chance	Chance
Passive	Above	Chance

As shown in Table 5.1, Broca's patients who performed above chance on active and at chance on scrambled active (see Chapter 4) are predicted to perform above chance if there is no movement in the Korean morphological *–hi* passive and at chance if there is movement.

A summary of all the predictions is given in Table 5.2.

Table 5.2

Summary of predictions for passives

Structure	TDH	ALH	MH	DDH
Passive	Chance	Chance	Below	Above/Chance[8]
Scrambled Passive	Above	Above	Above	Chance
Truncated Passive	Chance	Above	Above	Chance

[8]As mentioned in the previous paragraph, the prediction for the DDH in passives depends on which syntactic analysis (lexical or derived) is assumed.

5.3 Method and Materials

This section will describe the methods, materials and subjects for the passive, scrambled passive and truncated passive experiment.

5.3.1 Method

This experiment used the two-picture sentence-picture matching task. As described in Chapter 3, subjects were instructed to look at a card with two pictures mounted in a vertical arrangement, listen to a sentence and point to the picture that best matched the sentence.

5.3.2 Materials

A total of 60 sentences were developed to comprise the experimental stimuli. There were 20 semantically reversible sentences in each of three conditions: passive, scrambled passive, and truncated passive. As noted in Chapter 3, the verbs and nouns used in the experimental sentences were chosen from the same set of nouns and two-place, transitive verbs used in the active experiments. That is, the active sentences used in Chapter 4 were transformed into passive equivalents for this experiment. The verb and noun pairings for this experiment are given in (5-67).

(5-67)	push (woman, giraffe)	kick (policeman, giraffe)
	photograph (dog, man)	drag (baker, camel)
	bite (zebra, baker)	bind (policeman, cow)
	carry (camel, doctor)	lift (camel, doctor)
	cover (man, woman)	chase (cow, dog)

Each verb in (5-67) was used six times: passive, semantically reversed passive, scrambled and semantically reversed scrambled and truncated passive and reversed truncated passive. Examples are given in (5-68) through (5-70).

(5-68)	a.	yeca-ka	kirin-eyke	mil-hi-n-ta	*Passive*
		woman-nom	giraffe-by	push-pass-pres-decl	
		'The woman is pushed by the giraffe'			
	b.	kirin-i	yeca-eyke	mil-hi-n-ta	*Reversed*
		giraffe-nom	woman-by	push-pass-pres-decl	
		'The giraffe is pushed by the woman'			
(5-69)	a.	kirin-eyke	yeca-ka	mil-hi-n-ta	*Scrambled*
		giraffe-by	woman-nom	push-pass-pres-decl	
		'The woman is pushed by the giraffe'			
	b.	yeca-eyke	kirin-i	mil-hi-n-ta	*Reversed*
		woman-by	giraffe-nom	push-pass-pres-decl	
		'The giraffe is pushed by the woman'			
(5-70)	a.	yeca-ka	mil-hi-n-ta		*Truncated*
		woman-nom	push-pass-pres-decl		
		'The woman is pushed (by the giraffe)'			

b. kirin-i mil-hi-n-ta *Reversed*

giraffe-nom push-pass-pres-decl

'The giraffe is pushed (by the woman)'

A complete list of stimuli is given in Appendix B.

The same set of black and white line-drawing pictures used in the active experiment was used in this experiment. The pictures were arranged vertically two per page. Each of the 60 pages thus consisted of a series of two pictures representing actions between two actors (one Agent and one Theme), both of whom could perform the action with equal plausibility. Among the actors in the picture, one matched the corresponding test sentence; the second picture represented the same actors in the inverse thematic relation. The pictures were counterbalanced between top and bottom position.

5.3.3 Subjects

All four Broca's patients (CDK, KTS, JJP, KKM), two Wernicke's patients (HCJ, KYA) and six matched controls participated in the passive and scrambled passive conditions of this experiment. Because the truncated passive experiment was conducted later than the other experiments, only two Broca's patients (CDK and KTS) were able to participate. Both Wernicke's and all six neurologically intact control subjects were also tested in the truncated condition.

5.4 Results

This section provides the results of the active and scrambled active experiment. Section 5.4.1 describes the results for Broca's aphasics. Section 5.4.2 provides the analyses for Wernicke's aphasics. Section 5.4.3 compares performance by Broca's and Wernicke's.

5.4.1 Broca's Results

Tables 5.3 and 5.4 present the raw scores for Broca's subjects and their matched controls.[9] Controls performed nearly without error, so they are not discussed further. Figure 5.1 provides individual percent scores for Broca's subjects.

Table 5.3

Raw scores for Broca's on passives (correct out of 20)

Structure	CDK	KTS	JJP	KKM	Avg	%
Passive	13	10	13	7	10.8	54%
Scrambled	14	10	10	11	11.3	56%
Truncated	19	18			18.5	93%

Table 5.4

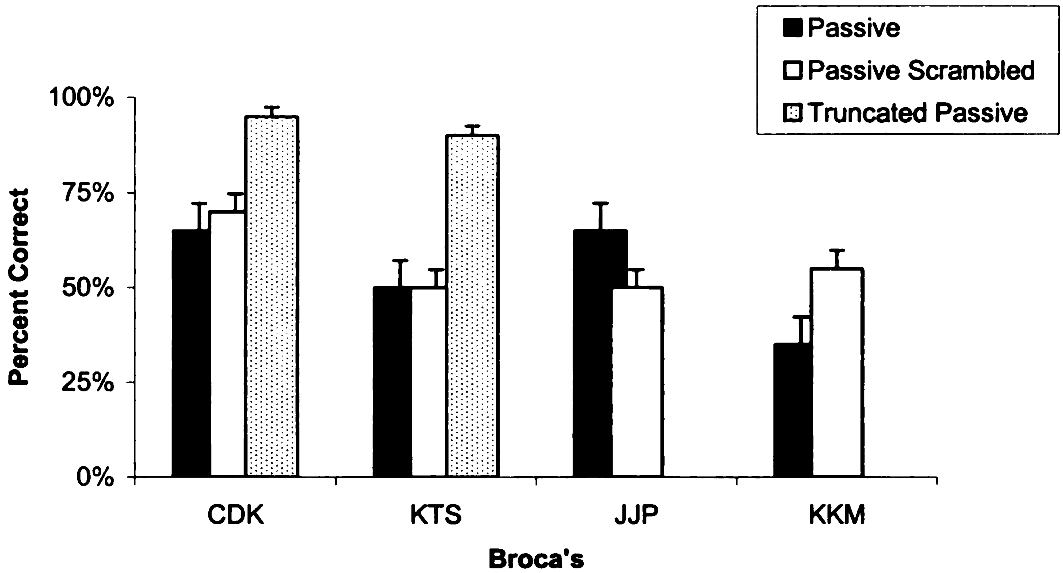
Raw scores for controls on passives (correct out of 20)

Structure	JBA	DCM	KDS	JGF	Avg	%
Passive	20	19	20	20	19.8	99%
Scrambled	20	20	20	20	20	100%
Truncated	20	20	20	20	20	100%

[9] Because the truncated passive experiment was conducted later than the other experiments, JJP and KKM were not available for testing.

Figure 5.1

Percent correct for Broca's on passives



As seen in Table 5.1, group performance on passive sentences was 54% correct, scrambled passive 58%, and truncated passive 93%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance on passives and passive scrambled was at chance ($t(3) = .522$, $p = .638$ and $t(3) = 1.32$, $p = .278$, respectively). Truncated passive, however, was above chance ($t(3) = 17$, $p = .037$). This pattern is summarized in Table 5.5.

Table 5.5

Significance patterns for Broca's on passives compared with chance (50%)

Sentence Type	Significance
Passive	ns
Scrambled Passive	ns
Truncated Passive	p = .037

To determine whether there is a significant difference among conditions, an analysis of variance (ANOVA) was conducted. Analysis reveals a significant difference for sentence type, $F(3,7) = 8.79$, $p = .012$. Planned post hoc analyses indicate that the truncated passive is significantly different from passive and scrambled passive, while passive and scrambled passive are not significantly different from each other.

5.4.2 Wernicke's Results

Tables 5.6 and 5.7 present the raw scores for Wernicke's subjects and their matched controls. Controls performed without error, so they are not discussed further. Figure 5.2 provides individual percent scores for Wernicke's subjects.

Table 5.6

Raw scores for Wernicke's on passives (correct out of 20)

Structure	HCJ	KYA	Avg	%
Passive	10	15	12.5	63%
Scrambled	10	13	11.5	58%
Truncated	13	15	14	70%

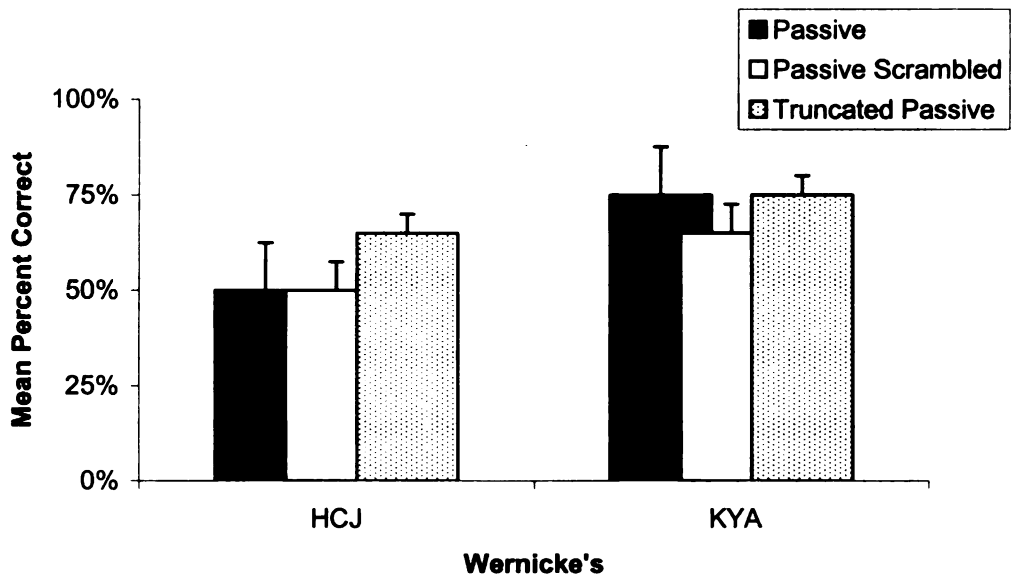
Table 5.7

Raw scores for controls on passives (correct out of 20)

Structure	SHB	OKT	Avg	%
Passive	20	20	20	100%
Scrambled	20	20	20	100%
Truncated	20	20	20	100%

Figure 5.2

Percent correct for Wernicke's on passives



As can be seen in Table 5.6, Wernicke's group performance on passive sentences was 63% correct, scrambled passive 58%, and truncated passive 70%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance was at chance on passive ($t(1) = 1.00$, $p = .5$), scrambled passive ($t(1) = 1.00$, $p = .5$), and truncated passive ($t(1) = 4$, $p = .156$). This pattern is summarized in Table 5.8.

Table 5.8

Significance patterns for Wernicke's on passives compared with chance (50%)

Sentence Type	Significance
Passive	ns
Scrambled Passive	ns
Truncated Passive	ns

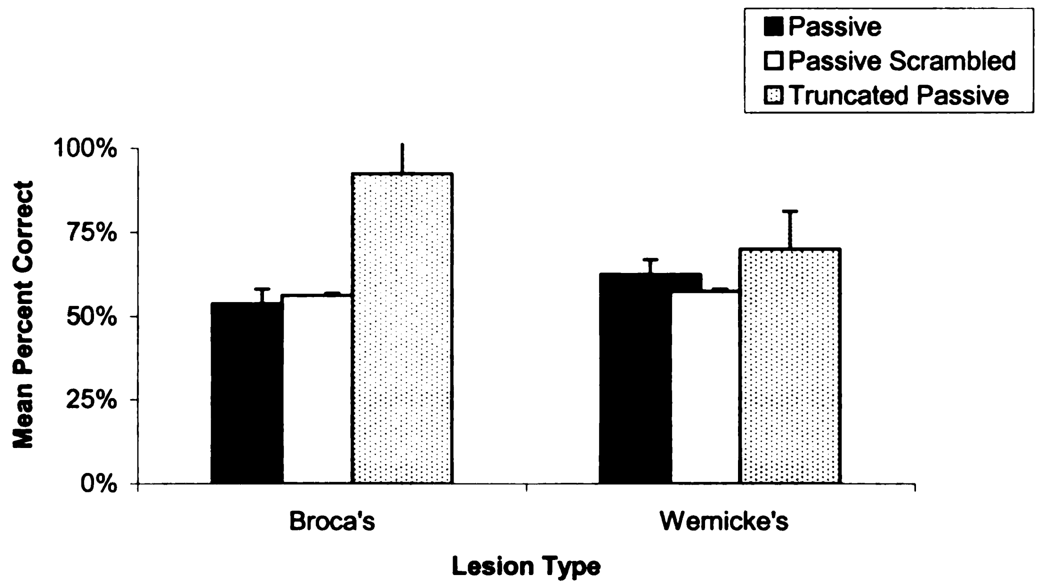
To determine whether there is a significant difference among conditions, an analysis of variance (ANOVA) was conducted. Analysis reveals no significant difference for sentence type.

5.4.3 Broca's versus Wernicke's

Group scores for Broca's and Wernicke's reported above are repeated in Figure 5.3. As noted above, Broca's performed at chance on passive (54% correct) and scrambled passive (56% correct) but above chance on truncated passive (93% correct). Wernicke's performed at chance on all three conditions (63%, 58% and 70%, respectively).

Figure 5.3

Percent correct on passives for each lesion type



Results from a 2 x 3 (Lesion type x Sentence type) analysis of variance (ANOVA) reveal a main effect for sentence type ($F(2, 10) = 5.982$, $p = .019$) but no main effect for lesion type ($F(1, 10) = .454$, $p = .52$). There was no significant interaction ($F(2, 10) = 2.136$, $p = .168$). Planned comparisons using Bonferroni posttests reveal a significant difference between Broca's and Wernicke's in the truncated passive condition ($p < .05$) but no significant difference in the passive and scrambled conditions.

5.5 Discussion

Section 5.5.1 summarizes the empirical findings presented in the previous section. In Section 5.5.2 I relate these findings to the predictions made in the theoretical background in Section 5.2.2, as well as discuss some of the theoretical implications based upon the above analyses.

5.5.1 Empirical Findings

The findings of this experiment indicate that as a group the four Korean Broca's patients are impaired in their comprehension of passive and scrambled passive sentences. These findings confirm the passive and scrambled patterns discussed in Chapter 2 for Korean and Japanese (Beretta et al., 2001; Hagiwara and Caplan, 1990). Two of the four patients participated in the truncated passive condition and neither patient was impaired in this construction. This finding adds to the growing list of studies that report above chance behavior on truncated passives (e.g., Badecker, Nathan and Caramazza, 1991; Beretta, Pinango, Patterson and Harford, 1999; Berndt, Mitchum, Wayland, 1997).

The Wernicke's patients, however, did not show the same pattern as the Broca's and were impaired in all three conditions. As in the active and active scrambled conditions, KYA performed better than HCJ but was consistent in all three sentence types.

The finding of a main effect for sentence type and not for lesion type is again expected if Broca's patients perform above chance on truncated passive and at chance on passive and scrambled passive sentences. This is because performance in the truncated condition increases the mean despite Wernicke's chance performance. A look at row and column means in Table 5.9 confirms this.

Table 5.9

Group column and row means for passives

	Broca's	**Wernicke's**	
Passive	54%	63%	*59%*
Scrambled Passive	56%	58%	*57%*
Truncated Passive	93%	70%	*81%*
	68%	*64%*	

The higher scores in truncated passive for Broca's combined with KYA's higher scores for Wernicke's pushes the truncated passive row mean to 81%, while chance performance by Broca's in the passive and scrambled passive conditions strengthens the chance level of these sentences. Comparing sentence type (passive 59% versus scrambled passive 57% versus truncated passive 81%), there is a significant difference; and the difference in truncated is enough to create a main effect for sentence type. However, the same is not true for lesion type. The higher score for Broca's in the truncated passive condition is not enough to offset the chance performance in the passive and scrambled conditions. Comparing column means (Broca's 68% versus Wernicke's 64%), there is no significant difference.

5.5.2 Theoretical Implications

The syntax of Korean morphological passives

The four Broca's aphasics performed above chance on simple active sentences, which do not involve overt movement and at chance on scrambled active sentences, which do involve overt movement from object position to sentence-initial position (see Section 4.4). These same patients performed at chance on passive sentences. Table 5.10 provides a comparison of the predictions and results. The results of Broca's aphasic comprehension of *–hi* passives confirm the predictions made only by the Derived Passive Hypothesis.

Table 5.10

Predictions and results for passive

Structure	Lexical Passive	Derived Passive	Result
Active (control)	Above	Above	Above
Scrambled Active (control)	Chance	Chance	Chance
Passive	Above	Chance	Chance

In presenting syntactic arguments for the two competing passive analyses in Section 5.2.2, I argued that evidence against a movement analysis is not strong. I claimed that arguments in support of a movement analysis are quite strong, though not thoroughly convincing. Experimentally, active, active scrambled and passive sentences differ only in their syntactic structure and Broca's aphasics are seen to have equal difficulty with scrambled actives and passives. As the problem with scrambled actives is movement of the object to sentence-initial position, it can be concluded that Broca's aphasics have difficulties with passives because there is overt movement from object position to subject position. Converging evidence, then, from syntactic theory and neuropsychological behavioral data points toward a specific analysis of the Korean *–hi* passive. The derived passive analysis is both theoretically and empirically motivated.

Accounts of Aphasia

Table 5.11 provides a summary of the predictions made for Broca's in Section 5.2.2 and the findings. As described above, Broca's patients performed at chance on passive and passive scrambled but above chance on truncated passive. Three of the four accounts correctly predict performance on passive sentences. The MH predicts reversed thematic roles and thus fails to predict chance performance.

Table 5.11

Summary of predictions and results for passives

Structure	TDH	ALH	MH	DDH	Result
Passive	Chance	Chance	Below	Chance	Chance
Scrambled Passive	Above	Above	Above	Chance	Chance
Truncated Passive	Chance	Above	Above	Chance	Above

For scrambled passive sentences, however, the three linear models fail. This failure stems from their reliance on canonical ordering of thematic roles. Once again the TDH's reliance on the Thematic Hierarchy for the selection of roles for two moved elements is a major weakness. The process of selecting the next role down in the hierarchy forces the TDH to correctly assign Agent to the first NP and Theme to the second but then cannot explain why patients are still impaired. That is, even though patients are at chance on passive sentences, the TDH makes the surprising claim that they should have been facilitated in their comprehension of the very same passive sentences when the by-phrase is moved to the beginning of the sentence. Therefore, as with scrambled active sentences, the TDH is unable to account for scrambled passives.

Both the ALH and MH suffer from reliance on linearity as well. Relying on strict linear order for assignment of thematic roles from the theta-grid allows for correct thematic assignment to the two NPs, and yet, Broca's patients are at chance on such constructions. Again, the surprising predictions of the linear models are not borne out.

Only the DDH correctly predicts performance on scrambled passive sentences. This is because the DDH relies on dependencies created by movement. When two movements occur, ambiguity results. Thus, for both scrambled active and passive, the DDH makes the correct predictions.

On the other hand, two of the linear models do succeed in accounting for truncated passives. Both the ALH and the MH assume that passivization occurs in the lexicon, affecting the number of roles that may be assigned (e.g., Grimshaw, 1990). As the external argument is suppressed, the only argument to be assigned to the NP is Theme. It appears not to be linearity but rather reliance on a different passive analysis that allows these two models to succeed in the truncated passive.

Conversely, the TDH and DDH both assume that the passive morpheme receives a theta-role, and this creates problems. For the TDH, this again creates a situation in which the first NP is incorrectly assigned Agent when it should be Theme. To derive an above chance prediction, the TDH would need to resort to some other means of selecting thematic roles than an Agent-first strategy. For the DDH, there are two dependencies that should have created an ambiguity, when in fact there appears to be none. Both of these accounts thus fail to explain above chance performance.[10]

[10] Although Mauner (1995) argues that the DDH makes the (incorrect) prediction of chance for truncated passive, it can be rescued. Consider the following example.

5.6 Conclusion

Empirically the experiments in this chapter found that Broca's patients performed at chance on passive and passive scrambled constructions. This is consistent with findings reported in the literature for passives across languages, particularly from Korean (e.g., Beretta et al., 2001) and Japanese (e.g., Hagiwara and Caplan, 1990). However, Broca's patients performed above chance on truncated passive. This finding adds data to the growing list of studies reporting above chance comprehension of truncated passives. Additionally, it was found that Broca's and Wernicke's once again displayed different patterns.

This chapter also presented two theoretical issues and confronted each with the agrammatic data on passive structures in Korean. The first theoretical issue was the syntactic debate concerning the proper analysis of the Korean morphological passive. There are strong syntactic arguments for both a lexical and a derived analysis of the passive. This chapter then looked to language deficit to help discern the proper analysis.

(i) [yeca]-ka t mil-[hi]-ess-ta
woman-nom push-pass-past-decl
'The woman was pushed (by the giraffe).'

(ii) a. < yeca , t > and < hi >
woman pass

b. < yeca , hi > and < t >
woman pass

The DDH assumes that the passive morpheme *–hi* is an argument and receives the role of Agent. Thus, Mauner (1995) claims that two indexations are possible: "the subject NP could be coindexed with either the trace or the passive morpheme" (p. 356). In the above example, *yeca* 'woman' would be coindexed with the trace and the chain assigned Theme, while the passive morpheme is assigned Agent (iia). In (iib), a deviant coindexation is possible in which *yeca* 'woman' is coindexed with the passive morpheme. However, I believe that this latter coindexation is not possible. Doing so would yield an interpretation in which *yeca* 'woman' would be assigned Agent and the trace Theme; there is no NP to bind the trace and no interpretation for Theme. This would be a violation of X-bar and the Theta Criterion. Eliminating the deviant coindexation (iib) for syntactic reasons, as Mauner et al. do for actives, the DDH would argue that there is only one dependency in truncated passive and thus make the correct prediction of above chance.

It was found that Broca's are impaired in their comprehension of the Korean morphological passive. Because syntactic movement such as that found in scrambling interferes with comprehension in Broca's aphasia and because Korean Broca's patients were impaired in their comprehension the passive, it was concluded that the Korean morphological passive is best analyzed as derived by movement.

The second theoretical issue presented in this chapter was the extent to which the four accounts could explain Broca's performance patterns on Korean passive, scrambled passive and truncated passive constructions. It was found that, as in English, all four hypotheses could account for the passive. However, as discussed in Chapter 4, Korean allows for more variation in word order, and this variation allows for a crucial test of the accounts. Scrambled passives are a construction in which the linear and structural accounts make quite different predictions. It was found that all three linear accounts fail to account for chance behavior on scrambled passives, while the DDH succeeded. However, only the two accounts that rely on linear assignment from argument structure (ALH and MH) succeed in accounting for above chance behavior on truncated passives.[11]

The data from active and passive constructions suggest that Broca's patients are not assigning thematic roles canonically in all constructions. Although the structural model does not account for all of the data in Korean, it seems clear at this point that any model that relies simply on linear ordering of thematic roles is at a disadvantage. The next chapter further tests movement by considering another type of syntactic movement: A-bar movement.

[11] However, it was noted that with a minor revision, the DDH could account for above chance performance on truncated passives.

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SYNTACTIC MOVEMENT AND KOREAN APHASIC COMPREHENSION

VOLUME II

By

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CHAPTER 6

RELATIVE CLAUSES

6.1 Introduction

In this chapter I will present empirical data from Korean aphasia on two types of relative clause: subject and object. In Chapters 4 and 5 I presented data from Broca's aphasia on active, scrambled active, passive and scrambled passive sentences. Four Korean patients were seen to perform above chance on actives and at chance on scrambled actives, passives and scrambled passives. It was argued that it is syntactic movement that distinguishes the two sets of constructions and that performance by the Broca's patients was impaired in the movement constructions. I concluded that performance on passives provide further support for the hypothesis that these four Korean aphasic patients are sensitive to syntactic movement. The experiment reported in this chapter will further investigate this claim by testing these same patients on a different construction: relative clauses.

As described in Chapter 2, there is a robust pattern of above chance performance on subject relative clauses and at chance performance on object relative clauses in Broca's aphasia. However, there is little data from head-final, SOV languages. This chapter, then, will present empirical findings from Korean subject and object relative clauses. As in Chapters 4 and 5, empirical data from Wernicke's aphasia will also be presented.

This chapter will also present two important theoretical issues and confront each with the Broca's data from Korean relative clauses. The first theoretical issue is the syntactic debate concerning the proper analysis of the Korean relative clauses. I will claim that there are strong arguments in support of a syntactic (A-bar) movement analysis for Korean relative clauses (e.g., Han, 1992; Hong, 1985; Kaplan and Whitman, 1995). This issue is under debate, since there are accounts in which movement is not required (Saito, 1985; Sohn, 1999). Given the controversy, this chapter will look to language deficit to provide clues as to the proper analysis.

The second theoretical issue concerns the extent to which the four aphasia accounts can explain Broca's performance patterns on Korean relative clauses. Korean subject and object relative clauses are important because they confront the accounts with data on structures that differ in the order of arguments. English subject relatives (e.g., *The cat that bit the dog*) follow a canonical ordering of arguments (Agent, Theme), while object relatives (e.g., *The dog that the cat bit*) do not (Theme, Agent). Korean relatives, however, seem to pattern the opposite way. Korean subject relatives follow a non-canonical assignment (Theme, Agent), while object relatives are canonical (Agent, Theme). These Korean relative constructions, then, will help to tease apart the linear and structural accounts.

The organization of the chapter is as follows. Section 6.2 will provide the theoretical background for the chapter. It will outline the syntactic debate concerning relative clauses in Korean and briefly present the salient arguments for both non-movement and movement analyses. It will also provide the predictions of the four Broca's hypotheses for subject and object relative clauses in Korean. Section 6.3 will describe the methods and materials for the relative clause experiments. Section 6.4 presents the results from the experiments. In Section 6.5 I discuss the implications of the results in terms of the syntactic debate and the four accounts. Section 6.6 concludes the chapter.

6.2 Theoretical Background

This section will provide a brief description of Korean relative clauses and two competing syntactic analyses. Predictions for testing these analyses in Korean aphasia will be presented, as well as the predictions that the four agrammatic accounts make for Korean subject and object relative clauses.

6.2.1 Korean Relative Clauses

Traditional Description

Korean relative clauses are traditionally described along the lines of English relative clauses (e.g., Han, 1992; Kaplan and Whitman, 1995; Sohn, 1999; Yoon, 1990; among others) in that a relative clause consists of a CP that selects a clause, that the CP modifies a head noun, that there is a gap in the relative clause corresponding to the head noun, and that a number of grammatical functions may be relativized (e.g., subject, object, dative). However, there are some differences between Korean and English relative clauses. The following is a basic characterization of Korean relativization.

As Korean is an SOV language and heads of phrases occur finally, relative clauses precede the head noun they modify. Thus, in (6-1) the relative clause *koyangi-ka mwul-un* 'that the cat bit' precedes the NP head *kae* 'dog.'

(6-1)	[koyangi-ka	e_i	mwul-un]	kae_i
	cat-nom	e_i	bite-relativizer	dog_i
	'The dog that the cat bit'			

Relative clauses in Korean contain a gap in the surface structure. For example, the verb *mwul-ta* 'to bite' in (6-1) S-selects two theta-roles: Agent and Theme. In an active declarative sentence these roles are realized as subject and object NPs, respectively. However, in (6-1) the object Theme is missing in the relative clause, and it is the head noun *kae* 'dog' that is interpreted as the empty category *e* in the relative clause.

Korean also has no relative pronouns that correspond to the English *who*, *whom*, *whose*, or *which*. Instead, relative clauses are connected to their heads by means of the 'relativizer' suffixes *–un –nun*, and *-l*. The relativizer functions not only as a syntactic link between the relative clause and the head noun but also expresses tense. Yang (1972, p. 231) provides the following analysis of embedded tenses (Table 6.1).

Table 6.1

Relative clause tense markers

Relative Clause Marker	Tense of Relative Clause
-un	$T_{embedded} > T_{matrix}$
-nun	$T_{embedded} = T_{matrix}$
-l	$T_{matrix} > T_{embedded}$

Note: T 'Time', > 'precedes', = 'same'

The relative clause marker *-un* expresses past, *-nun* indicates present, and *–l* refers to future. Examples of these are given in (6-2).

(6-2) a. [[koyangi-ka e_i mwul] ***-nun***] kae_i

cat-nom e_i bite -rel (present) dog_i

'The dog that the cat bites'

b. [[koyangi-ka e_i mwul] ***-un***] kae_i

cat-nom e_i bite -rel (past) dog_i

'The dog that the cat bit'

c. [[koyangi-ka e_i mwul] ***-l***] kae_i

cat-nom e_i bite -rel (future) dog_i

'The dog that the cat will bite'

The 'tense' affixes that occur in relative clauses are relativizers and not the tense affixes that occur with declarative matrix verbs. Compare the tense affixes in (6-2) above with those in (6-3).

(6-3) a. koyangi-ka kae–lul mwul-***n***-ta

cat-nom dog-acc bite-present-decl

'The cat bites the dog'

b. koyangi-ka kae–lul mwul-***ess***-ta

cat-nom dog-acc bite-past-decl

'The cat bit the dog'

c. koyangi-ka	kae–lul	mwul-***kess***-ta	
cat-nom	dog-acc	bite-future-decl	

'The cat will bite the dog'

In the simple sentence in (6-3), the present tense affix is *–n*, the past is *–ess*, and the future is *-kess*.

Finally, as in English, both noun phrases and prepositional phrases may be relativized. The sentences in (6-4) from Sohn (1999) provide examples of relativized noun phrases.

(6-4) a. Mary-ka	John-eykey	phyenci-lul	cwu-ess-ta	
Mary-nom	John-to	letter-acc	give-past-decl	

'Mary gave John a letter.'

b. [[e John-eykey	phyenci-lul	cwu]	-un]	Mary	
e John-by	letter-acc	give	-rel	Mary	

'Mary who gave a letter to John'

c. [[Mary-ka	John-eykey	e cwu]	-un]	phyenci	
Mary-nom	John-by	e give	-rel	letter	

'The letter which Mary gave to John'

d. [[Mary-ka e phyenci-lul cwu] -un] John

Mary-nom e letter-acc give -rel John

'John who Mary gave a letter (to)'

The base sentence is given in (6-4a). The subject NP in (6-4b) is relativized, while in (6-4c) it is the object that is relativized. (6-4d) is an example of a relativized dative NP. The examples from Sohn (1999) in (6-5) through (6-8) illustrate relativized prepositional phrases: (6-5b) Locative, (6-6b) Source, (6-7b) Goal, and (6-8b) Time.

(6-5) a. Mary–ka John-ul siktang-eyse manna-ess-ta

Mary-nom John-acc restaurant-at meet-past-decl

'Mary met John in the restaurant'

b. [[Mary–ka John-ul e manna] -un] siktang

Mary-nom John-acc e meet -rel restaurant

'The restaurant in which Mary met John'

(6-6) a. Mary–ka siktang-eyse nao-ess-ta

Mary-nom restaurant-from come out-past-decl

'Mary came out of the restaurant'

b. [[Mary–ka e nao] -un] siktang

Mary-nom e come out -rel restaurant

'The restaurant from which Mary left'

(6-7) a. Mary–ka siktang-ey ka-ess-ta

Mary-nom restaurant-to go-past-decl

'Mary went to a restaurant'

b. [[Mary–ka e ka] -un] siktang

Mary-nom e go -rel restaurant

'The restaurant to which Mary went'

(6-8) a. Mary–ka John-ul ilyoil-ey manna-ess-ta

Mary-nom John-acc Sunday-at meet-past-decl

'Mary met John on Sunday'

b. [[Mary–ka John-ul e manna] -un] ilyoil

Mary-nom John-acc e meet -rel Sunday

'The Sunday in which Mary met John'

Syntactic Accounts of Korean Relative Clauses

As described above, the relative clause in Korean precedes the nominal it modifies. The argument within the relative clause, which is coreferential with the modified nominal, is not phonetically realized. Despite the relatively straightforward description provided above, there is debate in the syntactic literature concerning how to characterize the null elements in Korean relative clauses. Previous studies within the Principles and Parameters framework can be divided into two opposing positions.[1] First, the base-generated approach (e.g., Saito, 1985; Sohn, 1999) claims that relativization in Korean does not involve movement and that the gap in the relative clause is a base-generated *pro*. Second, the movement approach (e.g., Han, 1992; Kaplan and Whitman, 1995; Kang, M., 1988) claims that relativization involves overt movement, and thus the gap is a trace created by this movement. Below I will briefly review the most salient arguments for each position.

1. A Non-Movement Analysis: The Base-Generated Hypothesis

It has been widely argued that, unlike English relative clauses, Korean and Japanese relative clauses do not involve movement (e.g., Saito, 1985; Sohn, 1999; Yang, 1973, among others). The primary argument for this position is that relativization in these two languages does not seem to be subject to constraints on movement such as Subjacency. That is, relative clauses in Korean violate the classical island constraints

[1] As in previous chapters, a Principles and Parameters analysis will be presented here for two reasons: (i) the syntactic debates have been framed primarily within this framework, and (ii) cross-linguistic studies in linguistic aphasia and models to account for aphasic patterns have assumed analyses within this framework. Therefore, analyses here in Principles and Parameters will allow for better comparison in both theoretical areas.

described by Ross (1967) such as the *wh*-island constraint, complex NP condition, left branch condition and the adjunct condition. Examples of these are provided in (6-9).

(6-9) a. $[_{CP}$ $[_{IP}$ $[_{CP}$ $[_{IP}$ nwu-ka e_i ilk-ess] -nun ci]

who-nom e read-past -comp

Mary-ka kwungkumhayha] -nun] $chayk_i$

Mary-nom wonder -rel book

'the $book_i$ that Mary wonders who_j t_j read t_i'

(Han, 1992)

b. $[_{CP}$ $[_{IP}$ $[_{NP}$ $[_{CP}$ $[_{IP}$ e_i e_j ssu] –un] $ankyeng_j$-i] yeppu] -n] $yeca_i$

e e wear -rel glasses-nom pretty -rel woman

'the $woman_i$ who_i the $glasses_j$ that e_i wore e_j is pretty'

(Han, 1992)

c. $[_{CP}$ $[_{IP}$ e_i kyoswunim-i ttokttok ha] -n] $Mary_i$

e professor-nom intelligent be -rel Mary

'Mary, a professor, intelligent'

(Han, 1992)

d. $[_{CP}\ [_{IP}\ [_{CP}\ [_{IP}\ e_i$ tulo oa-ess] -ul ttay] motwu-ka insaha] -n] $Mary_i$

e enter-past -when everyone-nom greet -rel Mary

'$Mary_i$ that everyone greeted when t_i entered

(Han, 1992)

All of the examples in (6-9) are instances of Subjacency violations and, yet, are acceptable in Korean.[2] In (6-9a) *chaek* 'book' is relativized out of a *wh*-island. In (6-9b), *yeca* 'woman' is relativized out of a complex noun phrase. (6-9c) is an example of the NP *Mary* relativized out of a left branch construction. (6-9d) provides an example of relativization out of an adjunct clause. Based on these data it is argued that, since the Subjacency constraint applies only to movement, in Korean and similar languages such as Japanese, there is no movement in relative clauses; they are instead base-generated (Hale, 1980; Chomsky, 1981; Saito, 1985).

In addition to the lack of Subjacency effects, another argument in support of a non-movement analysis is the observation that in many relative clauses the phonetically null element may be optionally realized as a resumptive pronoun. Consider the example from (6-9a) above with a resumptive pronoun *ku-kes* 'that thing' given in (6-10).

[2] It should be noted that these judgments are controversial and not accepted by many native speakers.

(6-10) [$_{CP}$ [$_{IP}$ [$_{CP}$ [$_{IP}$ nwu-ka ku-kes$_i$ ilk-ess] -nun ci]

who-nom that-thing read-past -comp

Mary-ka kwungkumhayha] -nun] chayk$_i$

Mary-nom wonder -rel book

'the book that Mary wonders who read that'

If there were movement in the relative clause in (6-10), it is argued, then a resumptive pronoun would not be licensed in object position of the embedded clause.

Finally, proponents of the base-generated analysis argue that counterexamples in which sentences are claimed to be unacceptable due to Subjacency violations may in fact be unacceptable for different reasons. In order to create the island effects and obtain Subjacency violations, complex sentences must be created such that there are multiple levels of embedding. That is, relative clauses must be embedded inside of other embedded clauses. The ungrammaticality may in fact be due to processing rather than syntactic constraints, as is the case with complex embedded sentences in English (e.g., *The man the woman the dog bit loved died*). A sentence may be syntactically well formed but still judged unacceptable because the parser simply breaks down due to memory constraints. However, it is argued that movement analyses still cannot explain why Subjacency appears operates in some instances but not others.

There have been a number of proposals to account for the above data. However, Saito (1985) provides a Principles and Parameters analysis that is widely assumed in the descriptive and theoretical literature. Saito argues that the missing arguments in relative clauses are occupied by a base-generated, phonetically null pronoun *pro*. The data given in (6-9) would be represented as (6-11).

(6-11) a. [$_{CP}$ [$_{IP}$ [$_{CP}$ [$_{IP}$ nwu-ka pro$_i$ ilk-ess] -nun ci]

who-nom read-past -comp

Mary-ka kwungkumhayha] -nun] chayk$_i$

Mary-nom wonder -rel book

'the book$_i$ that Mary wonders who$_j$ t$_j$ read t$_i$'

b. [$_{CP}$ [$_{IP}$ [$_{NP}$ [$_{CP}$ [$_{IP}$ pro$_i$ pro$_j$ ssu] -un] ankyeng$_j$-i] yeppu] -n] yeca$_i$

wear -rel glasses-nom pretty -rel woman

'the woman$_i$ who$_i$ the glasses that e$_i$ wore e$_j$ is pretty'

c. [$_{CP}$ [$_{IP}$ pro$_i$ kyoswunim-i ttokttok ha] -n] Mary$_i$

professor-nom intelligent be -rel Mary

'Mary, a professor, intelligent'

d. [$_{CP}$ [$_{IP}$ [$_{CP}$ [$_{IP}$ pro$_i$ tulo oa-ess] -ul ttay] motwu-ka insaha] -n] Mary$_i$

enter-past -when everyone-nom greet -rel Mary

'Mary$_i$ that everyone greeted when t$_i$ entered

As there is simply a coreferential relation between the pronoun and the head nominal and no movement, Subjacency is not violated.

Therefore, to account for the lack of Subjacency violations in relative clauses, the base-generated analysis claims that relativization in Korean involves the generation of a phonetically null pronoun *pro* in the argument gap in the relative clause. Crucially, this process does not involve movement.

2. A Movement Analysis: The Derived Relative Clause Hypothesis

In contrast to the base-generated hypothesis, I will argue that relativization in Korean involves syntactic movement of an empty operator.[3] Following Kaplan and Whitman (1995) and Han (1992) I will argue that the null element in Korean relative clauses is best analyzed as a variable A-bar bound by an operator in the specifier position of CP. Evidence in support of this position comes from Subjacency effects and the restricted distribution of resumptive pronouns.

The first argument in support of a movement analysis comes from Subjacency. Kaplan and Whitman (1995) note that, unlike English, Korean lacks an overt relative operator, and this has encouraged the notion that operator movement is lacking altogether. However, *that*-relatives in English also have no overt relative pronoun but share the properties of *wh*-relative clauses: (i) there is a gap in the relative clause, (ii) the gap occupies the same position as the omitted argument in the NP (iii), movement is constrained by Subjacency and (iv) there is an unbounded relation between the gap and

[3] I will ignore the debate between adjunct and complement analyses of relative clauses, as both involve movement, and will assume the adjunct analysis here. For arguments supporting a complement analysis of relative clauses see Schmitt (2001) and Alexiadou et al. (2001).

the empty relative operator, as long as Subjacency is maintained. Korean relatives, it is argued, pattern much like *that*-relatives in English and obey Subjacency constraints.

Citing Hong (1985), Kaplan and Whitman claim that there is relative movement in Korean due to the existence of *wh*-island effects. Consider the example in (6-12).

(6-12) a. [[[nwu-ka t_i sa-ess-nun ci]

who-nom buy-past -comp

John-i kwungkumha-ess-tun] $chayk_i$]

John-nom wonder-past-rel book

'the $book_i$ that John wondered who_j t_j bought t_i'

(Hong, 1985)

b. *[[[[nwu-ka t_i sa-ess-nun-ci] –lul nwu-ka

who-nom buy-past –comp-acc who-nom

mwul-ess-nun-ci] John-i kwungkumha-ess-tun] $chayk_i$]

bite-past-comp John-nom wonder-past-rel book

'the $book_i$ that John wondered who_j t_j asked who_k t_k bought t_i'

(Hong, 1985)

Hong argues that the contrast between (6-12a) and (6-12b) can be explained under the assumption that S' (rather than S) is a bounding node in Korean. In (6-12a) the relative operator moves across only one [+WH] complementizer, and no Subjacency violation results. In (6-12b), however, the relative operator must cross two [+WH] complementizers, resulting in unacceptability. Kaplan and Whitman (1995) point out that this contrast is identical to the Subjacency effects Rizzi (1982) reports for Italian syntactic *wh*-movement.

Further support for Subjacency effects is provided by Han (1992). Han argues that movement out of a complex NP also results in a Subjacency violation. Consider (6-13).

(6-13) a. *[[e_i e_j mandun] yenghwa$_j$-lul nay-ka cohaha-nun] Spielberg$_i$

make-rel movie-acc I-nom like-rel Spielberg

'Spielberg who$_i$ I like the movie which$_j$ t_i made t_j'

(Han, 1992)

b. *[[John-i [e_i e_j mwul -un] kae$_i$-lul]

John-nom bite -rel dog-acc

chacanay-n] namca$_i$

identifiy-rel man

'the man who$_i$ John identified the dog which$_j$ bit t_i'

(Han, 1992)

Given a movement analysis, consider the S-structure representation of (6-13) given in (6-14).

(6-14) a. *[$_{CP}$ OP$_i$ [$_{IP}$ [$_{NP}$ [$_{CP}$ OP$_j$ [$_{IP}$ t$_i$ t$_j$ mandu] -n] yenghwa$_j$-lul

make-rel movie-acc

nay-ka cohaha] -nun] Spielberg$_i$

I-nom like-rel Spielberg

'Spielberg who$_i$ I like the movie which$_j$ t$_i$ made t$_j$'

(Han, 1992)

b. *[$_{CP}$ OP$_i$ [$_{IP}$ John-i [$_{NP}$ [$_{CP}$ OP$_j$ [$_{IP}$ t$_j$ t$_i$ mwul] -un] kay$_i$-lul]

John-nom bite-rel dog-acc

chacanay] -n] namca$_i$

identify-rel man

'the man who$_i$ John identified the dog which$_j$ bit t$_i$'

(Han, 1992)

Under a movement analysis, (6-14) involves movement of two relative operators: (i) the lower relative operator OP$_j$ and (ii) the higher relative operator OP$_i$. The unacceptability of these examples follows from Subjacency. In the first relativization, the movement of the lower relative operator observes Subjacency as it crosses the lower IP to [Spec CP]. In the second relativization, however, the higher relative operator OP$_i$ must move directly to the specifier position of the higher CP, since the specifier position of the lower CP is already occupied by the other operator OP$_j$. This movement crosses two bounding nodes, resulting in an unacceptable sentence. Therefore, based on examples like (6-13), Han (1992) argues that Subjacency effects obtain in extractions of complex NPs.

Han (1992) also provides an example of Korean relative clauses constrained by the Sentential Subject Condition. Consider the examples in (6-15).

(6-15) a. *[[[e_i Mary-lul salangha-nun] kes-i] na-lul
Mary-acc love-comp thing-nom I-acc

hwanakeyha-nun] $John_i$
make angry-rel John

'John who_i that t_i loves Mary makes me angry'

(Han, 1992)

b. *[[[haksayng-i e_i ttayli-n] kes-i] wuli-lul
student-nom hit-comp thing-nom us-acc

sulpukeyhan-un] $kyoswu_i$
make sad-rel professor

'the professor who_i that students beat t_i makes us sad'

(Han, 1992)

In a movement analysis the examples in (6-15) would have the S-structure representations given in (6-16).

(6-16) a. * [$_{CP}$ OP$_i$ [$_{IP}$ [$_{NP}$ [$_{CP}$ t'$_i$ [$_{IP}$ t$_i$ Mary-lul salangha] -nun] kes-i]

Mary-acc love -comp thing-nom

na-lul hwanakeyha] -nun] John

I-acc make angry -rel John

'John who$_i$ that t$_i$ loves Mary makes me angry'

(Han, 1992)

b. * [$_{CP}$ OP$_i$ [$_{IP}$ [$_{NP}$ [$_{CP}$ t'$_i$ [$_{IP}$ haksayng-i t$_i$ ttayli] -n] kes-i]

student-nom hit -comp thing-nom

wuli-lul sulpukeyha] -un] kyoswu

us-acc make sad -rel professor

'the professor who$_i$ that students beat t$_i$ makes us sad'

(Han, 1992)

In (6-16), elements are relativized out of sentential subjects, yielding a violation of Subjacency. In both examples, the first movement satisfies Subjacency since it is to the immediately dominating (lower) CP. In the second cycle, however, the operator must move across two bounding nodes, violating Subjacency.

The counterexamples provided by the Base-Generated Hypothesis can now be accounted for by a movement analysis. The counterexamples above in (6-9b) and (6-9c) were argued to illustrate the lack of Subjacency effects in the complex NP condition and the left branch condition. However, these examples are judged unacceptable, or very marginal at best, by some Korean linguists and many native speaker informants. The counterexample provided in (6-9a) is analyzed by Hong (1985) in (6-12a) above as obeying Subjacency. Therefore, based on data provided by Kaplan and Whitman (1995), Hong (1985) and Han (1992), most Korean relativization does seem to be constrained by the classical cases of Subjacency.

A second argument in support of a movement analysis is the restricted distribution of resumptive pronouns in Korean relative clauses. It was argued that Subjacency is violated in (6-9a), repeated here as (6-17), and yet the construction is acceptable. The Base-Generated Hypothesis argues that a Subjacency violation is avoided when e_i is analyzed as a base-generated *pro*. Further evidence was that a resumptive pronoun could occur in that position.

(6-17) [[[nwu-ka e_i ilk-ess-nun ci]

who-nom read-past -comp

Mary-ka kwungkumha-nun] $chayk_i$]

John-nom wonder-rel book

'the $book_i$ that Mary wondered who_j t_j read t_i'

However, Kaplan and Whitman (1995) draw on Chao and Sells (1983), who observe that resumptive pronouns in English cannot occur in relative clauses headed by quantified expressions. Assuming that Korean is like English in relative clause operator movement, this prohibition should be observed in Korean as well. Indeed, when the head noun in (6-17) is quantified as in (6-18), it does become ungrammatical.

(6-18) *[[[nwu-ka e_i ilk-ess-nun ci]

who-nom read-past -comp

Mary-ka kwungkumha-nun] motwun chayk$_i$]

John-nom wonder-rel every book

'every book$_i$ that Mary wondered who$_j$ t_j read t_i'

(Kaplan and Whitman, 1995)

Kaplan and Whitman argue that if e_i is a null pronoun, then there should be no Subjacency violation. However, unacceptability can be explained by the unavailability of the resumptive pronoun strategy and a movement-derived Subjacency violation. As mentioned above, the empty category e_i in (6-18) is prohibited from being a resumptive pronoun in a quantified expression. At the same time, Subjacency prevents e_i from being the trace of relative operator movement. As neither a pronoun nor operator movement is possible, the construction is unacceptable. Thus a movement analysis can better account for the contrast between (6-17) and (6-18).

Finally, contrary to the claims of the Base-Generated Hypothesis, the distribution of resumptive pronouns in Korean relative clauses is quite restricted. In fact, in all of the examples provided thus far, it is only in (6-17) that the resumptive pronoun is licensed. Consider (6-19).

(6-19) a. [e_i Mary-lul ttayli-n] ai_i

Mary-acc hit-rel child

'child that hit Mary'

b. *[$caki_i$ -ka Mary-lul ttayli-n] ai_i

self-nom Mary-acc hit-rel child

'child that himself hit Mary'

c. *[ku_i -ka Mary-lul ttayli-n] ai_i

he-nom Mary-acc hit-rel child

'child that he hit Mary'

In (6-19), the resumptive pronouns are not licensed. Additionally, resumptive pronouns do not save any of the constructions presented above from Subjacency violations. Consider (6-13) repeated here as (6-20) and (6-15) repeated here as (6-21).

(6-20) *[[John-i [e_i ku_j-lul mwul -un] kae_i-lul]

John-nom it-acc bite -rel dog-acc

chacanay-n] $namca_i$

identifiy-rel man

'the man who_i John identified the dog $which_j$ bit him_i'

(Kaplan and Whitman, 1995)

(6-21) *[[[ku$_i$-ka Mary-lul salangha-nun] ket-i] na-lul

he-nom Mary-acc love-comp thing-nom I-acc

hwanakeyha-nun] John$_i$

make angry-rel John

'John who$_i$ that t_i loves Mary makes me angry'

(Kaplan and Whitman, 1995)

Given that resumptive pronouns are not licensed in simple relative clauses and are rarely licensed in complex ones, it can be concluded that relative clauses in Korean are derived via syntactic movement of a null operator.

In summary, the base-generated approach claims that relativization in Korean does not involve movement and that the gap in the relative clause is a base-generated *pro*. The movement approach claims that relativization involves overt movement, and thus the gap is a trace created by this movement. The syntactic debate, then, concerns both the approach to accounting for the data and the data itself. That is, grammatical judgments of the same data are not stable, and there are relative clauses that do seem to obey Subjacency and some that do not. Additionally, there are resumptive pronouns that are licensed in some constructions but not others. It is based upon these data that each theory argues for base-generation or movement. Because of this, I argue that evidence in support of a movement analysis appears strong but not thoroughly convincing. Again, looking to language deficits may provide clues as to the proper analysis. Therefore, the relative clause experiment will test how Broca's aphasics treat subject and object relative clauses.

6.2.2 Accounts of aphasia

As described in Chapter 2, the four hypotheses can account for comprehension patterns in English relative clauses. This section will present predictions that each makes for Korean subject and object relative clauses. Because the DDH makes different predictions for the movement and non-movement analyses described above, I will provide predictions for both syntactic analyses. Although the linear models (TDH, ALH and MH) do make reference to syntactic movement, they rely primarily upon the order of arguments in a linear string. Thus, the predictions for the TDH, ALH and MH will not distinguish between the syntactic analyses.

Trace Deletion Hypothesis (TDH)

Subject Relative Clause

The normal subject relative clause representation is given in (6-22a).[4] The operator moves from its VP-internal subject position to [Spec IP] and then to [Spec CP], leaving a trace in each position. In the agrammatic representation these traces are deleted, resulting in the representation in (6-22b).

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[4] As in previous chapters, predictions for each of the four aphasia accounts are based upon the syntactic analysis assumed in each account.

(6-22) a. [Op_i [t'_i [t_i $[yeca]_j$-lul mil-un_i]]] $kirin_i$

woman-acc	push-rel	giraffe
Theme		**Agent**

'The giraffe that pushed the woman.'

b. [Op_i [* [* $[yeca]_j$-lul mil-un_i]]] $kirin_i$

woman-acc	push-rel	giraffe
Theme		**Theme**
(via syntax)		***(via strategy)***

'The giraffe that pushed the woman.'

According to Grodzinsky (2000), the chain between the moved operator, and its trace is disrupted.[5] The operator does not receive a theta-role, and therefore cannot transmit a role to the NP *kirin* 'giraffe' with which it is coindexed. As there is an NP without a role, and this NP is in second position, the R-strategy assigns the role of Theme. The NP *yeca* 'woman' in object position is assigned Theme syntactically. This creates competition between arguments for Theme, and performance is predicted to be at chance.

Object Relative Clause

The normal object relative clause representation is given in (6-23a). The NP *kirin* 'giraffe' moves from its VP-internal subject position to [Spec IP], leaving a trace.

[5] Grodzinsky (2000) considers the chain to be <complementizer, operator, trace>. The verb assigns the theta-role to the operator in [Spec VP], which then moves first to [Spec IP] and then to [Spec CP]. He assumes that the operator is coindexed with the complementizer, which apparently transmits its features to the head noun.

Additionally, the operator moves from object position to [Spec CP]. As trace is deleted in agrammatism, the agrammatic representation would be that in (6-23b).

(6-23) a. [Op_j	[$[kirin]_i$-i	[t_i	t_j	mil] -un_j]]	$yeca_j$
	giraffe-nom			push-rel	woman
	Agent				**Theme**

'The woman that the giraffe pushed.'

b. [Op_j	$[[kirin]_i$-i	[*	*	mil] -un_j]]	$yeca_j$
	giraffe-nom			push-rel	woman
	Agent				**Theme**
	(via strategy)				***(via strategy)***

'The woman that the giraffe pushed.'

The chains between both moved elements and their thematic positions are disrupted, such that neither receives a theta-role. The R-strategy thus assigns the Agent role to the first visible NP without a role, *kirin* 'giraffe' in (6-23b), and Theme to the second NP, *yeca* 'woman', which is the next role down in the Thematic hierarchy. The R-strategy thus compensates the impaired representation by matching normal thematic assignment, and performance is predicted to be above chance.

Argument Linking Hypothesis (ALH)

Subject Relative Clause

The basic argument structure of the verb *MIL-TA* 'to push' is given in (6-24). Based upon this argument structure, semantic linking in (6-25) would yield Agent for the NP *yeca* 'woman' in first position and Theme for the NP *kirin* 'giraffe' in second position. Syntactic linking would link Theme to the NP *yeca* 'woman' in object position and Agent to the NP *kirin* 'giraffe.'

(6-24) MIL-TA: verb <Agent, Theme>

'to push'

(6-25)	[yeca-lul	mil-un]	kirin
	woman-acc	push-rel	giraffe
Semantic:	**Agent**		**Theme**
Syntactic:	**Theme**		**Agent**
	'The giraffe that pushed the woman'		

As there is a mismatch in thematic assignment in the linking processes, Broca's patients are predicted to perform at chance on subject relative clauses.

Object Relative Clause

Based upon the argument structure in (6-24), both semantic and syntactic linking in (6-26) would yield Agent for the NP *kirin* 'giraffe' in first position and Theme for the NP *yeca* 'woman' in second position.

(6-26)	[kirin-i	mil-un]	yeca
	giraffe-nom	push-rel	woman
Semantic:	**Agent**		**Theme**
Syntactic:	**Agent**		**Theme**
	'The woman that the giraffe pushed'		

As both semantic and syntactic linking match, Broca's patients are predicted to perform above chance on object relative clauses

Mapping Hypothesis

Subject Relative Clauses

The basic argument structure of the verb *MIL-TA* 'to push' is repeated in (6-27). Based upon this argument structure, mapping in (6-28) would yield Agent for the NP *yeca* 'woman' in first position and Theme for the NP *kirin* 'giraffe' in second position.

(6-27) MIL-TA: verb <Agent, Theme>

'to push'

(6-28) [yeca-lul mil-un] kirin

woman-acc push-rel giraffe

Theme **Agent**

'The giraffe that pushed the woman'

As thematic assignment does not match the order of the elements in the grid, assignment is non-canonical. The MH predicts that mapping process will be disrupted. Broca's patients are predicted to perform below chance.

Object Relative Clauses

Based upon the argument structure in (6-27), mapping in (6-29) would yield Agent for the NP *kirin* 'giraffe' in first position and Theme for the NP *yeca* 'woman' in second position.

(6-29) [kirin-i mil-un] yeca

giraffe-nom push-rel woman

Agent **Theme**

'The woman that the giraffe pushed'

As thematic assignment matches the order of the elements in the grid, assignment is canonical. The MH predicts that mapping process will not be disrupted, and Broca's patients are predicted to perform above chance.

Double Dependency Hypothesis

As in previous chapters, the DDH will be used to make predictions to test not only this aphasia account but also the syntactic debate. In the following I will provide predictions for both the base-generated and derived hypotheses

(i) The Base-Generated Hypothesis

Subject Relative Clauses

The Base-Generated Hypothesis claims that relativization in Korean involves the generation of a phonetically null pronoun *pro* in the argument gap of the relative clause. The representation of a subject relative clause would be that in (6-30a).

(6-30) a. [$_{CP}$ [$_{IP}$ [pro]$_i$	[t$_i$	[yeca]$_j$-lul	mil]]	-un]	kirin$_i$
		woman-acc	push	-rel	giraffe

'The giraffe that pushed the woman'

b. $< \text{pro}_i , t_i >$

Agent

In (6-30a) the *pro* is base-generated in [Spec VP] of the embedded clause and moves to [Spec IP].

It is necessary to point out that although *pro* is coindexed with the head NP *kirin* 'giraffe,' the dependency in (6-30a) would consist only of *pro* and its trace (6-30b). As noted in Chapter 2, Mauner et al. (1993) assume that the dependency between the null element and the head NP of a relative clause is non-thematic. They argue that in non-thematic R-dependencies, such as that between anaphors and antecedents, the chain serves not to transmit a single theta-role but to indicate co-reference in interpretation. For example, in the sentence *John hurt himself*, the NP *John* and anaphor *himself* each independently receive a theta-role from the verb but are still interpreted as co-referential. Thus, they are coindexed and form a non-thematic chain for interpretation. However, in thematic R-dependencies, such as that created by movement, the coindexation of a trace and its antecedent allows for the transmission of a single theta-role. As was seen in passives in Chapter 5, the internal argument of a passive moves from object position to [Spec IP], leaving a trace. The chain < NP, t > receives a single theta-role from the verb. Thus, the NP and trace are coindexed and form a thematic chain.

In this way Mauner et al. can distinguish between chains that consist of R-dependencies created by *syntactic movement* and R-dependencies based on *interpretation*. While they argue that Broca's aphasia affects all R-dependencies (e.g., agreement features in grammaticality judgments), they also argue that only disruption to thematic R-dependencies leads to disruption in thematic interpretation. Thus, although the *pro* in (6-34a) is coindexed with the head NP *kirin* 'giraffe,' this would constitute a non-thematic dependency; and therefore the dependency between the *pro* and the NP would not disrupt thematic interpretation.

As represented in (6-30b), the thematic R-dependency chain would consist of the *pro* and its trace. As there is only one dependency, the base-generated analysis of the DDH predicts above chance on subject relatives.

Object Relative Clause

The representation of an object relative clause would be that in (6-31).

(6-31) a. [[$_{IP}$ [kirin]$_i$-i [$_{VP}$ t_i [pro]$_j$ mil]] -un] yeca$_j$

giraffe-nom push -rel woman

'The woman that the giraffe pushed'

b. < kirin$_i$, t_i >

Agent

In (6-31a) the *pro* is base-generated in object position of the embedded clause. There is movement of the subject from its VP-internal position to [Spec IP]. As there is only one dependency in (6-31b), the DDH predicts above chance on object relatives. Therefore, if the Base-Generated Hypothesis is correct, Broca's comprehension will be above chance on both subject and object relative clauses.

(ii) The Derived Relative Clause Hypothesis

Subject Relative Clauses

The movement analysis argues that relativization involves the syntactic movement of an empty relative operator. The representation for a subject relative clause would be that in (6-32).

(6-32) a. [$_{CP}$ OP$_i$ [$_{IP}$ t'$_i$ [t$_i$ [yeca]$_j$ -lul mil]] -un] kirin$_i$

woman-acc push -rel woman

'The giraffe that pushed the woman'

b. $< OP_i, t_i >$

In the subject relative in (6-32a), there is only one dependency, created by operator movement (6-32b). As in the non-movement analysis, the head NP *kirin* 'giraffe' would not form a thematic chain with the operator and trace. The coindexation of the operator and the head NP simply creates a co-referential interpretation chain that is argued to not disrupt thematic interpretation. As there is only one referential dependency, Broca's patients are predicted to be above chance.

Object Relative Clauses

The representation of an object relative clause in a movement analysis would be that in (6-33).

(6-33) a. [$_{CP}$ OP$_j$ [$_{IP}$ [kirin]$_i$-i [$_{VP}$ t$_i$ t$_j$ mil] -un]] yeca$_i$

giraffe-nom push -rel woman

'The dog that the cat bit.'

b. $< kirin_i, t_i >$ and $< OP_j, t_j >$

c. $< \text{kirin}_i , t_j >$ and $< \text{OP}_j , t_i >$

In the object relative in (6-33a), there are two movements. The subject NP *kirin-i* 'giraffe-nom' moves from its VP-internal position to [Spec IP], and the operator moves from object position to [Spec CP]. There are thus two R-dependencies in the normal representation, given in (6-33b). Therefore, an anomalous coindexation is possible (6-33c). Given that coindexation is ambiguous, for object relatives in a movement analysis the DDH predicts that Broca's comprehension will be at chance. A summary of predictions for the two competing syntactic analyses is given in Table 6.2.

Table 6.2

Predictions for relative clauses

Structure	Base-Generated	Derived
Subject Relative	Above	Above
Object Relative	Above	Chance

As shown in Table 6.2, Broca's patients who performed above chance on active and at chance on scrambled active and passive are predicted to perform above chance on both subject and object relatives if there is no movement. Patients are predicted to be above chance on subject and at chance on object relative clauses if there is syntactic movement. A summary of all predictions is given in Table 6.3.

Table 6.3

Summary of predictions for relative clauses

Structure	TDH	ALH	MH	DDH
Subject Relative	Chance	Chance	Below	Above
Object relative	Above	Above	Above	Above/Chance

In Table 6.3, there is a clear distinction between the linear and structural accounts. The linear hypotheses predict at chance (or below chance) performance on subject relatives and above chance on object, while the structural account predicts the opposite on subject relatives. Again, the structural prediction for object relatives depends on the syntactic analysis assumed. The Korean relative clause experiment, then, provides an interesting means of culling the hypotheses. The next section will describe the methods, materials and subjects for the experiment.

6.3 Method and Materials

This section will describe the methods, materials and subjects for the relative clause experiment.

6.3.1 Method

This experiment used the two-picture sentence-picture matching task. As described in Chapter 3, subjects were instructed to look at a card with two pictures mounted in a vertical arrangement, listen to a sentence and point to the picture that best matches the sentence.

6.3.2 Materials

A total of 40 sentences were developed to comprise the experimental stimuli. There were 20 semantically reversible sentences in each of two conditions: subject relative clause and object relative clause. As noted in Chapter 3, the verbs and nouns used in the experimental sentences were chosen from the same set of nouns and two-place, transitive verbs used in all experiments. That is, the active sentences used in Chapter 4 were transformed into relative clause equivalents for this experiment. The verb and noun pairings for this experiment are given in (6-34).

(6-34)	push (woman, giraffe)	kick (policeman, giraffe)
	photograph (dog, man)	drag (baker, camel)
	bite (zebra, baker)	bind (policeman, cow)
	carry (camel, doctor)	lift (camel, doctor)
	cover (man, woman)	chase (cow, dog)

Each verb in (6-34) was used four times: subject relative, semantically reversed subject relative, object relative, and semantically reversed object relative. Examples are given in (6-35) and (6-36).

(6-35) a. yeca-lul mil-nun kirin-ul karukyo-cwuseyo *Subject*

woman-acc push-rel giraffe-acc point out-please

'Point to the giraffe that pushes the woman'

b. kirin-ul mil-nun yeca-lul karukyo-cwuseyo *Reversed*

giraffe-acc push-rel woman-acc point out-please

'Point to the woman that pushes the giraffe'

(6-36) a. yeca-ka mil-nun kirin-ul karukyo-cwuseyo *Object*

woman-nom push-rel giraffe-acc point out-please

'Point to the giraffe that the woman pushes'

b. kirin-i mil-nun yeca-lul karukyo-cwuseyo *Reversed*

giraffe-nom push-rel woman-acc point out-please

'Point to the woman that the giraffe pushes'

A complete list of stimuli is given in Appendix C.

The same set of black and white line-drawing pictures used in the active and passive experiments was used in this experiment. The pictures were arranged vertically two per page. Each of the 40 pages thus consisted of a series of two pictures representing actions between two actors (one Agent and one Theme), both of whom could perform the action with equal plausibility. Among the actors in the picture, one matched the corresponding test sentence; the second picture represented the same actors in the inverse thematic relation. The pictures were counterbalanced between top and bottom position.

6.3.3 Subjects

All four Broca's patients (CDK, KTS, JJP, KKM), two Wernicke's patients (HCJ, KYA) and six matched controls participated in this experiment.

6.4 Results

This section provides the results of the relative clause experiment. Section 6.4.1 describes the results for Broca's aphasics. Section 6.4.2 provides the analyses for Wernicke's aphasics. Section 6.4.3 compares performance by Broca's and Wernicke's.

6.4.1 Broca's Results

Tables 6.4 and 6.5 present the raw scores for Broca's subjects and their matched controls. Controls performed nearly without error, so they are not discussed further. Figure 6.1 provides individual percent scores for Broca's subjects.

Table 6.4

Raw scores for Broca's on relative clauses (correct out of 20)

Structure	CDK	KTS [6]	JJP	KKM	Avg	%
Subject Relative	16	13	15	16	15	75%
Object Relative	14	17	16	17	16	80%

Table 6.5

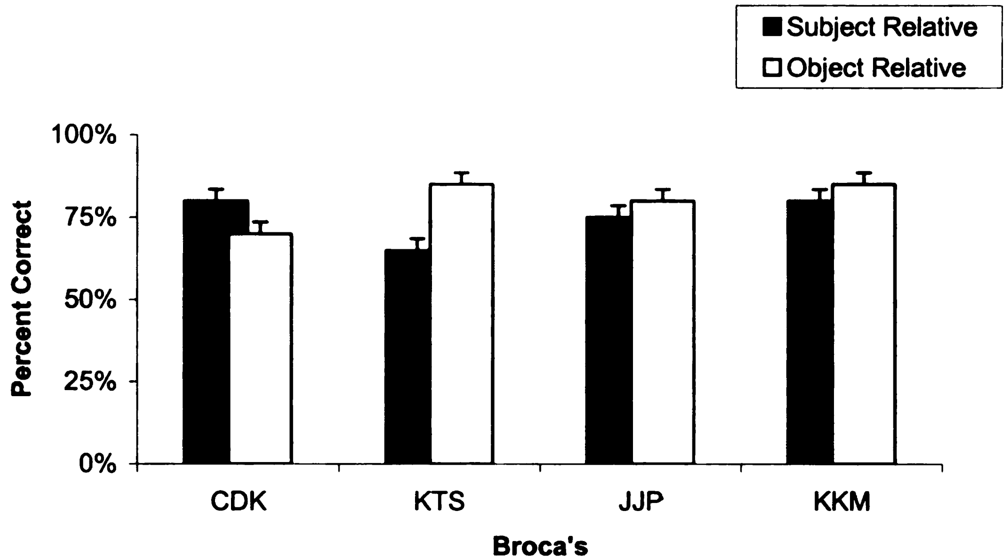
Raw scores for controls on relative clauses (correct out of 20)

Structure	JBA	DCM	KDS	JGF	Avg	%
Subject Relative	20	19	20	20	19.8	99%
Object Relative	20	20	19	20	19.8	99%

[6] KTS suffered from severe fatigue and attention problems during the experimental trial. His data from that trial were discarded and data from an earlier (pilot) testing with the same materials is reported here.

Figure 6.1

Percent correct for Broca's on relative clauses



As can be seen in Table 6.4 performance on subject relatives was 75% correct and object relatives 80%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance on subject and object relatives was above chance ($t(3) = 7.071$, $p = .006$ and $t(3) = 8.485$, $p = .003$, respectively). This pattern is summarized in Table 6.6.

Table 6.6

Significance patterns for Broca's compared with chance (50%)

Sentence Type	Significance
Subject Relative	p = .006
Object Relative	p = .003

To determine whether there is a significant difference between conditions, a two-tailed t-test was conducted. Analysis reveals no significant difference between performance on subject and object relatives.

6.4.2 Wernicke's Results

Tables 6.7 and 6.8 present the raw scores for Wernicke's subjects and their matched controls. Controls performed without error, so they are not discussed further. Figure 6.2 provides individual percent scores for Wernicke's subjects.

Table 6.7

Raw scores for Wernicke's on relative clauses (correct out of 20)

Structure	HCJ	KYA	Avg	%
Subject Relative	8	10	9	45%
Object Relative	9	8	8.5	43%

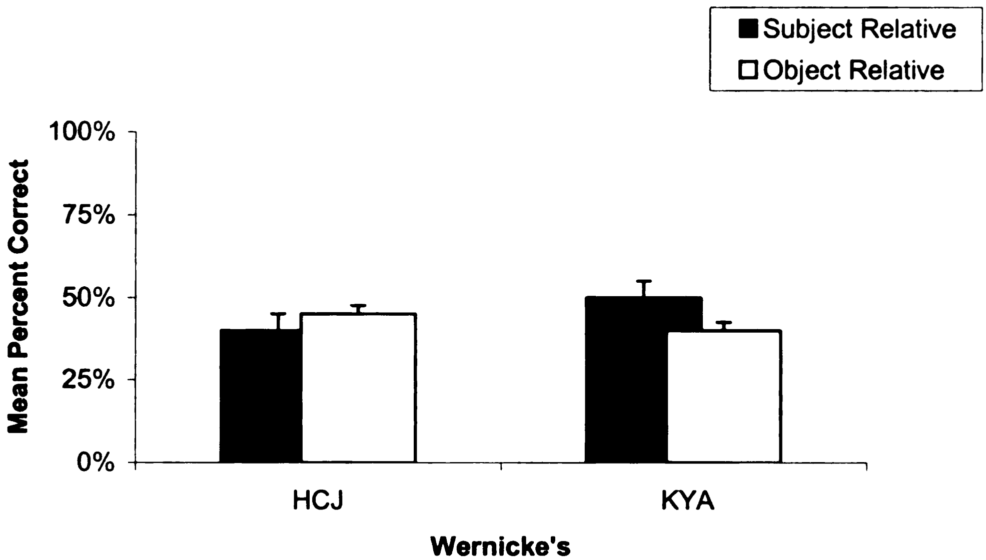
Table 6.8

Raw scores for controls on relative clauses (correct out of 20)

Structure	SHB	OKT	Avg	%
Subject Relative	20	20	20	100%
Object Relative	20	20	20	100%

Figure 6.2

Percent correct for Wernicke's on relative clauses



As can be seen in Table 6.7 Wernicke's performance on subject relatives was 45% correct and object relatives 43%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance was at chance on both subject and object relatives ($t(1) = -1.00$, $p = .5$), ($t(1) = -3.00$, $p = .205$), respectively). This pattern is summarized in Table 6.9.

Table 6.9

Significance patterns for Wernicke's on relative clauses compared with chance (50%)

Sentence Type	Significance
Subject Relatives	ns
Object Relatives	ns

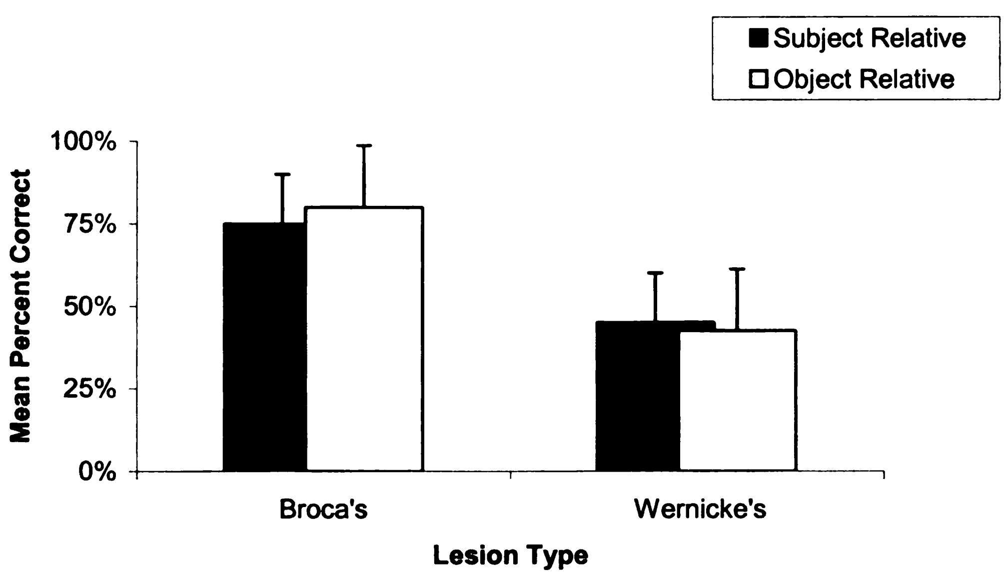
To determine whether there is a significant difference between conditions a two-tailed t-test was conducted. Analysis reveals no significant difference between performance on subject and object relatives.

6.4.3 Broca's versus Wernicke's

Group scores for Broca's and Wernicke's reported above are repeated in Figure 6.3. As noted above, Broca's performed above chance on subject relatives (75% correct) and object relatives (80% correct). Wernicke's performed at chance on both conditions (45% and 43%, respectively).

Figure 6.3

Percent correct on relative clauses for each lesion type



Results from a 2 x 2 (Lesion x Sentence) analysis of variance (ANOVA) reveal a main effect for lesion type ($F(1, 8) = 67.03$, $p < .0001$) but no main effect for sentence type ($F(1, 8) = .092$, $p = .769$). There was no significant interaction ($F(1, 8) = .828$, $p = .389$). Planned comparisons using Bonferroni posttests reveal significant differences between Broca's and Wernicke's in both the subject relative condition ($p < .01$) and the object relative condition ($p < .001$).

6.5 Discussion

Section 6.5.1 summarizes the empirical findings presented in the previous section. In Section 6.5.2 I relate these findings to the predictions made in the theoretical background in Section 6.2.2, as well as discuss some of the theoretical implications based upon the above analyses.

6.5.1 Empirical Findings

The findings of this experiment indicate that as a group the four Korean Broca's patients perform above chance in their comprehension of both subject and object relative clauses. These findings are interesting because this pattern differs from the asymmetrical pattern of above chance on subject relatives and at chance on object relatives for English-speaking patients discussed in Chapter 2.

The finding of a main effect for lesion type and not for sentence type is expected if Broca's patients perform above chance on both subject and object relatives, while the Wernicke's perform at chance. A look at row and column means in Table 6.10 confirms this.

Table 6.10

Group column and row means for relative clauses

	Broca's	**Wernicke's**	
Subject Relative	75%	45%	*60%*
Object Relative	80%	43%	*61.5%*
	77.5%	*44%*	

The higher scores for Broca's in both conditions yielded an overall 77.5%, which is significantly different from the Wernicke's combined scores of 44%. Comparing sentence type, however, there is no significant difference, as Broca's above chance performance is muted by Wernicke's at chance performance. These findings support the conclusions that Broca's patients are significantly above chance and Wernicke's are at chance and that there is a significant difference between Broca's and Wernicke's performance in relative clauses.

6.5.2 Theoretical Implications

The syntax of Korean relative clauses

The four Broca's aphasics performed above chance on simple active sentences, which do not involve overt movement and at chance on scrambled active sentences, which do involve overt movement. These same patients perform above chance on both subject and object relatives. Table 6.11 provides a comparison of the predictions and results.

Table 6.11

Predictions and results for relative clauses

Structure	Base-Generated	Derived	Result
Subject Relative	Above	Above	Above
Object Relative	Above	Chance	Above

The results of Broca's aphasic comprehension confirm the predictions made by the Base-Generated Hypothesis. In presenting syntactic arguments for the two competing relative clause analyses in Section 6.2.1, I argued that evidence in support of a movement analysis are strong but not thoroughly convincing, as there are still problems with why resumptive pronouns are licensed in some constructions but not others and with the range of grammaticality judgments. Experimentally, the same Broca's patients that performed at chance on sentence types that contain syntactic movement (i.e., active scrambled, passive, passive scrambled) performed above chance on both subject and object relative clauses. Thus, the empirical data do not provide support a movement analysis but rather suggest that there is no movement in Korean relative clauses.[7]

Accounts of aphasia

Table 6.12 provides a summary of the predictions made for Broca's in Section 6.2.2 and the findings in Section 6.4. As the Base-Generated Hypothesis was supported above, only the non-movement predictions for the DDH will be presented.

Table 6.12

Summary of predictions and results for relative clauses

Structure	TDH	ALH	MH	DDH	Result
Subject Relative	Chance	Chance	Below	Above	Above
Object Relative	Above	Above	Above	Above	Above

As seen in Table 6.12, all four accounts are successful in predicting performance in object relatives; however, only the DDH is successful in accounting for performance in subject relatives. This is not surprising given that the DDH relies on dependencies for its

[7] This, however, presents a problem for syntactic theory. As described above, there are several strong arguments that support a movement analysis, and these cannot be accounted for by base-generation.

predictions. Where there is no overt syntactic movement, there are no ambiguous dependencies. Thus there is no impaired performance.

However, the linear models fail once again because they rely on linear order for assignment of thematic roles from the theta-grid. This allows for correct thematic assignment in one sentence type but fails to account for why patients are not impaired when these roles are reversed. This provides further evidence that canonical ordering is insufficient in accounting for the syntactic deficit in Broca's aphasia.

6.6 Conclusion

Empirically the experiment in this chapter found that Broca's patients performed above chance on both subject and object relative clauses. This finding is different from that reported in the literature. The Korean pattern is not surprising, though, if patterns of Broca's aphasia follow from language specific structural properties. That is, the finding is not surprising if syntactic movement is implicated in the deficit and if Korean relative clauses have no movement. This would account for why English relative clauses display a subject/object asymmetry, while Korean relative clauses do not. This experiment, then, provides further support for the notion that syntactic movement is implicated in the deficit.

This chapter also presented two theoretical issues and confronted each with the Broca's data in Korean. The first theoretical issue was the syntactic debate concerning the proper analysis of the Korean relative clauses. I argued that a movement analysis is to be preferred for Korean relative clauses, even though there are arguments for both a non-movement and movement analyses. Neither analysis, however, is thoroughly convincing. This chapter then looked to language deficit to help glean some clues as to the proper analysis. It was found that Korean Broca's are above chance in their comprehension of subject and object relatives. Because syntactic movement such as that found in scrambling interferes with comprehension in Broca's aphasia and because these same Broca's patients were not impaired in their comprehension of relative clauses, it was concluded that Korean relative clauses may be best analyzed as not involving syntactic movement.

The second theoretical issue presented in this chapter was the extent to which the four aphasia accounts could explain Broca's performance patterns on Korean subject and object relatives. It was found that all four hypotheses could account for the object relatives; however, only the DDH could account for subject relatives. The linear accounts, which rely on linear assignment from argument structure, again failed. Thus, the data from actives, passives, and relative clauses suggest that Broca's patients are not simply assigning thematic roles canonically in all constructions and that syntactic movement appears to be implicated in this syntactic impairment. The next chapter will further investigate movement by looking at *wh*-questions.

CHAPTER 7

WH-QUESTIONS

7.1 Introduction

In this chapter I will present empirical data from Korean aphasia on subject and object *wh*-questions. In Chapters 4, 5, and 6 I presented data from Broca's aphasia on active, scrambled active, passive, scrambled passive, and subject and object relative clauses. Four Korean patients were seen to perform above chance on actives, subject relatives and object relatives. These same patients performed at chance on scrambled actives, passives and scrambled passives. I have argued that syntactic movement characterizes the difference between the two sets of constructions and that Broca's patients are impaired in the movement constructions. The experiment reported in this chapter will further investigate this claim by testing these patients on a construction involving a different type of syntactic movement: *wh*-questions.

This chapter will test the hypothesis that there is an asymmetry for *wh*-questions in Korean agrammatic comprehension. This is theoretically interesting for three reasons. First, as described in Chapter 2, surprisingly there is no asymmetry in comprehension reported for English subject and object *wh*-questions. English-speaking patients are above chance in the comprehension of both subject and object *wh*-questions. Also, Korean questions do not involve overt *wh*-movement (i.e., *wh*-phrases remain *in-situ*) but instead may involve movement at the syntactic level of Logical Form (LF). Korean is thus a crucial language to test the involvement of the level of LF.

Second, in addition to the level of representation implicated in the impairment, dissociations between subject and object *wh*-questions in Korean are theoretically interesting for the four aphasia accounts because elements in a Korean question remain in canonical linear order but are argued to move at a different level. Thus, testing *wh*-questions in Korean may further tease apart the linear and structural assumptions of the accounts.

A third reason that Korean *wh*-questions are interesting is that current syntactic theories suggest that the interpretation of *in-situ* questions such as those found in Korean may be dependent on movement of the *in-situ* question phrase at the syntactic level of LF (Cheng, 1991; Huang, 1982). This issue is under some debate, since there are accounts in which LF movement is not required (e.g., Aoun and Li, 1993; Yoon, S., 1997). The existence of comprehension asymmetries between subject and object questions in an *in-situ* language like Korean may provide further evidence for the necessity of LF movement. That is, if Korean Broca's patients, who are sensitive to syntactic movement, show a dissociation between subject and object *wh*-questions, neither of which has overt *wh*-movement, then it may be inferred that syntactic movement has occurred at some non-overt level.

The organization of the chapter is as follows. Section 7.2 will provide the theoretical background for the chapter. It will outline the syntactic debate concerning *wh*-questions in *in-situ* languages like Chinese and Korean and briefly present the salient arguments for both non-movement and movement analyses. It will also provide the predictions of the four Broca's accounts for subject and object *wh*-questions in Korean. Section 7.3 will describe the methods and materials for the *wh*-question experiment.

Section 7.4 presents the results from the experiments. In Section 7.5 I discuss the implications of the results in terms of the syntactic debates and the four accounts. Section 7.6 concludes the chapter.

7.2 Theoretical Background

This section will provide a brief description of Korean *wh*-questions and two competing syntactic analyses for *in-situ wh*-questions. Predictions for testing these analyses and the four aphasia accounts will be presented.

7.2.1 Korean Wh-Questions

Traditional Description

Traditionally, Korean has been described as a language that lacks overt *wh*-movement, in contrast to languages like English. This contrast is shown in (7-1) through (7-3).

(7-1) a. The cat bit the dog.

b. koyangi-ka kae-lul mwul-ess-ta
cat-nom dog-acc bite-past-decl
'The cat bit the dog.'

(7-2) a. Who bit the dog?

b. nwukwu-ka kae-lul mwul-ess-ni?
who-nom dog-acc bite-past-Q
'Who bit the dog?'

(7-3) a. Who$_i$ did the dog bite t_i ?

b. koyangi-ka nwukwu-lul mwul-ess-ni?

cat-nom who-acc bite-past-Q

'Who did the cat bite?'

As discussed in Chapter 4, canonical English word order is SVO (7-1a), while in Korean it is SOV (7-1b). In (7-2a) there seems to be little difference between the two languages, as the *wh*-word appears sentence-initial in both English and Korean. However, in (7-3a), the *wh*-phrase in English moves from object position to sentence-initial position, while in Korean the *wh*-phrase remains *in-situ*.

Syntactic Accounts of Korean Relative Clauses

Although the basic description above is accurate, it fails to capture many of the syntactic and semantic similarities between the two languages. For example, the above description does not account for that fact that the meanings in (7-1) through (7-3) are the same despite the differences in movement. Syntactic accounts seek to capture important properties such as this.

It is widely argued that in all languages *wh*-phrases are operators and that the scope properties of these operators must be syntactically represented. However, there is a debate as to the level at which these operators exist. Huang (1982) argue that *wh*-phrases behave like quantifiers and move at LF to take appropriate sentential scope. Aoun and Li (1993) argue that *wh*-phrases in Chinese and other *in situ* languages are not question words like English and thus cannot be treated as quantifiers. They argue that *wh*-phrases in these languages do not move at LF but rather propose a Question operator to interpret the *wh*-question words. Below I will briefly characterize the most salient arguments for each position.

1. A Movement Analysis: LF Movement

It has been widely argued that, although *wh*-questions in languages like Chinese remain *in-situ* and do not involve overt syntactic movement, they do involve movement at some covert level such as LF (e.g., Cheng, 1991; Huang, 1982). In the following, I will briefly describe three arguments based on Huang (1982) for Chinese in support of an LF movement analysis. These arguments include selectional restrictions, argument/adjunct asymmetry and interaction with quantifiers. For each argument I will also consider how the analysis accounts for Korean *wh*-questions.

(i) Selectional Restrictions

The first argument in support of LF movement is that *in-situ wh*-questions in Chinese show the same scope as English *wh*-questions. That is, Huang (1982) argues that although *wh*-phrases remain *in-situ* at S-structure in Chinese, Chinese questions are interpreted just like the corresponding English *wh*-questions that undergo movement at S-structure. To account for this, it is argued that *wh*-elements in Chinese must also move for scope but do so at the level of LF.

LF is the level that encodes the logico-semantic properties of sentences such as the scope of operators. One way to capture the generalization that the English and Korean examples presented in (7-1) through (7-3) mean the same despite surface differences is to argue that both languages are the same at LF. Thus, to capture the logical properties of the English and Chinese questions, Huang argues that *wh*-phrases are like quantifiers and raise to [Spec CP] in order to take scope over the clause. Consider the examples in (7-4).

(7-4) a. Zhangsan wen wo [shei mai-le shu]
Zhangsan ask me who buy-asp book
'Zhangsan asked me who bought books.'
(Huang, 1982)

b. Zhangsan xiangxin [shei mai-le shu] ?
Zhangsan believe who buy-asp book
'Who does Zhangsan believe bought books?'
(Huang, 1982)

c. Zhangsan zhidao [shei mai-le shu] (?)
Zhangsan know who buy- asp book
(i) 'Who does Zhangsan know bought books'
(ii) 'Zhangsan knows who bought books.
(Huang, 1982)

In (7-4a) the verb *wen* 'ask' selects a question as its argument, and the *wh*-phrase has scope over the embedded clause but not the matrix clause. The verb *xiangxin* 'believe' in

(7-4b) selects a statement as its argument, and the *wh*-phrase has its scope over the matrix clause. The verb *zhidao* 'know' in (7-4c) selects either a question or a statement as its argument, and the scope of the *wh*-phrase is either over the matrix clause or the embedded clause.

Based upon the data in (7-4), Huang claims that the argument selection restrictions of the verbs reflect the scope of the *wh*-phrases. The English translations show that the LF of the Chinese *wh*-phrase is equivalent to that of the English *wh*-phrase at S-structure. Thus, as the English and Chinese mean the same thing, it must be that *wh*-elements in Chinese move for scope at LF.

This same analysis has been applied to Korean data as well (Yoon, J., 1990). Consider the examples in (7-5).

(7-5) a. John-i Mary-eykey [nwukwu-ka chaek-ul
John-nom Mary-to who-nom book-acc

sa-ess-nunci] mwul-ess-ta
buy-past-comp ask-past-decl

'John asked Mary who bought books.'

b. John-i [nwukwu-ka chaek-ul

John-nom who-nom book-acc

sa-ess-nunci] seyngkakha-ni?

buy-past-comp think-Q

'Who does John think bought books?'

c. John-i [nwukwu-ka chaek-ul

John-nom who-nom book-acc

sa-ess-nunci] al-eyo (?)

buy-past-comp know-pres-decl/Q

(i) 'John knows who bought books.'

(ii) 'Who does John know bought books?'

In (7-5a) the verb *mul* 'ask' selects a question as its argument, and the *wh*-phrase has scope over the embedded clause but not the matrix clause. The verb *seyngkakha* 'think' in (7-5b) selects a statement as its argument, and the *wh*-phrase has scope over the matrix clause. The verb *al* 'know' in (7-5c) selects either a question or a statement as its argument, and the scope of the *wh*-word is either over the matrix clause or the embedded clause respectively. Again, the English translations show that the LF of the Korean *wh*-phrase is equivalent to that of the English *wh*-phrase at S-structure. Therefore, although English is different from Chinese and Korean at S-structure, they are interpreted the same way. This provides support for the argument that Chinese and Korean *wh*-phrases move covertly at LF to show the same scope as the English *wh*-phrases at S-structure.

(ii) Argument/Adjunct Asymmetry

Huang's second argument for LF movement in Chinese comes from the asymmetry between argument and adjunct questions and the Empty Category Principle (ECP). The ECP requires a trace to be properly governed either by a proper governor (INFL or a lexical head) or by its antecedent. Since Chinese argument *wh*-phrases (henceforth *wh*-arguments) are always properly governed, the ECP does not constrain their movement. However, he argues that adjunct *wh*-phrases (henceforth *wh*-adjuncts) do observe the ECP, and violations occur when *wh*-adjuncts move to a position from which their traces cannot be properly governed. An example of argument *wh*-phrases that do not show island constraints is given in (7-6a), along with the LF representations (7-6b) and (7-6c).

(7-6) a. [ta xiang-zhidao [shei mai-le shenme]]

he wonder who buy-asp what

'What is the thing x such that he wonders who bought x?'

'Who is the person x such that he wonders what x bought?'

b. $[_{CP}$ shenme$_j$ $[_{IP}$ ta xiang-zhidao $[_{CP}$ shei$_i$ $[_{IP}$ t_i mai-le t_j]]]]

what he wonder who buy-asp

c. $[_{CP}$ shei$_i$ $[_{IP}$ ta xiang-zhidao $[_{CP}$ shenme$_j$ $[_{IP}$ t_i mai-le t_j]]]]

who he wonder what buy-asp

The sentence in (7-6a) is ambiguous when there are two *wh*-arguments present. The LF representations in (7-6b) and (7-6c) indicate that the *wh*-arguments are not subject to island constraints because their traces are properly governed. *Shenme* 'what' in (7-6b) crosses the island headed by *shei* 'who'; however, the trace of *shei* 'who' is properly governed by INFL. *Shei* 'who' in (7-6c) crosses the island headed by *shenme* 'what', and the trace of *shei* 'who' is governed by the verb. Thus, in both (7-6b) and (7-6c), the intervening *wh*-phrases, do not block the government of the traces.

However, a sentence containing an argument *wh*-phrase and an adjunct *wh*-phrase does not display the same ambiguity seen above. Consider (7-7).

(7-7) a. [ta xiang-zhidao [shei weishenme mai-le shu]]?

he wonder who why buy-asp book

'Who is the person x such that he wonders why x bought books?

#'What is the reason x such that he wonders who bought books for x?'

b. $[_{CP}$ shei$_i$ [ta xiang-zhidao $[_{CP}$ weishenme$_j$ $[_{IP}$ t_i t_j mai-le shu]]]]

who he wonder why buy-asp book

c. *$[_{CP}$ weishenme$_j$ [ta xiang-zhidao $[_{CP}$ shei$_i$ $[_{IP}$ t_i t_j mai-le shu]]]]

why he wonder who buy-asp book

As the LF representation in (7-7b) shows, the subject *shei* 'who', which crosses the island headed by *weishenme* 'why,' is governed by INFL, so there is no ECP violation. However, the *wh*-adjunct *weishenme* 'why' in (7-7c) cannot be governed by any governor. The *wh*-adjunct's movement across the intervening *shei* 'who' prevents it from antecedent governing its trace.

Huang argues that both (7-6) and (7-7) have two *wh*-question words. (7-6) shows that *wh*-arguments do not violate the ECP since their traces are properly governed no matter how far they move. (7-7) shows that *wh*-adjuncts cannot move out of a *wh*-island, and doing so violates the ECP. Therefore, the second reading in (7-7a) is barred by the ECP.

This same pattern can be seen in Korean as well. Consider first the *wh*-argument examples in (7-8).

(7-8) a. John-i [nwukwu-ka mwues-ul sa-ess-nunci] kwungkumha-eyo

John-nom who-nom what-acc buy-past-comp wonder-decl

'What is the thing x such that John wonders who bought x?'

'Who is the person x such that John wonders what x bought?'

b. [$_{CP}$ mwues$_j$-ul [$_{IP}$ John-i [$_{CP}$ nwukwu$_i$-ka [$_{IP}$ t_i t_j sa-ess-nunci]

what-acc John-nom who-nom buy-past-comp

kwungkumha-eyo]]]

wonder-decl

c. [$_{CP}$ nwukwu$_i$-ka [$_{IP}$ John-i [$_{CP}$ mwues-ul [$_{IP}$ t_i t_j sa-ess-nunci]

who-nom John-nom what-acc buy-past-comp

kwungkumha-eyo]]]

wonder-decl

The sentence in (7-7a) is ambiguous when there are two *wh*-arguments present. The LF representations in (7-7b) and (7-7c) indicate that the *wh*-arguments are not subject to island constraints because their traces are properly governed. *Mwues* 'what' in (7-7b) crosses the island headed by *nwukwu* 'who;' however, the trace of *nwukwu* 'who' is properly governed by INFL. *Nwukwu* 'who' in (7-7c) crosses the island headed by *mwues* 'what,' and the trace of *nwukwu* 'who' is governed by the verb. Thus, in both (7-7b) and (7-7c), the intervening *wh*-phrases, do not block the government of the traces.

Consider next the Korean *wh*-adjunct examples in (7-9).

(7-9) a. John-i [nwukwu-ka chaek-ul woae sa-ess-nunci]

John-nom who-nom book-acc why buy-past-comp

kwungkumha-eyo

wonder-decl

'Who is the person x such that John wonders why x bought books'

#'What is the reason x such that he wonders who bought books for x?'

b. [$_{CP}$ nwukwu$_i$-ka [$_{IP}$ John-i [$_{CP}$ woae$_j$ [$_{IP}$ t_i chaek-ul t_j sa-ess-nunci]

who-nom John-nom why book-acc buy-past-comp

kwungkumha-eyo]]]

wonder-decl

c. *[$_{CP}$ woae$_j$ [$_{IP}$ John-i [$_{CP}$ nwukwu$_i$-ka [$_{IP}$ t_i chaek-ul t_j sa-ess-nunci]

why John-nom who-nom book-acc buy-past-comp

kwungkumha-eyo]]]

wonder-decl

In the LF representation in (7-9b) the subject *nwukwu* 'who' crosses the island headed by *woae* 'why,' and given that the trace is governed by INFL, there is no ECP violation. However, the trace of the adjunct *woae* 'why' in (7-9c) cannot be governed by any governor. The adjunct's movement across *nwukwu* 'who' prevents it from antecedent governing its trace. As in the Chinese examples, (7-8) shows that *wh*-arguments do not violate the ECP, while (7-9) shows that *wh*-adjuncts cannot move out of a *wh*-island and that doing so violates the ECP. Therefore, the second reading in (7-9a) is not allowed by the ECP.

Thus, in order to account for the asymmetrical pattern in arguments and adjuncts, Huang argues that movement of *wh*-phrase must occur. As Chinese does not show overt movement at S-structure, covert movement must thus occur at LF. This argument was seen to account for the asymmetrical pattern in Korean as well.

(iii) Interaction with Quantifiers

A third argument from Huang (1982) in support of *wh*-movement at LF is the interaction between *wh*-phrases and quantifier phrases. When a *wh*-phrase and a quantifier phrase co-occur in a sentence, the *wh*-phrase will have wide scope over the quantifier phrase. Consider the example in (7-10).

(7-10)	Mei-ge-ren	dou	mai-le	shenme?
	every-cl-person	all	buy-asp	what
	'What did everybody buy?'			

The *wh*-phrase *shenme* 'what' has wide scope over *mei-ge-ren* 'everybody' but not vice versa. According to Huang, a possible answer for (7-10) would be (7-11a) but not (7-11b).

(7-11) a.	Mei-ge-ren	dou	mai-le	shu
	every-cl-person	all	buy-asp	book
	'Everybody bought books.'			

b. # Zhangsan mai-le shu, Lisi mai-le bi,

Zhangsan buy-asp book, Lisi buy-asp pen

Wangwu mai-le hua

Wangwu buy-asp painting

'Zhangsan bought books, Lisi pens, Wangwu paintings.'

Given the order of elements at S-structure, the pattern in (7-11) suggests that movement must have occurred in order for scope to be represented appropriately.

Consider now the Korean examples in (7-12) and (7-13).

(7-12) motun salam-tul ta mwues-ul sa-ess-ni?

every person-pl all what-acc buy-past-Q

'What did everybody buy?'

(7-13) a. motun salam-tul ta chaek-ul sa-ess-ta

every person-pl all book-acc buy-past-decl

'Everybody bought books'

b. John-un chaek-ul sa-ess-ko Mary-nun pen-ul sa-ess-ko

John-top book-acc buy-past-conj Mary-top pen-acc buy-past-conj

Bill-un kongchaek-ul sa-ess-ta

Bill-top notebook-acc buy-past-decl

'John bought a book, and Mary bought a pen, and Bill bought a notebook.'

In the Korean example in (7-12), a *wh*-phrase and a quantifier phrase co-occur. As in Chinese, the *wh*-phrase may have wide scope over the quantifier phrase. The *wh*-phrase *mwues* 'what' has wide scope over *motun-salam-tul* 'everybody.' Thus the answer to the question in (7-12) would be that in (7-13a), in which the *wh*-phrase has scope over the quantifier (i.e., there is some x such that everybody bought x).

However, unlike Huang's example, the Korean example is ambiguous. That is, not only can the *wh*-phrase take scope over the quantifier, but the quantifier may also take scope over the *wh*-phrase. This is seen in the answer given (7-13b), in which *motun-salam-tul* '*everybody*' has scope over *mwues* 'what' (i.e., everybody bought some x). Although this may be taken as evidence that the *wh*-phrase does not raise, Cheng (1991) argues that there is another reason for this pattern.

Cheng (1991) disagrees with Huang's analysis of (7-10) and argues that it is indeed ambiguous. However, the wide scope reading of the quantifier is available 'only under a certain interpretation of *mei* 'every'' (p188). Thus, unlike Huang, Cheng also claims that the two readings in (7-14) are both possible.

(7-14) Mei-ge-ren dou mai-le shenme?

every-cl-person all buy-asp what

'What did everyone buy?'

a. 'What is the thing x such that everyone bought x?'

b 'For every x, what is the thing that x bought?'

Cheng argues that (7-14b) is not a result of *mei-ge-ren* 'everyone' having scope over *shenme* 'what' but rather that an NP containing *mei-* 'every' has to associate with the adverb *dou* 'all.' Whenever a *mei*-NP associates with *dou* 'all', the distributive reading emerges. Further, under certain contexts that make the *mei*-NP more specific, the distributive reading will become salient, and thus *mei-* 'every' appears to have wide scope. Thus, according to Cheng, the reading in Chinese (7-14b) is not a result of the quantifier having wide scope over the *wh*-phrase.

Overall, given the order of elements at S-structure, the patterns described above for Chinese and Korean suggest that *wh*-elements behave like operators and movement must have occurred in order for scope to be represented appropriately.

2. A Non-Movement Analysis

In the following section I will argue that there is no movement of *in-situ wh*-phrases at LF. Following Aoun and Li (1993) and Yoon, S. (1997), I will argue that there is a Question operator (Qu) used to interpret *wh*-phrases and that this operator moves at S-structure according to the scope of the *wh*-elements. In support of this analysis, I will discuss three main arguments provided by Aoun and Li (1993): (i) *wh*-phrases are not operators, (ii) selectional restrictions, (iii) argument/adjunct asymmetry, and (iv) *wh*-phrase interaction with quantifiers. For each argument I will also provide an analysis of the same patterns in Korean.

(i) Wh-elements are not operators

Aoun and Li's first argument against *wh*-movement at LF is that Chinese *wh*-words are in fact not operators. They argue that this is because Chinese has a *wh*-question marker *ne* and because Chinese *wh*-elements function not only as *wh*-question words but also as indefinites. Consider (7-15).

(7-15) a. Ta yiwei wo xihuan <u>shenme</u>?

he think I like what

'What does he think I like?'

(Aoun and Li, 1993)

b. Ta yiwei wo xihuan <u>shenme</u>.

he think I like what

'He thinks that I like something.'

(Aoun and Li, 1993)

The *wh*-phrase *shenme* 'what' in (7-15a) is a question, while and the *shenme* 'what' in (7-15b) is an indefinite NP. This property of Chinese *wh*-words leads Aoun and Li to conclude that Chinese *wh*-elements are not interrogative operators.

In addition, Aoun and Li point out that Chinese does have a *wh*-question marker *ne,* which is often optional (7-16).

(7-16) Ni xihuan shei (ne)?

you like who Qu

'Who do you like?'

(Aoun and Li, 1993)

Aoun and Li argue that *ne* is an overt Qu-marker that is a head that appears in C position at S-structure. They point out that there is evidence from other languages (e.g., French) that C and [Spec CP] show Spec-head agreement in *wh*-elements. Thus, they propose a non-overt Qu operator which moves to the appropriate [Spec CP] position and triggers Spec-head agreement. They argue that a Qu operator has at least two functions: (i) to indicate the scope of a *wh*-phrase and (ii) to provide an antecedent for the *wh*-phrase.

This same pattern can be seen in Korean as well. Consider the examples of *wh*-elements that function as indefinite pronouns in (7-17) through (7-19).

(7-17) John-un nwukwu-lul manna-ess-ni?

John-top who/someone-acc meet-past-Q

a. 'Who did John meet?'

b. 'Did John meet someone?'

(Yoon, S., 1997)

(7-18) John-un nwukwu-lul salangha-n-ta

John-top someone-acc love-pres-decl

'John loves someone'

(Yoon, S., 1997)

(7-19) John-un nwukwu-to pinanhaci-an-nun-ta

John-top anyone-also criticize-not-pres-decl

'John does not criticize anyone'

(Yoon, S., 1997)

In (7-17) *nwukwu* 'who' is interpreted either as the typical *wh*-question phrase *who* or an indefinite noun phrase *someone.* In (7-18) the same *wh*-phrase is only interpreted as an indefinite noun phrase. In (7-19) *nwukwu* 'who' is understood as a negative polarity item in the context of negation and the particle *-to.* Thus, in Korean, as well as in Chinese, *wh*-phrases do not function only as *wh*-operators.

(ii) Selectional Restrictions

Aoun and Li's claim that there is a Qu operator that binds *wh*-elements can account for selectional restrictions discussed in (7-4) above. The selectional restrictions for the data given by Huang in (7-4) above would be represented as in (7-20) through (7-22).

(7-20) [$_{CP}$ [$_{IP}$ Zhangsan wen wo [$_{CP}$ **Qu**$_i$ [$_{IP}$ **shei**$_i$ mai-le shu]]]].

Zhangsan ask me who buy-asp book

'Zhangsan asked me who bought books.'

(7-21) [$_{CP}$ **Qu**$_i$ [$_{IP}$ Zhangsan xiangxin [$_{CP}$ [$_{IP}$ **shei**$_i$ mai-le shu]]]]?

Zhangsan believe who buy-asp book

'Who does Zhangsan believe bought books?'

(7-22) a. [$_{CP}$ **Qu**$_i$ [$_{IP}$ Zhangsan zhidao [$_{CP}$ [$_{IP}$ **shei**$_i$ mai-le shu]]]]?

Zhangsan know who buy-asp book

'Who does Zhangsan know bought books'

b. [$_{CP}$ [$_{IP}$ Zhangsan zhidao [$_{CP}$ **Qu**$_i$ [$_{IP}$ **shei**$_i$ mai-le shu] ?

Zhangsan know who buy-asp book

'Zhangsan knows who bought books.'

Since *wen* 'ask' selects an indirect question as its argument, the scope of the *wh*-phrase in (7-20) is the embedded clause; therefore, the Qu operator is generated in the specifier position of the lower CP. The scope of the *wh*-phrase in (7-21) is the matrix clause, so the Qu operator is generated in the highest [Spec CP]. The Qu operator in (7-22) is generated either in the specifier position of embedded clause or in the specifier of the matrix clause, depending upon the interpretation.

Yoon, S. (1997), Choe (1994), and Kim (1989, 1991) independently provide a similar analysis for the Korean counterparts of the Chinese data. First, Korean has an overt question marker *ni* (7-23).

(7-23) a. John-i salangha-n-ta

John-nom love-pres-decl

'John loves'

b. John-i salangha-**ni**?

John-nom love-**Q**

'Does John love?'

c. John-i nwukwu-lul salangha-**ni**?

John-nom who-acc love-**Q**

'Who does John love?'

The example in (7-23a) is a declarative sentence. Substitution of the declarative marker *–ta* with the question marker *–ni* changes the sentence into a yes/no question (7-23b). This same marker is used in the *wh*-question in (7-23c). As seen in (7-18), if this question marker is not present, the *wh*-element is interpreted as an indefinite NP.

To account for selectional restrictions discussed in relation to Huang's analysis, the representation of the Korean example in (7-5) above would be that in (7-24).

(7-24) a. [$_{CP}$ [$_{IP}$ John-i [$_{CP}$ **Qu$_i$** [$_{IP}$ **nwukwu$_i$**-ka chaek-ul

John-nom who-nom book-acc

sa-ess] -nunci] mwul-ess] -ta]

buy-past-comp ask-past-decl

'John asked who bought books.'

b. [$_{CP}$ **Qu$_i$** [$_{IP}$ John-i [$_{CP}$ [$_{IP}$ **nwukwu$_i$**-ka chaek-ul

John-nom who-nom book-acc

sa-ess]-nunci] seyngkakha]-ni]?

buy-past-comp think-Q

'Who does John think bought books?'

When the Qu operator is generated in the appropriate CP position and binds the *wh*-phrase, appropriate scope can be represented. In (7-24a) the operator is generated in the embedded CP and, thus, scope is over the lower clause. In (7-24b) the operator is generated in the higher CP, and thus, scope is over the matrix clause.

(iii) Argument/Adjunct Asymmetry

Aoun and Li's Qu operator analysis can also account for Huang's argument/adjunct asymmetry (ECP effects). To achieve this, Aoun and Li propose the following constraints:

(7-25) a. A *wh-in-situ* such as *why* in adjunct position must have an antecedent (i.e., must be antecedent-governed) in the minimal clause in which it occurs.

b. A *wh-in-situ* such as *who* or *what* in argument position need not have a local antecedent in the minimal clause in which it occurs.

(Aoun and Li, 1993, p. 219)

Thus, the Qu operators that are antecedents for *wh*-adjuncts must be generated locally and move for scope (7-26).

(7-26)	[$_{CP}$ **Qu**$_i$ [$_{IP}$ ta	xiangxin	[$_{CP}$ **x'**$_i$ [$_{IP}$ John [$_{I'}$ **x**$_i$	weishenmei	mai-le	shu]]]]]
	he	believe	John	why	buy-asp	book

But this is not the case for *wh*-arguments, as the Qu operator can be generated in the appropriate position for scope. Since Chinese *wh*-arguments are not sensitive to island constraints, (7-25a) allows Aoun and Li to account for the different requirements for *wh*-argument and *wh*-adjuncts. (7-26) shows that the Qu operator of a *wh*-adjunct begin in a position local to the element that it binds, and then move for its scope.

Aoun and Li can then account for multiple *wh*-questions like (7-6) and (7-7) above, repeated here as (7-27) and (7-28).

(7-27) [ta xiang-zhidao [shei mai-le shenme]

he wonder who buy-asp what

'What is the thing x, such that he wonder who bought x?'

'Who is the person x, such that he wonder what x bought?'

'He wonders who bought what.'

(7-28) [ta xiang-zhidao [shei weishenme mai-le shu]]?

he wonder who why buy-asp book

'Who is the person x such that he wonders why x bought books?

'#What is the reason x such that he wonders who bought books for x?'

'He wonders who bought books why?'

According to the meanings of (7-27) and (7-28), the S-structures would be those in (7-29) and (7-30), respectively.

(7-29) a. [$_{CP}$ $\mathbf{Qu}_i$ [$_{IP}$ ta xiang-zhidao [$_{CP}$ $\mathbf{Qu}_j$ [$_{IP}$ $\mathbf{shei}_i$ mai-le $\mathbf{shenme}_j$]]]]

he wonder who buy-asp what

b. [$_{CP}$ $\mathbf{Qu}_j$ [$_{IP}$ ta xiang-zhidao [$_{CP}$ $\mathbf{Qu}_i$ [$_{IP}$ [$\mathbf{shei}_i$ mai-le $\mathbf{shenme}_j$]]]]

he wonder who buy-asp what

c. [$_{CP}$ [$_{IP}$ ta xiang-zhidao [$_{CP}$ $\mathbf{Qu}_{i\,[j]}$ [$_{IP}$ $\mathbf{shei}_i$ mai-le $\mathbf{shenme}_i$]]]]

he wonder who buy-asp what

(7-30) a. [$_{CP}$ **Qu$_i$** [$_{IP}$ ta xiang-zhidao [$_{CP}$ **Qu$_j$** [$_{IP}$ **shei$_i$** **weishenme$_j$** mai-le shu]]]]

he wonder who why buy-asp book

b. *[$_{CP}$ **Qu$_j$** [$_{IP}$ ta xiang-zhidao [$_{CP}$ **Qu$_i$** [$_{IP}$ [**shei$_i$** **weishenme$_j$** mai-le shu]]]]

he wonder who why buy-asp book

c. *[$_{CP}$ [$_{IP}$ ta xiang-zhidao [$_{CP}$ **Qu$_{i[j]}$** [$_{IP}$ **shei$_i$** **weishenme$_j$** mai-le shu]]]]

he wonder who why buy-asp book

(7-29) shows that *wh*-arguments are not sensitive to locality. Thus, the Qu operators can be generated at the scope in which they are shown. Additionally, they can even occur within the same [Spec CP], which Aoun and Li refer to as absorption (7-29c). Absorption occurs when two distinct *wh*-elements are coindexed with the same Qu operator. An example is given in (7-31).

(7-31) a. Ta xiang-zhidao [Qu$_{i[j]}$ [shei$_i$ mai-le shenme$_j$]]

he wonder who buy-asp what

'He wonders who bought what?'

b. He wonders [who$_i$ [t_i bought what$_j$]][1]

[1] According to Aoun and Li, *who* as a subject in (7-26b) cannot be absorbed by *what* in English. Thus, only *who* has wide scope. This is not true of Chinese; thus, (7-26a) has two readings in which either *shei* 'who' or *shenme* 'what' has the wide scope.

The *i [j]* denotes that *i* absorbs *j* and the relationship between the Qu operator and *shenme* 'what' cannot be a true binding relation; therefore, it will not be bound by *shei* 'who' and violate Principle C of the binding theory. Absorption allows the pair interpretation of the *wh*-arguments in (7-31).

However, (7-30) shows that the *wh*-adjunct must have a local Qu operator. In (7-30a) the Qu operator does not need to be local to *shei* 'who,' which is a *wh*-argument. The unacceptability of (7-30b) shows that the Qu operator that binds the *wh*-adjunct is too far in that it crosses a *wh*-island; therefore, it violates the principle in (7-25a). (7-30c) shows that *wh*-adjuncts cannot absorbed by *wh*-arguments, as occurs in (7-29c). This is because the operators are different semantic types: *wh*-argument operators range over individuals, whereas *wh*-adjuncts operators range over non-individuals.

Yoon, S. (1997) assumes the same analysis for the *wh*-argument (7-8) and *wh*-adjunct (7-9) examples above, repeated here as (7-32) and (7-33), respectively.

(7-32) John-i [nwukwu-ka mwues-ul sa-ess-nunci] kwungkumha-eyo

John-nom who-nom what-acc buy-past-comp wonder-decl

'What is the thing x such that John wonders who bought x?'

'Who is the person x such that John wonders what x bought?'

(Yoon, S., 1997)

(7-33) John-i [nwukwu-ka chaek-ul woae sa-ess-nunci] kwungkumha-eyo

John-nom who-nom book-acc why buy-past-comp wonder-decl

'Who is the person x such that John wonders why x bought books'

#'What is the reason x such that he wonders who bought books for x?'

(Yoon, S., 1997)

The representations of these examples are given in (7-34) and (7-35).

(7-34) a. [$_{CP}$ **Qu**$_j$ [$_{IP}$ John-i [$_{CP}$ **Qu**$_j$ [$_{IP}$ **nwukwu**$_i$-ka **mwues**$_j$-ul sa-ess-nunci]

John-nom who-nom what-acc buy-past-comp

kwungkumha-eyo]]]

wonder-decl

b. [$_{CP}$ **Qu**$_i$ [$_{IP}$ John-i [$_{CP}$ **Qu**$_j$ [$_{IP}$ **nwukwu**$_i$-ka **mwues**$_j$-ul sa-ess-nunci]

John-nom who-nom what-acc buy-past-comp

kwungkumha-eyo]]]

wonder-decl

(7-35) a. [$_{CP}$ **Qu$_i$** [$_{IP}$ John-i [$_{CP}$ **Qu$_j$** [$_{IP}$ **nwukwu$_i$**-ka chaek-ul **woae$_j$**

John-nom who-nom book-acc why

sa-ess-nunci] kwungkumha-eyo]]]

buy-past-comp wonder-decl

b. *[$_{CP}$ **Qu$_j$** [$_{IP}$ John-i [$_{CP}$ **Qu$_i$** [$_{IP}$ **nwukwu$_i$**-ka chaek-ul **woae$_j$**

John-nom who-nom book-acc why

sa-ess-nunci] kwungkumha-eyo]]]

buy-past-comp wonder-decl

Wh-arguments are not sensitive to locality, and thus, the Qu operators in (7-34) can be generated at the scope in which they are shown. However, (7-35) shows that the *wh*-adjunct must have a local Qu operator. In (7-35a) the Qu operator does not need to be local to *nwukwu* 'who,' which is a *wh*-argument. However, the Qu operator that binds the *wh*-adjunct in (7-35b) crosses a *wh*-island and, therefore, violates the principle in (7-25a). Thus, as in Chinese, an operator analysis can account for Huang's ECP effects in Korean.

(iv) The interaction with quantifiers

Aoun and Li's (1993) fourth argument against an LF movement analysis is the interaction of *wh*-phrases and quantifiers. Recall that Huang (1982) treats (7-10), repeated here as (7-36), as non-ambiguous. Huang argued that only one reading (7-36b) is available because only the *wh*-phrase has wide scope over the quantifier. Thus, the *wh*-phrase must have raised for scope at LF.

(7-36) a. Mei-ge-ren dou mai-le shenme?

every-cl-person all buy-asp what

'What did everybody buy?'

b. Mei-ge-ren dou mai-le shu

every-cl-person all buy-asp book

'Everybody bought books.'

c. # Zhangsan mai-le shu, Lisi mai-le bi,

Zhangsan buy-asp book, Lisi buy-asp pen

Wangwu mai-le hua

Wangwu buy-asp painting

'Zhangsan bought books, Lisi pens, Wangwu paintings.'

However, Aoun and Li (1993) treat the sentence as ambiguous. Consider the readings in (7-37).

(7-37) Mei-ge-ren dou mai-le shenme?

every-cl-person all buy-asp what

'What did everyone buy?'

a. 'What is the thing x, such that everyone bought x?'

b. 'For every x, what is the thing that x bought?'

They argue that an LF raising analysis cannot account for this ambiguity. In their analysis, the ambiguous readings in (7-37) are the result of the interaction of the Qu operator and the quantifier. They propose that either the Qu operator or the quantifier may have wide scope, with the Qu generated at the appropriate position at S-structure and the quantifier raising at LF.

Unlike in Chinese, there is no dispute over the ambiguity in the Korean example in (7-12) above, repeated here as (7-38).

(7-38) motun salam-tul ta mwues-ul sa-ess-ni?

every person-pl all what-acc buy-past-Q

'What did everybody buy?'

a. 'What is the thing x, such that everyone bought x?'

b. 'For every x, what is the thing that x bought?'

As in the Chinese example, either the Qu operator or the quantifier may have wide scope, with the Qu generated at the appropriate position at S-structure and the quantifier raising at LF.

Overall, Aoun and Li argue that *wh*-phrases themselves are not operators but are elements bound by question operators. This analysis accounts for the fact that *wh*-phrases in Chinese and Korean can function as indefinite NPs, selectional restrictions, argument/adjunct asymmetries, and the interaction between *wh*-phrases and quantifiers. Given that the data presented in support of LF movement can be accounted for with this analysis, there is no strong reason to posit covert movement at LF for *in-situ* languages.

In summary, Huang (1982) and Cheng (1991) provide several arguments in support of *wh*-movement at LF. Aoun and Li (1993) and Yoon, S. (1997) argue against LF movement and propose a Qu operator that binds the *wh*-phrase at S-structure. Both analyses seek to account for the same data and both appear to do so equally well. Both analyses account for the core data consisting of selectional restrictions, argument/adjunct asymmetries, and quantifier interactions. Syntactic arguments for both a movement and non-movement analysis appear strong. By considering performance in language deficit, we may be able to glean some clues as to the proper analysis. Therefore, the *wh*-question experiment will investigate how Broca's aphasics perform on subject and object *wh*-questions. The next section will provide the predictions that the two competing syntactic analyses make.

7.2.2 Accounts of Aphasia

This section will present predictions that each of the four aphasia accounts makes for Korean subject and object *wh*-questions. Because the DDH makes different predictions for the movement and non-movement analyses described above, I will provide predictions for both syntactic analyses. Although the linear models (TDH, ALH and MH) do make reference to syntactic movement, they rely primarily upon the order of arguments in a linear string. Thus, the predictions for the TDH, ALH and MH do not distinguish between the syntactic analyses.

Trace Deletion Hypothesis (TDH)

As described in Chapter 2, the TDH argues that *wh*-questions are not referential and, therefore, are not impaired. Broca's patients are thus predicted to be above chance on both subject and object *wh*-questions.

Argument Linking Hypothesis (ALH)

Subject Wh-Questions

The basic argument structure of the verb *MIL-TA* 'to push' is given in (7-39). Based upon this argument structure, both semantic and syntactic linking in (7-40) yield Agent for the *wh*-phrase ***nwukwu*** in first position and Theme for the NP ***kirin*** 'giraffe' in second position. As both semantic and syntactic linking match, Broca's patients are predicted to perform above chance on subject *wh*-questions.

(7-39) MIL-TA: verb <Agent, Theme>

'to push'

(7-40)	nwukwu-ka	kirin-ul	mil-ess-ni
	who-nom	giraffe-acc	push-past-Q
Semantic:	**Agent**	**Theme**	
Syntactic:	**Agent**	**Theme**	
	'Who pushed the giraffe?'		

Object Wh-Questions

Based upon the argument structure in (7-39), both semantic and syntactic linking in (7-41) yield Agent for the NP *yeja* 'woman' in first position and Theme for the *wh*-phrase *nwukwu* in second position. As both semantic and syntactic linking match, Broca's patients are predicted to perform above chance on object *wh*-questions.

(7-41)	yeja-ka	nwukwu-lul	mil-ess-ni
	woman-nom	who-acc	push-past-Q
Semantic:	**Agent**	**Theme**	
Syntactic:	**Agent**	**Theme**	
	'Who did the woman push?'		

Mapping Hypothesis

Subject Wh-Questions

The basic argument structure of the verb *MIL-TA* 'to push' is repeated in (7-42). Based upon this argument structure, mapping for the subject question in (7-43) would yield Agent for the *wh*-phrase *nwukwu* in first position and Theme for the NP *kirin* 'giraffe' in second position.

(7-42) MIL-TA: verb <Agent, Theme>

to push

(7-43)

nwukwu-ka	kirin-ul	mil-ess-ni
who-nom	giraffe-acc	push-past-Q
Agent	**Theme**	

'Who pushed the giraffe?'

As thematic assignment matches the order of the elements in the grid, assignment is canonical. The MH predicts that the mapping process will be facilitated, and Broca's patients are predicted to perform above chance on subject *wh*-questions

Object Wh-Questions

For the object question in (7-44), mapping would yield Agent for the NP *yeja* 'woman' in first position and Theme for the *wh*-phrase *nwukwu* in second position.

(7-44)

yeja-ka	nwukwu-lul	mil-ess-ni
woman-nom	who-acc	push-past-Q
Agent	**Theme**	

'Who did the woman push?'

As thematic assignment matches the order of the elements in the grid for object questions, assignment is canonical. The MH predicts that the mapping process will be facilitated, and Broca's patients are also predicted to perform above chance on object *wh*-questions.

Double Dependency Hypothesis

(i) Movement Analysis

Subject Wh-Questions

The LF Movement analysis claims that there is movement of the *wh*-phrase to [Spec CP] at LF. The S-structure and LF representations of Korean subject *wh*-questions would be those in (7-45). These representations would yield the single dependency in (7-46).

(7-45) a. $[_{CP}$ $[_{IP}$ [nwukwu]$_i$-ka kirin-ul mil-ess]-ni]

who-nom giraffe-acc push-past-Q

'Who pushed the giraffe?'

b. $[_{CP}$ [nwukwu]$_i$-ka $[_{IP}$ t_i [kirin]-ul mil-ess] -ni]

who giraffe-acc push-past-Q

'Who pushed the giraffe?'

(7-46) < nwukwu$_i$, t_i >

who

In the subject *wh*-question, the *wh*-phrase raises from IP to [Spec CP] for scope purposes at LF. There is thus one referential dependency at LF between *nwukwu* 'who' and its trace. As this is the only dependency, the DDH predicts Broca's patients to be above chance on subject *wh*-questions.

Object Wh-Questions

For object *wh*-questions, the S-structure and LF representations would be those in (7-47). A normal representation would yield the two dependencies given in (7-48a).

(7-47) a. $[_{CP}$ $[_{IP}$ $[$yeja$]_i$-ka $[_{VP}$ t_i nwukwu-lul mil] -ess]-ni]

woman-nom who-acc push-past-Q

'Who did the woman push?'

b. $[_{CP}$ $[$nwukwu$]_j$ $[_{IP}$ yeja-ka t_j mil-ess] -ni]

who woman-nom push-past-Q

'Who did the woman push?'

(7-48) a. <$[$yeja$]_i$, t_i > and < nwukwu$_j$, t_j >

woman who

b. <$[$yeja$]_i$, t_j > and < nwukwu$_j$, t_i >

woman who

In (7-47) there is movement of the subject *yeja* 'woman' from its VP-internal position to [Spec IP] at S-structure. At LF, there is *wh*-raising of *nwukwu* 'who' from object position to [Spec CP]. Thus, there are two referential dependencies in a normal representation (7-48a). Given two dependencies in the normal representation, an anomalous coindexation is possible (7-48b). Within this analysis, then, the DDH predicts that Broca's comprehension will be at chance.

(ii) Non-Movement Analysis

Subject Wh-Questions

The Non-movement analysis argues that there is no movement of the *in-situ wh*-phrase at LF; rather a question operator is generated in [Spec CP] at S-structure. The representation of a subject question is given in (7-49).

(7-49) $[_{CP}$ Qu$_i$ $[_{IP}$ nwukwu$_i$ t$_i$ kirin-ul mil-ess] –ni]

who giraffe-acc push-past-Q

'Who pushed the giraffe?'

(7-50) < nwukwu$_i$, t$_i$ >

who

In the subject *wh*-question in (7-49), *nwukwu* 'who' moves from its VP-internal position to [Spec IP] at S-structure. As there is only one referential dependency, Broca's patients are predicted to be above chance on subject *wh*-questions.

Object Wh-Questions

The representation of an object *wh*-question is given in (7-51) and the referential dependency in (7-52).

(7-51) $[_{CP}$ Qu$_j$ $[_{IP}$ [yeja]$_i$-ka $[_{VP}$ t$_i$ [nwukwu]$_j$-lul mil] -ess] -ni]

woman who-acc push-past-Q

'Who did the woman push?'

(7-52) < kae$_i$, t$_i$ >

In the object *wh*-question, there is only one movement created by the subject moving from its VP-internal position to [Spec IP].[2] Since there is only one dependency and no anomalous coindexation possible, Broca's patients are predicted to perform above chance. A summary of predictions for the two competing syntactic analyses is given in Table 7.1.

Table 7.1

Predictions for wh-questions

Structure	LF Movement	No LF Movement
Subject *wh*-questions	Above	Above
Object *wh*-questions	Chance	Above

[2] Although the Qu operator binds the *wh*-phrase, this would be a non-thematic dependency. As described in Chapter 2, Mauner et al. argue that impairment to this type of chain does not disrupt thematic interpretation.

As shown in Table 7.1, Broca's patients who performed above chance on active and at chance on scrambled active are predicted to perform above chance on both subject and object questions if there is no LF movement. However, patients are predicted to be above chance on subject and at chance on object questions if there is LF movement.

A summary of all predictions is given in Table 7.2.

Table 7.2

Summary of predictions for wh-questions

Structure	**TDH**	**ALH**	**MH**	**DDH**
Subject *wh*-questions	Above	Above	Above	Above
Object *wh*-questions	Above	Above	Above	Chance/Above

As shown in Table 7.2, all four accounts predict above chance performance on subject *wh*-questions. In addition, if there is no *wh*-raising at LF in Korean questions, all four accounts predict above chance performance on object questions as well. The only account to predict an asymmetry is the DDH in the case that there is LF movement. The next section will describe the methods, materials and subjects for the *wh*-question experiment.

7.3 Method and Materials

This section describes the methods, materials and subjects for the subject and object *wh*-question experiment.

7.3.1 Method

Following Thompson et al. (1999), this experiment used the one-picture sentence-picture matching task. Subjects were instructed to look at a card with a single black and white line-drawing picture representing simultaneous actions among three actors, two of which could perform the action with equal plausibility. The experimenter pointed to characters in the picture and described the actions in the picture (e.g., 'The giraffe is biting the dog, and the dog is biting the cow'). Subjects then listened to a question and were asked to point to the animal that best answers the question.

7.3.2 Materials

A total of 40 sentences were developed to comprise the experimental stimuli. There were 20 semantically reversible sentences in each of two conditions: subject *wh*-question and object *wh*-question. Five verbs (bite, kick, push, grab, hit) and ten nouns (giraffe, dog, zebra, camel, cow, elephant, tiger, horse, pig, sheep) were used in the questions. In an attempt to be more pragmatically appropriate, the nouns and verbs used in this experiment differ from those used in the other experiments in this dissertation. Thus, the materials are significantly different for this experiment.

Each verb was used eight times: (1) subject question with animals facing right (e.g., Figure 7.1), (2) semantically reversed subject question with animals facing right, (3) subject question with animals facing left (Figure 7.2), (4) semantically reversed subject question with animals facing left, (5) object question with animals facing right, (6) object question with animals facing left, (7) semantically reversed object question with animals facing right, and (8) semantically reversed object question with animals facing left. Examples of subject questions are given in (7-53) and object questions in (7-54).

Figure 7.1

Sample picture: facing right

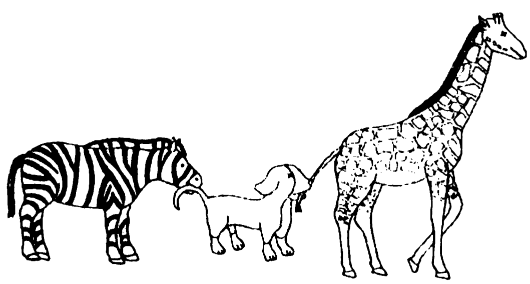
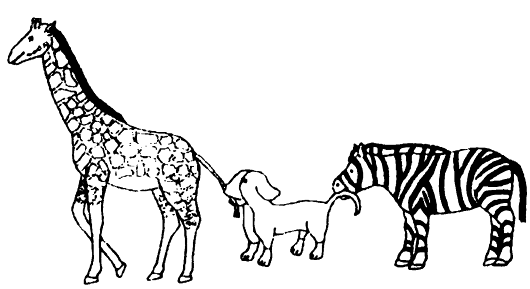


Figure 7.2

Sample picture: facing left



(7-53) a. nwukwu-ka kae-lul mul-ess-ni *Facing Right*

who-nom dog-acc bite-past-Q

'Who bit the dog?'

b. nwukwu-ka kae-lul mul-ess-ni *Facing Left*

who-nom dog-acc bite-past-Q

'Who bit the dog?'

c. nwukwu-ka kae-lul mul-ess-ni *Reversed Facing Right*

who-nom dog-acc bite-past-Q

'Who bit the dog?'

d. nwukwu-ka kae-lul mul-ess-ni *Reversed Facing Left*

who-nom dog-acc bite-past-Q

'Who bit the dog?'

(7-54) a. kae-ka nwukwu -lul mul-ess-ni *Facing Right*

dog -nom who-acc bite-past-Q

'Who did the dog bite?'

b. kae-ka nwukwu -lul mul-ess-ni *Facing Left*

dog -nom who-acc bite-past-Q

'Who did the dog bite?'

c. kae-ka nwukwu-lul mul-ess-ni *Reversed Facing Right*

dog -nom who-acc bite-past-Q

'Who did the dog bite?'

d. kae-ka nwukwu-lul mul-ess-ni *Reversed Facing Right*

dog -nom who-acc bite-past-Q

'Who did the dog bite?'

A complete list of stimuli is given in Appendix D.

This experiment used a set of 40 black and white line-drawing pictures. Each picture consisted of three actors arranged in a linear manner (Figures 7-1 and 7-2). Each picture represented actions among the three actors. All questions were asked of the actor in the center, who could perform as Agent or Theme with equal plausibility. Thus, there were only two possible answers for each question (i.e., the actor to the right of the center or the left). The pictures were counterbalanced between actors facing left and right; actors in left, middle and right position in the linear arrangement, and answer of left and right actor. Again, it is important to note that these pictures differ from those used in the two-picture tasks.

7.3.3 Subjects

All four Broca's patients (CDK, KTS, JJP, KKM), two Wernicke's patients (HCJ, KYA) and six matched controls participated in this experiment.

7.4 Results

This section provides the results of the *wh*-question experiment. Section 7.4.1 describes the results for Broca's aphasics. Section 7.4.2 provides the analyses for Wernicke's aphasics. Section 7.4.3 compares performance by Broca's and Wernicke's.

7.4.1 Broca's Results

Tables 7.3 and 7.4 present the raw scores for Broca's subjects and their matched controls. Controls performed without error, so they are not discussed further. Figure 7.3 provides individual percent scores for Broca's subjects.

Table 7.3

Raw scores for Broca's on wh-questions (correct out of 20)

Structure	CDK	KTS [3]	JJP	KKM	Avg	%
Subject *wh*-questions	20	17	14	19	17.5	88%
Object *wh*-questions	19	15	15	17	16.5	83%

Table 7.4

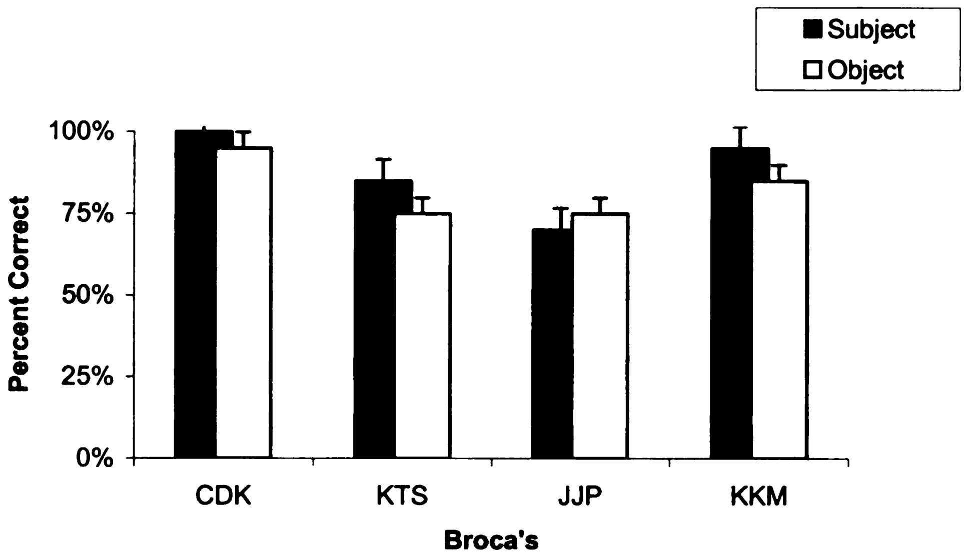
Raw scores for controls on wh-questions (correct out of 20)

Structure	JBA	DCM	KDS	JGF	Avg	%
Subject *wh*-questions	20	20	20	20	20	100%
Object *wh*-questions	20	20	20	20	20	100%

[3] KTS suffered from severe fatigue and attention problems during the experimental trial. His data from that trial were discarded and data from an earlier (pilot) testing with the same materials is reported here.

Figure 7.3

Percent correct for Broca's on wh-questions



As presented in Table 7.3, performance on subject *wh*-questions was 88% correct and object *wh*-questions 83%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance on both subject and object *wh*-questions is above chance ($t(3) = 5.669$, $p = .011$ and $t(3) = 6.789$, $p = .007$, respectively). This pattern is summarized in Table 7.5.

Table 7.5

Significance patterns for Broca's on wh-questions compared with chance (50%)

Sentence Type	Significance
Subject *wh*-questions	p = .011
Object *wh*-questions	p = .007

To determine whether there is a significant difference between conditions, a two-tailed t-test was conducted. Analysis reveals no significant difference between performance on subject and object *wh*-questions.

7.4.2 Wernicke's Results

Tables 7.6 and 7.7 present the raw scores for Wernicke's subjects and their matched controls. Controls performed without error, so they are not discussed further. Figure 7.4 provides individual percent scores for Wernicke's subjects.

Table 7.6

Raw scores for Wernicke's on wh-questions (correct out of 20)

Structure	HCJ	KYA	Avg	%
Subject *wh*-questions	4	9	6.5	33%
Object *wh*-questions	7	16	11.5	58%

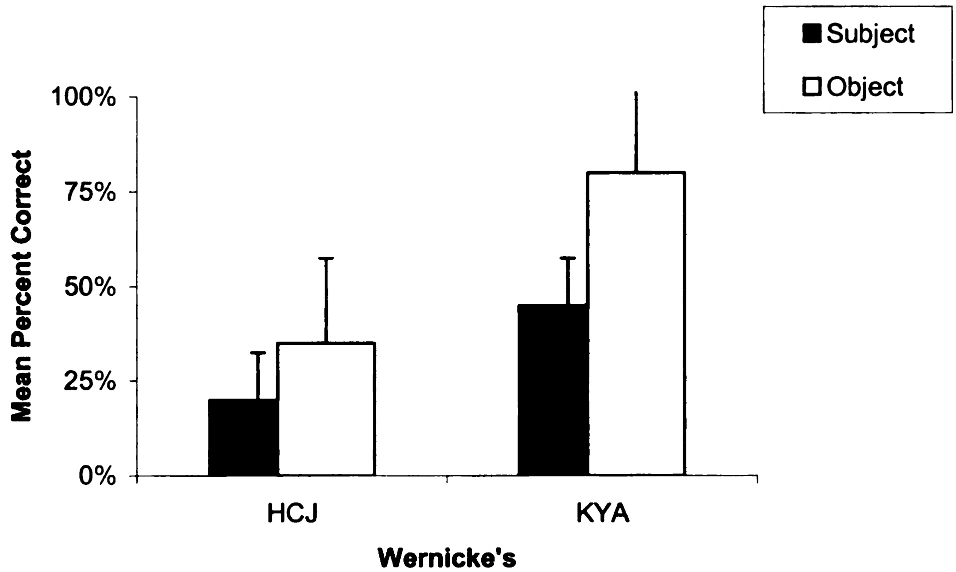
Table 7.7

Raw scores for controls on wh-questions (correct out of 20)

Structure	SHB	OKT	Avg	%
Subject *wh*-questions	20	20	20	100%
Object *wh*-questions	20	20	20	100%

Figure 7.4

Percent correct for Wernicke's on wh-questions



As can be seen in Table 7.6, Wernicke's performance on subject *wh*-questions was 33% correct and object *wh*-questions 58%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance was at chance on both subject and object relatives (t(1) = -1.40, p = .395), (t(1) = .333, p = .795), respectively). This pattern is summarized in Table 7.8.

Table 7.8

Significance patterns for Wernicke's on wh-questions compared with chance (50%)

Sentence Type	Significance
Subject *wh*-questions	ns
Object *wh*-questions	ns

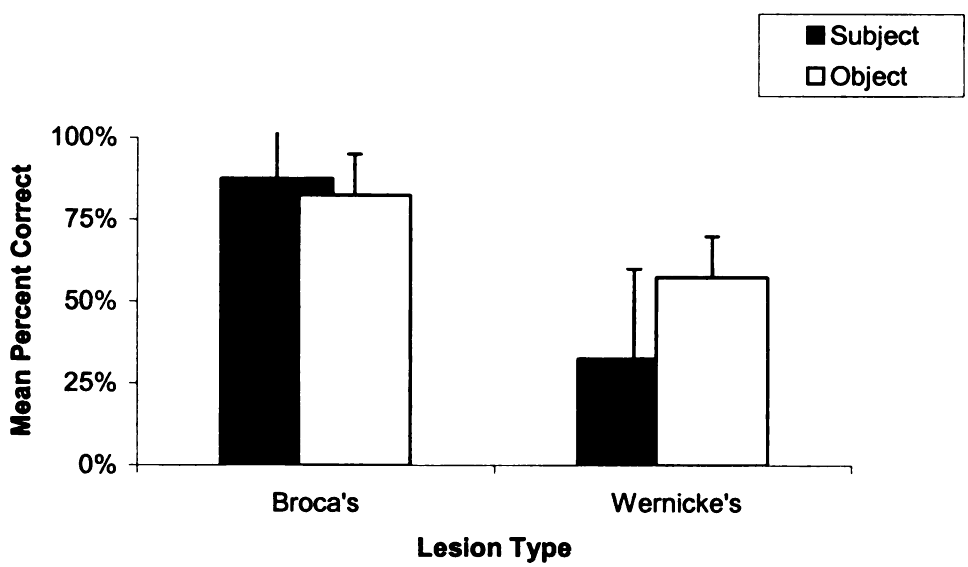
To determine whether there is a significant difference between conditions a two-tailed t-test was conducted. Analysis reveals no significant difference between performance on subject and object *wh*-questions.

7.4.3 Broca's versus Wernicke's

Group scores for Broca's and Wernicke's reported above are repeated in Figure 7.5. As noted above, Broca's performed above chance on subject *wh*-questions (88% correct) and object *wh*-questions (83% correct). Wernicke's performed at chance on both conditions (33% and 58%, respectively).

Figure 7.5

Percent correct on wh-questions for each lesion type



Results from a 2 x 2 (Lesion x Sentence) analysis of variance (ANOVA) reveal a main effect for lesion type ($F(1, 8) = 16.06$, $p = .004$) but no main effect for sentence type ($F(1, 8) = 1.004$, $p = .346$). There was no significant interaction ($F(1, 8) = 2.259$, $p = .171$). Planned comparisons using Bonferroni posttests reveal a significant difference between Broca's and Wernicke's in the subject *wh*-question condition ($p < .01$) but not in the object *wh*-question condition ($p > .05$).

7.5 Discussion

Section 7.5.1 summarizes the empirical findings presented in the previous section. In Section 7.5.2 I relate these findings to the predictions made in the theoretical background in Section 7.2.2, as well as discuss some of the theoretical implications based upon the above analyses.

7.5.1 Empirical Findings

The findings of this experiment indicate that as a group the four Korean Broca's patients performed above chance in their comprehension of subject and object *wh*-questions. These findings are interesting because they replicate the pattern reported in English. Although there seems to be slightly better performance on subject *wh*-questions than object questions in three of the four patients, this difference is statistically negligible.

As in previous experiments, and as shown in Figure 7.3, the Wernicke's patients were quite different from Broca's. Not only did the Wernicke's patients as a group score lower in both conditions, they also did not show the same pattern: performance on object *wh*-questions was better than subject *wh*-questions. Again, KYA performed much better than HCJ. However, in this experiment, KYA was not consistently better in each condition. That is, he was at chance on subject and above chance on object questions. As a group, however, performance was very similar to the other experiments.

The finding of a main effect for lesion type and not for sentence type is again expected if Broca's patients perform above chance on both subject and object *wh*-

questions, while Wernicke's perform at chance. A look at row and column means in Table 7.9 confirms this.

Table 7.9

Group column and row means for wh-questions

	Broca's	**Wernicke's**	
Subject *wh*-questions	88%	33%	*60.5%*
Object *wh*-questions	83%	58%	*70.5%*
	85.5%	*45.5%*	

The higher scores for Broca's in both conditions yielded an overall 85.5%, which is significantly different from the Wernicke's performance of 45.5%. Comparing sentence types, however, there is a no significant difference. Wernicke's chance performance lowers the mean despite Broca's above chance performance.

The post-hoc finding that Broca's performance on object *wh*-questions is not significantly different than Wernicke's is surprising. However, it appears that KYA's above chance performance on object questions raised the Wernicke's mean to a level close enough to above chance that statistically there is no difference between Broca's and Wernicke's.

Despite this, it can be concluded that Broca's patients are above chance and Wernicke's are at chance on object *wh*-questions. Overall, these findings once again support the conclusion that Broca's patients are different from Wernicke's.

7.5.2 Theoretical Implications

The Syntax of Wh-Questions

The four Broca's aphasics performed above chance on simple active sentences, which do not involve overt movement and at chance on scrambled active sentences, which do involve overt movement. These same patients perform above chance on subject and object *wh*-questions. Table 7.10 provides a comparison of the predictions and results.

Table 7.10

Predictions and results for wh-questions

Structure	LF Movement	No LF Movement	Result
Subject *wh*-questions	Above	Above	Above
Object *wh*-questions	Chance	Above	Above

As seen in Table 7.10, the results of Broca's aphasic comprehension provide further support the conclusion that there is no LF movement in Korean *wh*-questions. Although there are strong arguments for both movement and non-movement analyses, I argued that the latter is preferred. I noted that Aoun and Li (1993) and Yoon, S. (1997) provide a simpler analysis that does not require covert movement at a different level but rather requires a Qu operator that binds the *wh*-phrase at S-structure. These data appear to support this analysis.

This conclusion, however, must be tempered with caution. If the results had shown an asymmetry in which patients were above chance on subject *wh*-questions and at chance on object questions, then there would have been clear support for an LF movement analysis and for the notion that Broca's are sensitive to LF operations. The fact that patients were above chance on both questions suggests at least three alternative conclusions in addition to no LF movement.

The first alternative is that Broca's patients are not impaired in operations at LF. That is, LF may not be implicated in the disorder and the deficit may involve only elements at S-structure. If the level of LF were not implicated in the deficit, there would be only one movement for both subject and object *wh*-questions (i.e., the VP-internal subject moving to [Spec IP] at S-structure). The above chance performance would thus be similar to performance on active sentences.

A second alternative is that *wh*-questions are not vulnerable to disruption. As described in Chapter 2, Grodzinsky (2000) argues based upon Pesetsky (1987) that *who* questions are non-referential. Both Grodzinsky and Hickok (2000) argue that referential and non-referential chains are different. This difference is used to account for above chance performance on non-referential elements such as *who* questions and chance performance on referential elements such as *which* questions. Although both chains are impaired in Broca's aphasia, in non-referential chains, the language system can refer back to argument structure to infer thematic roles in a sentence. This is not the case with referential elements, and thus, performance on referential elements is impaired.

If this is indeed the case, then other non-referential elements are predicted to be above chance. The next chapter will test this by presenting patients with quantified NPs in the same passive sentences on which they performed at chance. If they perform above chance on these sentence types, then the conclusion that referentiality affects Broca's comprehension may be supported.[4]

A third alternative is that the four Korean Broca's patients may indeed be impaired in *wh*-questions but the task is inadequate. That is, the *wh*-question experiment is significantly different from the other tasks in this dissertation. Other factors may then be involved in performance levels such as clues in the materials that help compensate performance or the task itself is too simple.

At this point, all that can be concluded experimentally is that the same Broca's patients that were shown to have difficulty with sentence types that contain movement (i.e., active scrambled, passive, passive scrambled) have little difficulty with subject and object *wh*-questions. This may provide further support for an analysis in which LF movement is not required.

[4] This solution is not without its problems, however. Even if non-referential elements remain intact, Grodzinsky still has not explained how the system is able to recover thematic information from argument structure for appropriate assignment.

Accounts of Aphasia

Table 7.11 provides a summary of the predictions made for Broca's in Section 7.2.2 and the findings.

Table 7.11

Summary of predictions and results for wh-questions

Structure	TDH	ALH	MH	DDH	Result
Subject *wh*-questions	Above	Above	Above	Above	Above
Object *wh*-questions	Above	Above	Above	Above	Above

Based on the findings above and the conclusion that there is no LF movement, or at least that the level of LF is not implicated, all four of the accounts successfully predict the pattern in Korean *wh*-questions. This is not surprising given that elements remain in canonical order and that there is no overt movement.

7.6 Conclusion

This chapter sought to test the hypothesis that there is an asymmetry for subject and object *wh*-questions in Korean agrammatic comprehension. This was theoretically interesting for two reasons. First, no asymmetry in Broca's comprehension is reported for English in subject and object questions. Second, current syntactic theories suggest that the interpretation of *in-situ wh*-questions such as those found in Korean may be dependent upon movement of the *in-situ* question phrase at the syntactic level of LF. Empirically the experiment in this chapter reveals that that Broca's patients performed above chance on both subject and object *wh*-questions. Although this finding replicates that reported for English, it is not surprising if in fact there is no *wh*-movement in Korean at S-structure or if LF movement is not implicated in the impairment. The next chapter will further investigate the notion referentiality and by looking at the effects of quantification.

CHAPTER 8

QUANTIFIED SUBJECTS

8.1 Introduction

In this chapter I will test the hypothesis that the referentiality of moved elements affects Broca's comprehension. The previous chapters have investigated agrammatic comprehension of displaced referential arguments. I have argued that syntactic movement characterizes the difference between the sets of constructions on which Broca's patients perform above chance and those on which they perform at chance. In Chapter 7, I concluded that the findings from Korean *wh*-question were ambiguous. It is not clear as to whether Korean Broca's patients were above chance because the task was easier than previous tasks, because *wh*-questions remain *in situ*, or because *wh*-questions are non-referential. Grodzinsky (1995, 2000) argued that it is the latter that accounts for performance patterns. Thus, this chapter will provide a cross-linguistic test of Grodzinsky (1995, 2000), Avrutin (2000), Balogh and Grodzinsky's (2000) claim that referentiality affects moved elements in Broca's comprehension.

The organization of the chapter is as follows. Section 8.2 will provide the theoretical background for the chapter. It will briefly characterize the referentiality of *wh*-questions and quantifiers assumed in Grodzinsky (1995, 2000). It will then provide the predictions of the four Broca's accounts for active and passive sentences with quantified subjects in Korean. Section 8.3 will describe the methods and materials for the quantified subjects experiment. Section 8.4 presents the results from the experiment. In

Section 8.5 I discuss the implications of the results in terms of the four accounts. Section 8.6 concludes the chapter.

8.2 Theoretical Background

This section will provide the theoretical background for the quantified subjects experiment. Section 8.2.1 will provide a brief description of the referentiality of quantifiers assumed in Grodzinsky (1995, 2000). Section 8.2.2 will provide the predictions that the four aphasia accounts make for Korean active and passive sentences with quantified subjects.

8.2.1 Quantification and Referentiality

Grodzinsky (1995, 2000) argues that performance patterns on *wh*-questions is the result of the non-referential status of *wh*-phrases. He further argues that this makes the prediction that other non-referential elements such as quantifiers will pattern in the same manner. This section will briefly describe the non-referential status of quantifiers like 'every.'

As discussed in Chapter 2, Grodzinsky (1995) modified the TDH to account for the data reported in Hickok and Avrutin (1995). Hickok and Avrutin report that the Broca's patients performed above chance on subject *which-N* questions and at chance on object *which-N* questions. However, this asymmetry did not occur on *wh*-questions. Broca's patients performed above chance on both subject and object *wh*-questions. To account for this pattern, Hickok and Avrutin (1995) and Avrutin (2000), cite Pesetsky's (1987) notion of D-linking (discourse-linking). Consider the examples in (8-1).

(8-1) a. Which lion chased the tiger? *D-linked*

b. Who chased the tiger? *Non-D-linked*

(Avrutin, 2000)

Following Pesetsky (1987), the *which-N* example in (8-1a) presupposes a set of lions in the discourse, one of which chased the tiger. *Which-N* constructions are thus referential in that they are linked to the discourse (D-linked). However, the *wh*-question in (8-1b) is not referential. The sentence does not presuppose elements in the discourse and is thus not D-linked. To account for the *wh-/which-N* asymmetry, Grodzinsky argues that referential (D-linked) *which-N* elements are implicated in the deficit while non-referential (non-D-linked) *wh*-elements are not. The R-strategy thus applies only to referential elements.

Grodzinsky (2000) further argues that if referentiality is implicated in the comprehension of *wh*-questions, this makes the prediction that other non-referential constructions such as quantifier constructions should be above chance as well.

Consider the examples in (8-2).

(8-2) a. George saw William.

b. George saw everyone

(Haegeman, 1994)

In (8-2a) the subject NP *George* and the object NP *William* each pick out a referent from the discourse. The predicate *see* establishes a relation between these two entities, such that in the discourse the entity *George* sees the entity *William*.

The example in (8-2b), however, contains the quantifier *everyone*. Haegeman (1994) points out that quantifiers differ from arguments in that they do not pick out a specific entity from the discourse. That is, the example in (8-2b) does not mean 'there is some entity *everyone* and George saw it.' The example means something like 'for every x, where x is human, George saw x.' Thus, the interpretation of the internal argument of *see* in (8-2b) is variable. It is widely assumed, then, that quantifiers like *everyone* are not linked to entities in the discourse and are non-referential.

As quantified expressions are non-referential, Grodzinsky (1995, 2000) predicts that Broca's patients will perform above chance on sentences with quantified NPs. He cites Saddy (1995) as preliminary support. Saddy reports that, while three Broca's patients perform at chance on passives (8-3a), their performance is raised to above chance on the same stimuli if the subject of the passive is quantified (8-3b).

(8-3) a. The dog is bitten by the cat *Passive*

b. Every dog is bitten by a cat *Quantified Subject Passive*

These results were replicated in Balogh and Grodzinsky (2000), who report that four Broca's patients, who performed above chance on active and at chance on passive, performed above chance on quantified passive.

In summary, Grodzinsky (1995, 2000) argues that it is referentiality of the displaced arguments that affects Broca's performance on comprehension tasks. Constructions involving syntactic movement of referential noun phrases (e.g., passives) are impaired while constructions with non-referential noun phrases (e.g., *wh*-questions) and constructions not involving syntactic movement (e.g., actives) are not impaired. If this is indeed the case, then Korean Broca's patients who are at chance on passives should perform above chance on passives in which the moved element (i.e., internal argument) is quantified. This chapter will test this by simply adding *every* to the NP subjects of the active and passive stimuli used in Chapters 4 and 5. The next section will provide predictions for active and passive sentences with quantified subjects in Korean.

8.2.2 Accounts of Aphasia

This section will present predictions that each of the four aphasia accounts makes for Korean active and passive sentences with quantified subjects.

Trace Deletion Hypothesis (TDH)

As described above and in Chapter 2, the TDH argues that quantified expressions are not referential. Broca's patients are thus predicted to be above chance on both actives with quantified subjects and passives with quantified subjects.[1]

[1] It should be noted that Grodzinsky does not make real predictions for quantified constructions. They are simply stipulations with no explanatory force.

Argument Linking Hypothesis (ALH)

Quantified Subject Active

The basic argument structure of the verb *MIL-TA* 'to push' is given in (8-4). The active representation would be that in (8-5).

(8-4) MIL-TA: verb <Agent, Theme>

'to push'

(8-5)	[motun-yeja-ka]	[kirin-ul]	mil-eyo
	every-woman-nom	giraffe-acc	push-decl
Semantic:	**Agent**	**Theme**	
Syntactic:	**Agent**	**Theme**	
	'Every woman pushes a giraffe'		

Based upon the argument structure in (8-4), semantic linking in (8-5) would yield Agent for the NP *motun yeja* 'every woman' in first position and Theme for the NP *kirin* 'giraffe' in second position. Syntactic linking would link Agent to the NP *motun yeja* 'every woman' in subject position and Theme to the NP *kirin* 'giraffe' in object position. In both semantic and syntactic linking the Agent is linked to the NP *yeja* 'woman' and Theme to the NP *kirin* 'giraffe.' As both semantic and syntactic linking match, Broca's patients are predicted to perform above chance on quantified subject active.

Quantified Subject Passive

Based upon the basic argument structure of the verb *MIL-TA* 'to push' given above in (8-4) semantic linking in (8-6) would yield Agent for the NP *motun yeja* 'every woman' in first position and Theme for the NP *kirin* 'giraffe' in second position. However, syntactic linking would link Theme to the NP *motun yeja* 'every woman' in subject position and Agent to the NP *kirin* 'giraffe.' There is thus a mismatch in thematic assignment. Faced with this competition, Broca's patients are predicted to perform at chance on quantified subject passive.

(8-6)	[motun-yeja-ka]	[kirin-eykey]	mil-hi-eyo
	every-woman-nom	giraffe-by	push-pass-decl
Semantic:	**Agent**	**Theme**	
Syntactic:	**Theme**	**Agent**	
	'Every woman is pushed by a giraffe.'		

Mapping Hypothesis (MH)

Quantified Subject Active

The MH claims that the mapping process is facilitated in canonical structures and 'garden-pathed' in non-canonical ones. The theta-grid for the verb *MIL-TA* 'to push' given in (8-4) is Agent and Theme. The normal representation is given in (8-7a). Agent is assigned to the NP in subject position and Theme to the NP in object position.

(8-7) a. motun-yeja-ka kirin-ul mil-eyo *Normal*

every-woman-nom giraffe-acc push-decl

Agent **Theme**

'Every woman pushes a giraffe'

b. motun-yeja-ka kirin-ul mil-eyo *Broca's*

every-woman-nom giraffe-acc push-decl

Agent **Theme**

'Every woman pushes a giraffe'

In the agrammatic representation in (8-7b), the elements in the theta-grid would be correctly assigned canonically, with Agent assigned to the first NP and Theme to the second. Thus, the order of the elements in the grid matches the normal. The mapping process is facilitated and Broca's patients are predicted to perform above chance.

Quantified Subject Passive

Although passive sentences appear in the canonical SOV word order, thematically they are non-canonical. Again, the theta-grid for the verb would be Agent and Theme. The normal representation is given in (8-8a). Theme is assigned to the NP in subject position and Agent to the NP in the by-phrase.

(8-8)	a. motun-yeja-ka	kirin-eykey	mil-hi-eyo	*Normal*
	every-woman-nom	giraffe-by	push-pass-decl	
	Theme	**Agent**		
	'Every woman is pushed by a giraffe'			
	b. motun-yeja-ka	kirin-eykey	mil-hi-eyo	*Broca's*
	every-woman-nom	giraffe-by	push-pass-decl	
	Agent	**Theme**		
	'Every woman is pushed by a giraffe'			

As thematic assignment does not match the order of the elements in the grid, assignment is non-canonical. The MH predicts that mapping process will be disrupted and thematic roles reversed. Broca's patients are thus predicted to perform below chance.

Double Dependency Hypothesis (DDH)

Quantified Subject Active

In the active sentence in (8-9a), the NP *motun yeja* 'every woman' moves from its VP-internal position to [Spec IP], leaving a trace. Thus, there is only one possible referential dependency (8-9b).

(8-9)	a. [motun-yeja]$_i$-ka	t_i	[kirin]$_j$-ul	mil-eyo
	every-woman-nom		giraffe-acc	push-decl
	'Every woman pushes a giraffe'			

b. < $[\text{motun-yeja-ka}]_i$, t_i >

Agent

Removal of the constraint on coindexation in the agrammatic representation of (8-9a) produces only one dependency in which *motun yeja* 'every woman' is coindexed with the VP-internal subject trace. As there is no ambiguity, Broca's patients are predicted to perform above chance.

Quantified Subject Passive

In the passive sentence in (8-10a), the NP *motun yeja* 'every woman' moves from object position to [Spec IP], leaving a trace. In addition there is movement of the internal argument to subject position.

(8-10) a. $[\text{motun-yeja}]_i$-ka $[\text{kirin}]_j$ -eykey t_i mil-$[\text{hi}]_j$ -eyo

every-woman-nom giraffe-by push-pass-decl

'Every woman is pushed by a giraffe'

b. < motun-yeja$_i$, t_i > and < kirin$_j$, hi$_j$ >

every woman giraffe, pass

c. < motun-yeja$_i$, t_j > and < kirin$_j$, hi$_i$ >

every woman giraffe, pass

There are two referential dependencies in a normal representation (8-10b). Therefore an anomalous coindexation is possible (8-10c). Within this analysis, then, the DDH predicts that Broca's comprehension will be at chance. A summary of predictions is given in Table 8.1.

Table 8.1

Summary of predictions for quantified subjects

Structure	TDH	ALH	MH	DDH
Quantified Active	Above	Above	Above	Above
Quantified Passive	Above	Chance	Below	Chance

As seen in Table 8.1, only the TDH makes the prediction that patients who are above chance on active and at chance on passive will perform above chance on both actives and passives with quantified subjects. The ALH, MH, and DDH predict an active/passive asymmetry, as reported in Chapters 4 and 5. The next section will describe the methods, materials and subjects for the experiment.

8.3 Method and Materials

This section will describe the methods, materials and subjects for the quantified subjects experiment.

8.3.1 Method

This experiment used the two-picture sentence-picture matching task. As described in Chapter 3, subjects were instructed to look at a card with two pictures mounted in a vertical arrangement, listen to a sentence and point to the picture that best matches the sentence.

8.3.2 Materials

A total of 40 sentences were developed to comprise the experimental stimuli. There were 20 semantically reversible sentences in each of two conditions: quantified subject active and quantified subject passive. As noted in Chapter 3, the verbs and nouns used in the experimental sentences were chosen from the same set of nouns and two-place, transitive verbs used in all experiments. That is, the active sentences used in Chapter 4 and passive sentences used in Chapter 5 were transformed into quantified subjects sentences for this experiment. The verb and noun pairings for this experiment are given in (8-11).

(8-11)		
	push (woman, giraffe)	kick (policeman, giraffe)
	photograph (dog, man)	drag (baker, camel)
	bite (zebra, baker)	bind (policeman, cow)
	carry (camel, doctor)	lift (camel, doctor)
	cover (man, woman)	chase (cow, dog)

Each verb in (8-11) was used four times: active, semantically reversed active, passive and semantically reversed passive. Examples are given in (8-12) and (8-13).

(8-12) a. motun-yeja-ka kirin-ul mil-eyo *Active*

every-woman-nom giraffe-acc push-decl

'Every woman pushes a giraffe'

b. motun-kirin-i yeja-lul mil-eyo *Reversed*

every-giraffe-nom woman-acc push-decl

'Every giraffe pushes a woman'

(8-13) a. motun-yeja-ka kirin-eykey mil-hi-eyo *Passive*

every-woman-nom giraffe-by push-pass-decl

'Every woman is pushed by a giraffe'

b. motun-kirin-i yeja-eykey mil-hi-eyo *Reversed*

every giraffe-nom woman-by push-pass-decl

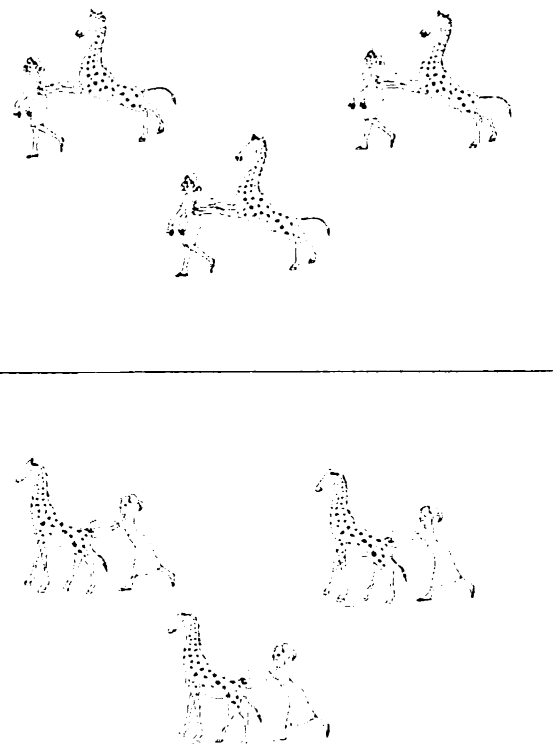
'Every giraffe is pushed by a woman'

A complete list of stimuli is given in Appendix E.

The set of black and white line-drawing pictures used in the active and passive experiments was manipulated for this experiment. In Chapters 4 and 5, pictures represented two actors (one Agent and one Theme). These pictures were adapted to create three sets of actors (one Agent and one Theme per set). An example is given in Figure 8.1. The pictures were arranged vertically two per page. Each of the 40 pages thus consisted of a series of two pictures representing actions between three sets of two actors. Among the actors in the picture, one set matched the corresponding test sentence; the second picture represented the same actors in the inverse thematic relation. The pictures were counterbalanced between top and bottom position.

Figure 8.1

Quantified subjects picture



8.3.3 Subjects

Two Broca's patients (CDK, KTS), two Wernicke's patients (HCJ, KYA) and their matched controls participated in this experiment. The other Broca's patients (JJP and KKM) were not available at the time of testing.

8.4 Results

This section provides the results of the quantified subjects experiment. Section 8.4.1 describes the results for Broca's aphasics. Section 8.4.2 provides the analyses for Wernicke's aphasics. Section 8.4.3 compares performance by Broca's and Wernicke's.

8.4.1 Broca's Results

Tables 8.2 and 8.3 present the raw scores for Broca's subjects and their matched controls. Controls performed without error, so they are not discussed further. Figure 8.2 provides individual percent scores for Broca's subjects.

Table 8.2

Raw scores for Broca's on quantified subjects (correct out of 20)

Structure	CDK	KTS	Avg	%
Quantified Active	19	20	19.5	98%
Quantified Passive	19	14	16.5	83%

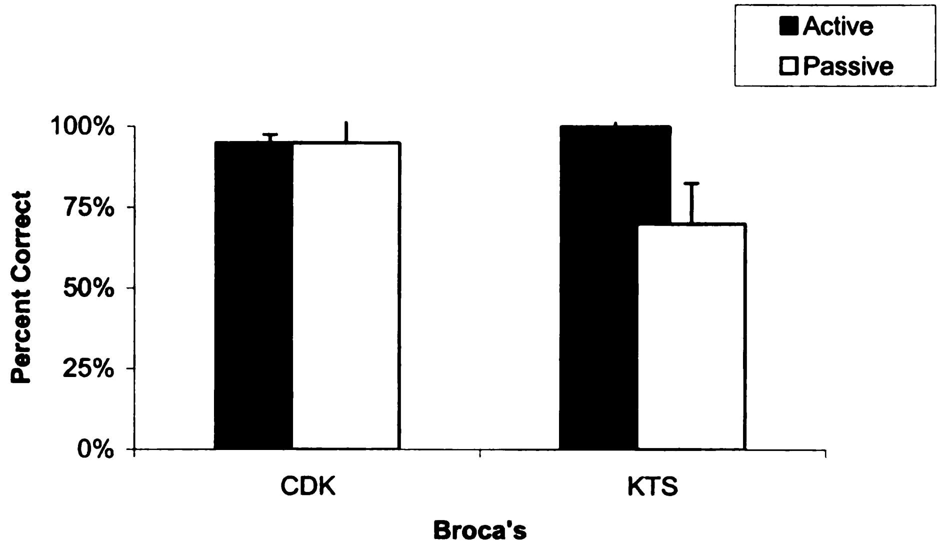
Table 8.3

Raw scores for controls on quantified subjects (correct out of 20)

Structure	JBA	DCM	Avg	%
Quantified Active	20	20	20	100%
Quantified Passive	20	20	20	100%

Figure 8.2

Percent correct for Broca's on quantified subjects



As presented in Table 8.2, performance on quantified subjects active was 98% correct and quantified subjects passive 83%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance on quantified active is above chance ($t(1) = 19$, $p = .033$), while quantified passive is at chance ($t(1) = 2.6$, $p = .234$). This pattern is summarized in Table 8.4.

Table 8.4

Significance patterns for Broca's on quantified subjects compared with chance (50%)

Sentence Type	Significance
Quantified Active	p = .03
Quantified Passive	ns

To determine whether there is a significant difference between conditions a two-tailed t-test was conducted. Analysis reveals no significant difference between performance on quantified active and quantified passive sentences.

When considering performance against the conventional standard of 75% and better as above chance, it appears that Broca's are above chance. Comparing performance against chance, statistically, Broca's are above chance on quantified active but at chance on quantified passive. As there are only two subjects and as there is considerable variation, individual analyses will also be considered here.

Individual analyses reveal that both subjects performed above chance on quantified active and passive sentences. CDK performed above chance performance on quantified actives (95% correct, $t(19) = 3.943$, $p < .0009$) and above chance on quantified passives (95% correct, $t(19) = 3.943$, $p < .0009$). KTS was also above chance on actives (100% correct, $t(19) = 4.359$, $p < .0003$) and above chance on quantified passives (70% correct, $t(19) = 2.179$, $p < .0421$).

Comparing individual performances on simple sentence types and quantified subjects (i.e., active versus quantified active, passive versus quantified passive) is also revealing. Analyses reveal that both subjects performed better on quantified active and passive constructions than simple active and passive sentences. As described in Chapter 4, both CDK and KTS were above chance on active sentences but at chance on passives. CDK performed significantly better on quantified active than active ($t(19) = 2.179$, $p = .0421$) and significantly better on quantified passive than passive ($t(19) = 2.854$, $p = .01$). KTS also performed better on quantified active ($t(19) = 2.179$, $p = .0421$) and quantified passive ($t(19) = 2.179$, $p < .0421$).

8.4.2 Wernicke's Results

Tables 8.5 and 8.6 present the raw scores for Wernicke's subjects and their matched controls. Controls performed without error, so they are not discussed further. Figure 8.3 provides individual percent scores for Wernicke's subjects.

Table 8.5

Raw scores for Wernicke's on quantified subjects (correct out of 20)

Structure	HCJ	KYA	Avg	%
Quantified Active	8	17	12.5	63%
Quantified Passive	7	13	10	50%

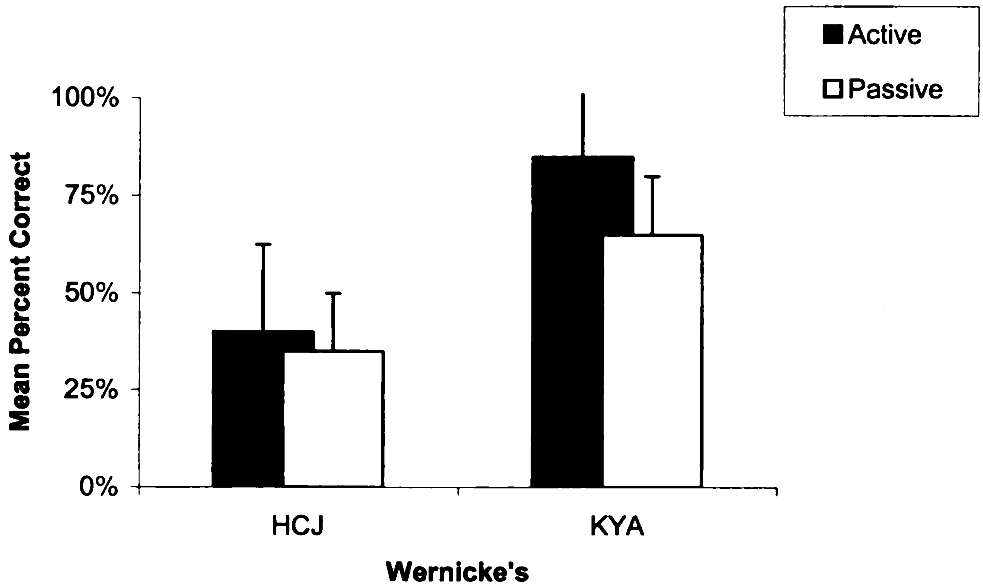
Table 8.6

Raw scores for controls on quantified subjects (correct out of 20)

Structure	SHB	OKT	Avg	%
Quantified Active	20	20	20	100%
Quantified Passive	20	20	20	100%

Figure 8.3

Percent correct for Wernicke's on quantified subjects



As can be seen in Table 8.5, Wernicke's performance on quantified active was 63% correct and quantified passive 50%. Comparing performance with chance (set at 50%), two-tailed t-tests reveal that performance was at chance on both quantified active and quantified passive sentences ($t(1) = .556$, $p = .677$) and $t(1) = 0$, $p = .1$, respectively). This pattern is summarized in Table 8.7.

Table 8.7

Significance patterns for Wernicke's on quantified subjects compared with chance (50%)

Sentence Type	Significance
Quantified Active	ns
Quantified Passive	ns

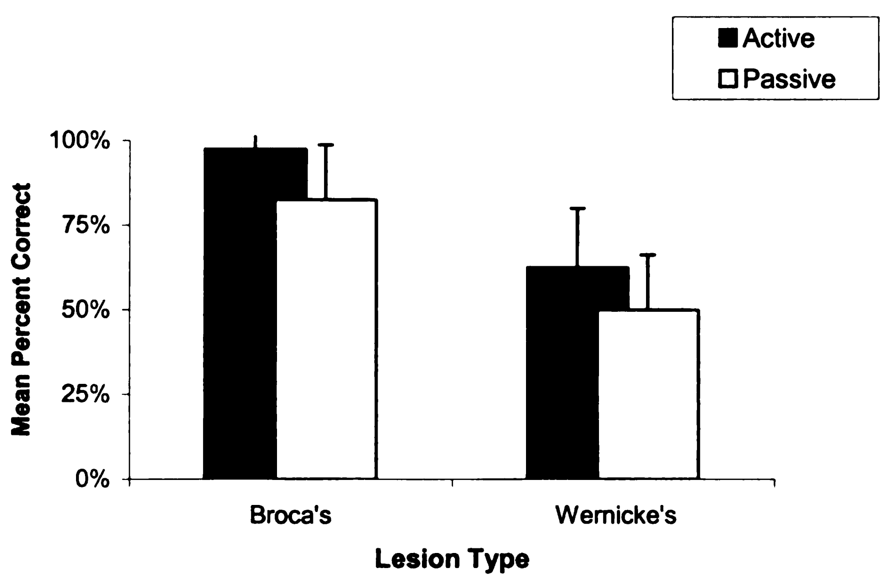
To determine whether there is a significant difference between conditions a two-tailed t-test was conducted. Analysis reveals no significant difference between conditions.

8.4.3 Broca's versus Wernicke's

Group scores for Broca's and Wernicke's reported above are repeated in Figure 8.4. As noted above, Broca's performed above chance on quantified subject active sentences (98% correct) and at chance on quantified passive sentences (83% correct). Wernicke's performed at chance on both conditions (63% and 50%, respectively).

Figure 8.4

Percent correct on quantified subjects for each lesion type



Results from a 2 x 2 (Lesion x Sentence) analysis of variance (ANOVA) reveal no main effect for lesion type ($F(1, 4) = 2.35$, $p = .2$), no main effect for sentence type ($F(1, 4) = .008$, $p = .933$), and no significant interaction ($F(1, 4) = .984$, $p = .377$).

8.5 Discussion

Section 8.5.1 summarizes the empirical findings presented in the previous section. In Section 8.5.2 I relate these findings to the predictions made in the theoretical background in Section 8.2.2, as well as discuss some of the theoretical implications based upon the above analyses.

8.5.1 Empirical Findings

The empirical findings of this experiment are mixed. Statistically, as a group the two Korean Broca's patients are above chance on active sentences with quantified subjects but at chance on passives with quantified subjects. However, a look at the means (98% correct for quantified actives, 83% for quantified passives) suggests otherwise. Problems for this analysis are that the sample is small that there is too much variation. Given this, individual analyses were conducted to glean some clues. These analyses reveal that not only are both patients above chance on quantified actives and quantified passives, performance in both conditions are significantly better than performance on simple actives and passives. Given that each patient is behaving in the same way, I will conclude that the results lean toward above chance on both sentence types. More testing is required to support this claim, however.

As in previous experiments, the Wernicke's patients were different from Broca's: Broca's performed above chance on both conditions, Wernicke's performed at chance on both. However, qualitatively Broca's and Wernicke's followed a similar pattern (Figure 8.5). Like Broca's, Wernicke's performed better in the quantified active than in the quantified passive. As in earlier experiments, it was KYA's better performance that raised the mean for Wernicke's. As a group, however, Wernicke's performance pattern was very similar to the other experiments.

The finding of no main effect for lesion type or sentence type is expected because of the variation in Broca's performance and KYA's better performance for the Wernicke's group. Despite this, it may be concluded that Broca's patients are different from Wernicke's in these sentence types.

8.5.2 Theoretical Implications

Patients who performed above chance on active and at chance passive performed above chance on both active and passive with a quantified subject. Table 8.8 provides a summary of the predictions made for Broca's in Section 8.2 and the findings.

Table 8.8

Summary of predictions and results for quantified subjects

Structure	TDH	ALH	MH	DDH	Result
Quantified Active	Above	Above	Above	Above	Above
Quantified Passive	Above	Chance	Chance	Chance	Above

Based on the findings presented above, only the TDH correctly predicts above chance on both sentence types. These results replicate those reported by Saddy (1995), Avrutin (2000), and Balogh and Grodzinsky (2000).

Turning to the discussion in Chapter 7 concerning the referentiality of *wh*-expressions, these preliminary quantification results in Korean support the conclusion that Broca's comprehension is affected by referentiality. Broca's patients who perform at chance on simple passives perform above chance on quantified passives. The difference between the two constructions is the quantified subject, which is non-referential. As the addition of a non-referential element lifts performance to above chance levels, it may be concluded that it is the non-referentiality of *wh*-phrases that allows Broca's to perform above chance on both subject and object *wh*-questions.

However, it is unclear whether referentiality is the only feature that distinguishes *which-N* constructions from *wh*-questions and quantifiers. In addition to the difference in D-linking, Pesetsky (1987) argues that there are differences at LF as well. *Wh*-phrases and quantifiers raise at LF for scope, while *which-N* phrases do not. This raises the possibility that something at LF aids in interpretation. What is clear is that more testing is required to tease these issues apart.

8.6 Conclusion

This chapter sought to test the hypothesis that referentiality of moved elements affects performance in Broca's comprehension. Broca's patients were above chance on both active and passive sentences with quantified subjects. This is theoretically interesting because it replicates the findings reported in Saddy (1995), Avrutin (2000), and Balogh and Grodzinsky (2000). These data provide support for the notion that referentiality affects Broca's comprehension.

CHAPTER 9

CONCLUSION

9.1 Introduction

This dissertation investigated a syntactic deficit associated with Korean Broca's aphasia. One empirical goal of the study was to provide a linguistic description of Korean aphasic comprehension on a selected number of constructions. As syntactic movement is a well-studied phenomenon in syntactic theory and aphasia research, patterns of movement in Korean aphasia were the focus of the investigation. Thus, empirically this dissertation investigated the nature of the comprehension deficit in Korean Broca's aphasia on such syntactic constructions as active, passive, relative clause, *wh*-question and quantified subject sentences.

A second empirical goal was to investigate the dissociation of comprehension patterns in Broca's and Wernicke's aphasia. It has been argued that Broca's area in the left frontal lobe is responsible for syntactic processing, while Wernicke's area in the left temporal lobe is responsible for lexico-semantic processing. There is debate as to whether damage to these areas in the brain results in different language deficits. Thus, this dissertation compared the comprehension patterns of Korean Broca's and Wernicke's aphasic patients.

This dissertation also had two theoretical goals. First, the empirical data from Korean Broca's comprehension was brought to bear on four linguistic accounts of Broca's aphasia. Second, the empirical data from Korean Broca's aphasia was used to help discern the appropriate analysis in three syntactic debates concerning movement in Korean syntax: passives, relative clauses and *wh*-questions.

This chapter will provide a summary discussion of the findings and relate these findings to the research questions asked in Chapter 2. The chapter is organized as follows. Section 9.2 will summarize the empirical findings for Korean Broca's patients and the comparison between Broca's and Wernicke's performance. Section 9.3 will summarize the theoretical findings and provide an evaluation of the four accounts of aphasia. Additionally, this section will summarize the findings concerning the three debates in Korean syntax. Section 9.4 concludes the dissertation.

9.2 Empirical Findings

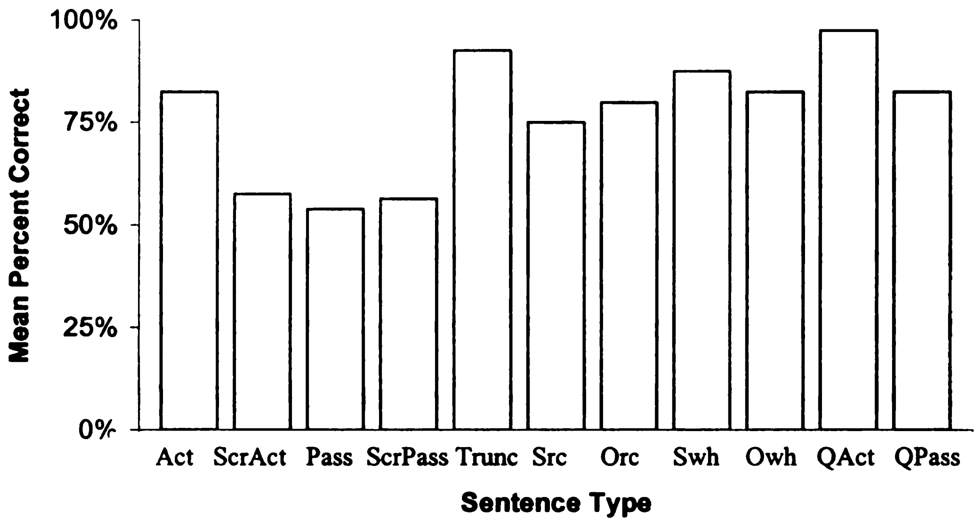
This section will review findings of this study in relation to the two empirical research questions in Chapter 2. Section 9.2.1 will summarize all of the empirical findings for Korean Broca's patients in the study. Section 9.2.2 will compare the overall patterns of Broca's and Wernicke's performance.

9.2.1 Korean Broca's Aphasia

The first empirical research question in Chapter 2 asked what the nature of the syntactic comprehension deficit is in Korean Broca's aphasia. To answer this question, patients were tested on actives, passives, relative clauses, *wh*-questions and quantified subject sentences. A summary of findings is given in Figure 9.1 and Table 9.1.

Figure 9.1

Summary of Broca's performance



Note: Act: active; ScrAct: scrambled active; Pass: passive; Trunc: truncated passive; Src: subject relative; Orc: object relative; Swh: subject wh-question; Owh: object wh-question; Qact: quantified active; QPass: quantified passive

Table 9.1

Summary of Broca's performance

Sentence Type	Mean
<u>Above Chance</u>	
Active	83%
Truncated Passive	93%
Subject Relative Clause	75%
Object Relative Clause	80%
Subject Wh-Question	88%
Object Wh-Question	83%
Quantified Active	98%
Quantified Passive	83%
<u>Chance</u>	
Scrambled Active	58%
Passive	54%
Scrambled Passive	56%

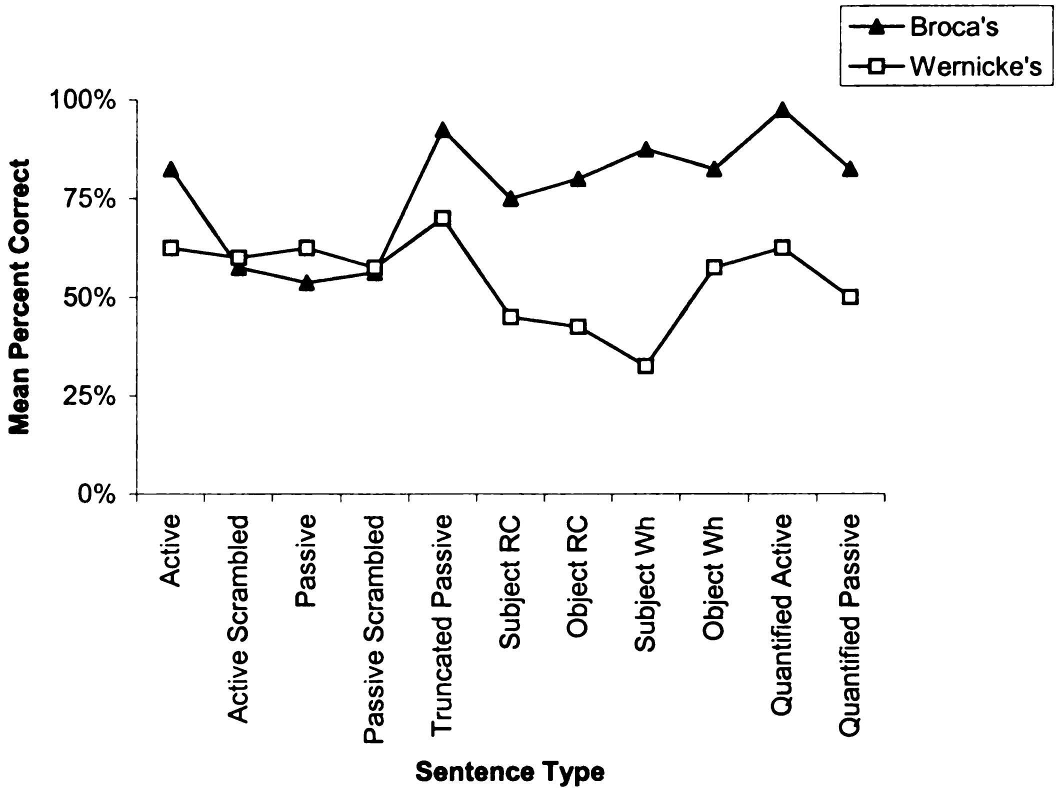
As reported in previous chapters, the findings indicate that the four Korean Broca's patients as a group performed above chance on actives (83%), truncated passives (93%), subject relatives (75%), object relatives (80%), subject *wh*-questions (88%), object *wh*-questions (83%), actives with quantified subjects (98%) and passives with quantified subjects (83%). Broca's performed at chance on scrambled actives (58%), passive (54%), and scrambled passives (56%). Also as mentioned previously, the findings in all but relative clauses replicate patterns reported in the literature; Korean relatives do not display the subject/object asymmetry found elsewhere.

9.2.2 Broca's versus Wernicke's Aphasia

The second empirical research question asked whether there is a dissociation in the comprehension patterns of Korean Broca's and Wernicke's aphasics. To answer this question, comprehension patterns in the syntactic constructions described above of Korean patients with damage to Broca's area and diagnosed as Broca's agrammatics were compared to patients with damage to Wernicke's area who have been diagnosed as fluent aphasics. Despite the data from those who argue that Broca's and Wernicke's are quantitatively different but qualitatively the same (e.g., Blumstein and Milberg, 2000; Lukatela, Shankweiler, and Crain, 1995; Luzzati, Toraldo, Guasti, Ghiradi, Lorenzi, and Guarnaschelli, 2001), this study found that Broca's and Wernicke's were significantly different both quantitatively and qualitatively. Consider the patterns in the summary data provided in Figure 9.2.

Figure 9.2

Summary of Broca's versus Wernicke's performance



As is evident in Figure 9.2, performance patterns of the two aphasias are different. Wernicke's as a group are at chance on every construction. Broca's drop to chance level only in the active scrambled, passive, and passive scrambled conditions. Although performance in mean percentage differs, statistically Wernicke's performance is consistent. Broca's are not consistent. Although there appear to be some parallels between the two aphasias, such as improved performance in truncated passive and decreased performance from quantified active to quantified passive, there are more differences. Thus, there is a dissociation in the comprehension levels and patterns of performance by the Korean patients in this study clinically classified as Broca's aphasia and Wernicke's aphasia.

9.3 Theoretical Implications

This section will review findings of this study in relation to the two theoretical research questions in Chapter 2. Section 9.3.1 will summarize how each of the four hypotheses accounts for the Korean Broca's data. Section 9.3.2 will consider possible alternative ways in which Broca's performance patterns may be grouped. Section 9.3.3 will provide an overall evaluation of the four accounts of aphasia. Section 9.3.4 will draw some conclusions concerning the linear versus structural debate. Finally, Section 9.3.5 will summarize the findings concerning the three debates in Korean syntax.

9.3.1 Accounts of Aphasia

The third research question in Chapter 2 asked which of the four accounts better explains the empirical patterns in Korean Broca's aphasia. To answer this question, this section will consider the overall patterns presented in this study.

The starting point of this dissertation in Chapter 4 was the notion that if the basic hypothesis is that movement disrupts comprehension, then the simplest test would be one in which patients are presented with an active sentence that they have shown they can comprehend but with one element moved (i.e., a scrambled active sentence). This construction did indeed disrupt interpretation in Korean patients. As scrambling in a simple active sentence is widely agreed to involve movement, and as scrambling disrupts comprehension in Korean Broca's aphasia, scrambling can be used as a screening test. Patients who perform above chance on actives and at chance on scrambled active can be used to test whether other syntactic constructions pattern in the same fashion in Korean Broca's aphasia.

In Chapters 5, 6 and 7 I presented results from passives, relative clauses and *wh*-questions, respectively. In each of these chapters there was a debate concerning whether these constructions should be analyzed as involving syntactic movement. I argued that passives may best be analyzed as derived through overt movement, while relative clauses and *wh*-questions may not. If we assume that actives, relative clauses, and *wh*-questions do not involve overt movement and that scrambled actives, passives and scrambled passives do involve overt movement, then the following is a summary of what the four proposals can account for.

First, consider Broca's performance on non-movement constructions given in Table 9.2.

Table 9.2

Summary of performance on non-movement constructions

Sentence Type	Result
Active (Control)	*Above*
Subject Relative Clause	Above
Object Relative Clause	Above
Subject Wh-Question	Above
Object Wh-Question	Above
Quantified Active	Above

Table 9.2 shows that patients who perform above chance on simple active sentences, also perform above chance on the constructions argued to involve no overt syntactic

movement.[1] Performance on the relative clauses, *wh*-questions and quantified actives appears to pattern much like performance on simple actives. The accounts attempt to explain why this pattern emerges. Table 9.3 provides a comparison of the predictions made by the four aphasia accounts for these non-movement constructions and the results.

Table 9.3

Summary of accounts for non-movement constructions

Sentence Type	**TDH**	**ALH**	**MH**	**DDH**
Active	+	+	+	+
Subject Relative	+	-	-	+
Object Relative	+	+	+	+
Subject Wh-Question	+	+	+	+
Object Wh-Question	+	+	+	+
Quantified Active	+	+	+	+

Note: + matches findings, - does not match findings

Both the TDH and the DDH are successful in accounting for all of the sentence types. The ALH and MH account for all of types except subject relative clauses. The reason that these two fail in this construction is that the order of arguments in subject relatives is non-canonical. That is, because these two linear approaches are based primarily upon canonical ordering of arguments, they are forced to make incorrect predictions.

Consider next Broca's performance on the sentences argued to involve overt syntactic movement given in Table 9.4.

[1] It should be noted again that the task in the subject and object *wh*-question experiment is different from the other experiments. The change in task type, albeit pragmatically necessary, may have confounded the results. However, it is clear that there is no overt displacement in Korean *wh*-questions and thus results will be included here.

Table 9.4

Summary of performance on movement constructions

Sentence Type	Result
Scrambled Active (control)	*Chance*
Passive	Chance
Scrambled Passive	Chance
Truncated Passive	Above
Quantified Passive	Above

Table 9.4 shows that patients who perform at chance on scrambled active sentences perform at chance on passives and scrambled passives. However, these patients also perform above chance on both truncated and quantified passives. Table 9.5 provides a comparison of the predictions made by the four accounts and the results.

Table 9.5

Summary of accounts for movement constructions

Sentence Type	TDH	ALH	MH	DDH
Scrambled Active	-	+	-	+
Passive	+	+	-	+
Scrambled Passive	-	-	-	+
Truncated Passive	-	+	+	- / +
Quantified Passive	+	+	-	-

Note: + matches findings, - does not match findings

The TDH correctly predicts performance in the passive and quantified passive sentences. However, it fails in two crucial sentence types: scrambled active and scrambled passive. These scrambled sentences are exemplary instances of movement and any account of Broca's aphasia argued to be based upon movement, such as the TDH, must minimally account for these.

As mentioned in Chapters 4 and 5, it is the TDH's reliance on linear assignment and the Thematic Hierarchy that leads it to these empirical problems. In syntactic constructions involving movement of an object to subject position (e.g., English passive), the TDH creates a situation in which the patient is faced with an ambiguity: two agents performing the action indicated by the predicate. Agent is assigned to the first NP by the default strategy because Agent is highest/first on the hierarchy. Thus, the combination of Thematic Hierarchy and linear order help to explain why Agent is assigned as a strategy.

For scrambling, however, the TDH loses its ability to present the patient with an ambiguity precisely because of the hierarchy and linear assignment. The default strategy selects one role (Agent) for the NP in sentence-initial position. Because another movement has occurred (i.e., from VP-internal position to subject position), the strategy must again refer to the hierarchy and select the next role down (Theme). As there is now no ambiguity, the TDH makes the wrong predictions. Thus, the Korean data presented in this study pose a serious problem for the TDH.

Second, the TDH cannot account for performance on truncated passives. This is again a result of their reliance on the R-strategy. Because the passive morpheme is argued to be an argument a theta-role must be assigned (Baker, Johnson and Roberts, 1989). Thus, even in a truncated passive, there are two arguments: the internal argument that has moved to subject position and the passive morpheme. Movement of the internal argument creates the competition for Agent, creating an ambiguity and an incorrect chance prediction.

The ALH successfully accounts for all movement sentence types except scrambled passive. The reason is that although the arguments in passive sentences are non-canonical, when elements are scrambled in the passive, the arguments are moved into canonical order. As semantic and syntactic linking match thematic assignment, the ALH is forced to incorrectly predict above chance. This is true despite the fact that the sentence is still passive and that the same patients are at chance on passives.

The MH is successful only on truncated passives. Like the ALH, it predicts that anytime arguments in a sentence appear in canonical order, patients should perform above chance. If argument order is not canonical, patients should reverse thematic roles and perform below chance. This appears to work for truncated passives, assuming Grimshaw's (1990) analysis of truncated passives. However, it fails to explain the other sentences. The MH fails because of its reliance on canonical ordering. First, arguments in scrambled actives, passive and quantified passives are argued to be in non-canonical orders. Patients are thus incorrectly predicted to reverse thematic assignment. Second, reliance on canonical order forces the MH to predict above chance for scrambled passives. Although the arguments in passive sentences are non-canonical, when elements are scrambled in the passive, the arguments are moved back into canonical order.

The DDH successfully accounts for all of the sentence types except truncated and quantified passives. However, as discussed in Chapter 5, if Mauner's (1995) prediction for truncated passive is modified, then the DDH could also account for truncated passives. The only problem for the DDH, then, is quantified passives because these constructions still involve overt movement and thus the creation of two referential dependencies.

As seen in Tables 9.3 and 9.5, no single account can explain all of the data reported in this study. However, it appears that the DDH fares better than the other three.

9.3.2 Some Alternatives

The previous section assumes that the sentences tested in this study are best divided into movement and non-movement and that this theoretical cut adequately accounts for Broca's performance. However, there are alternatives to grouping these same constructions that may account for performance.

Canonical Order

One alternative to grouping sentences by overt movement is canonical ordering of arguments. The screening test of active and scrambled active may be seen as divided along the lines of canonicity as well. Active sentences contain arguments in an order that matches the canonical order of arguments in argument structure. Scrambling in active sentences, however, create a construction in which arguments are reversed and, thus, non-canonical. Consider the summary of Broca's performance on canonical sentences in Table 9.6.

Table 9.6

Summary of performance on canonical constructions

Sentence Type	**Result**
Active (control)	*Above*
Scrambled Passive	Chance
Object Relative Clause	Above
Subject Wh-Question	Above
Object Wh-Question	Above
Quantified Active	Above

Table 9.6 shows that patients who perform above chance on canonical active sentences also perform above chance on all other canonical constructions except scrambled passive. As described above, although the arguments in passive sentences are non-canonical, when elements are scrambled in the passive, the arguments are moved into canonical order. Despite this canonical ordering, performance on scrambled passives is at chance.

Table 9.7 provides a summary of results for sentences grouped into the non-canonical category.

Table 9.7

Summary of performance on non-canonical constructions

Sentence Type	Result
Scrambled Active (control)	*Chance*
Passive	Chance
Subject Relative Clause	Above
Truncated Passive	Above
Quantified Passive	Above

Table 9.7 shows that patients who perform at chance on non-canonical scrambled active sentences, also perform at chance on passives. However, these same patients perform above chance on other non-canonical constructions such as subject relatives, truncated passives and quantified passives. Although canonicity alone can account for the core active/passive asymmetry, it fails to account for the core data in relative clauses and scrambling. It also fails to account for the patterns in truncated and quantified passives. It appears, then, that canonicity alone is insufficient in partitioning the data. The failure of the MH, which relies solely on this ordering, is evidence of this.

Type of Movement

A second alternative to dividing the data along theoretical lines may be a difference between A-movement and A-bar movement. The two types of movement, although both instances of Move, exhibit different syntactic properties. A-movement is movement of an NP from an argument position in which the NP receives a thematic role but no Case to an NP position in which there is no thematic role assigned and to which

Case is assigned. This movement leaves a trace in the D-structure argument position. Because the trace is co-indexed with its c-commanding antecedent in an A-position and the trace is locally A-bound, it has the properties of an anaphor. Thus, A-movement creates an A-chain to which Case is assigned at one position and thematic role is assigned to another.

In contrast, A-bar movement is movement of an NP, PP, Adverbial phrase or Operator from an argument position in which it receives Case and a thematic role to a Caseless, non-thematic position. This movement leaves a trace in the D-structure position. Unlike NP-traces, the trace created by A-bar movement is coindexed with an antecedent that is not in an argument position, and thus is not A-bound. The A-bar bound trace is free in its local domain and is an R-expression. Thus, A-bar movement creates an A-bar chain to which Case and thematic role are assigned at the D-structure position.

One alternative to dividing the data, then, may be that there is a difference between A-movement and A-bar movement such that A-movement disrupts comprehension while A-bar movement does not. In other words, when there is no overt A-movement, performance should be above chance; when there is overt A-movement, performance should be at chance. However, when there is A-bar movement, performance should be above chance. Consider the summary of Broca's performance based upon this categorization in Table 9.8.

Table 9.8

Summary of performance on A-movement constructions

Sentence Type	Result
No A-movement	
Active	Above
Quantified Active	Above
A-movement	
Passive	Chance
Scrambled Passive	Chance
Truncated Passive	Above
Quantified Passive	Above

Table 9.8 shows that patients who perform above chance on active and quantified active sentences, which do not involve overt A-movement, do perform at chance on passive and scrambled passive sentences, which do involve overt A-movement. However, patients perform above chance on truncated and quantified passive, which also involve overt A-movement.

Table 9.9 provides a summary of results for sentences grouped into the A-bar movement category.

Table 9.9

Summary of performance on A-bar movement constructions

Sentence Type	**Result**
Scrambled Active	Chance
Subject Relative Clause	Above
Object Relative Clause	Above
Subject Wh-Question	Above
Object Wh-Question	Above

Table 9.9 shows that patients perform above chance on all A-bar movement constructions except scrambled active. It was argued in Chapter 4 that scrambling involves non-operator, A-bar movement. It may be argued that it is *operator* A-bar movement that distinguishes the sentences. *Wh*-questions and relative clauses involve movement of operators. This hypothesis does appear to capture performance on *wh*-questions and relative clauses.

There are problems with this hypothesis, however. First, although the hypothesis can account for *wh*-questions and relative clauses, it does not account for the patterns in A-movement. Second, because *wh*-phrases do not move overtly in Korean, it is not at all clear that the above chance performance is a result of A-bar movement. Similarly, it was argued in Chapter that 6 that there may be no overt A-bar movement in Korean relative clauses. It becomes less clear that A-bar movement distinguishes Broca's performance. Third, this hypothesis would not be supported empirically with what has been found across languages. That is, given an A-movement/A-bar movement distinction, it would not be possible to account for the asymmetries in the core data described in Chapter 2.

For example, it would be possible to account for the active/passive distinction, *wh*-questions and quantified subjects data in English, but it would fail to account for the subject/object asymmetry in English relative clauses. It appears, then, that type of movement is also insufficient in partitioning the data.

Quantification

Although quantification cannot account for the entire data here, it certainly appears to have some effect on Broca's performance. As described in Chapter 8 and above, patients who perform above chance on actives and at chance on scrambled actives perform above chance on both quantified actives and passives. This is a surprising result considering that these same patients perform at chance on passives with the very same pictures and stimuli (minus the quantifier 'every'). These patients also performed above chance on *wh*-questions.

As noted in Chapter 8, one feature that quantificational and *wh*-elements share is non-referentiality. It may be that, as Grodzinsky (1995) argues, non-referential elements are not subject to the R-strategy and patients are able to infer thematic roles. However, it was also noted that it is unclear whether referentiality is the only feature that distinguishes *which-N* constructions from *wh*-questions and quantifiers. In addition to the difference in D-linking, Pesetsky (1987) argues that there are differences at LF as well. *Wh*-phrases and quantifiers raise at LF for scope, while *which-N* phrases do not. This raises the possibility that something at LF aids in interpretation. Therefore, the results here are confounded and it is not clear why quantification aids interpretation.

Additional Morphology

Yet another alternative hypothesis is that additional morphology may disrupt comprehension. It may be hypothesized that active, scrambled active, quantified active, relative clauses and *wh*-questions in Korean have simple verbal and nominal morphology. That is, verbs consist of the verb stem and sentence final particle, while NPs consist of the noun and Case particles. However, sentences such as passives, scrambled passives, truncated passives and quantified passives have verbal and nominal morphology that may complicate interpretation. Passive verbs differ from actives in that there is additional morphology in the form of the passive morpheme *–hi*, and the Agent in a passive sentence is marked not with a Case particle but with the postposition *–eykey* 'by.'

Consider the summary of Broca's performance on sentences classified as non-additional morphology in Table 9.10.

Table 9.10

Summary of performance on non-additional morphology constructions

Sentence Type	Result
Active	Above
Scrambled Active	Chance
Subject Relative Clause	Above
Object Relative Clause	Above
Subject Wh-Question	Above
Object Wh-Question	Above
Quantified Active	Above

Table 9.10 shows that patients perform above chance on all non-additional morphology sentences except scrambled actives. However, scrambled active is a crucial condition because if morphology is key to interpretation and no morphology has changed, performance on active and scramble active should be the same.

Consider the summary of Broca's performance on sentences classified as additional morphology in Table 9.11.

Table 9.11

Summary of performance on additional morphology constructions

Sentence Type	**Result**
Passive	Chance
Scrambled Passive	Chance
Truncated Passive	Above
Quantified Passive	Above

Table 9.11 shows that patients are at chance on passive and scrambled passive constructions, both of which involve additional verbal and nominal morphology. However, performance is above chance in the truncated and quantified passive sentences. The data is not consistent in terms of additional morphology.

A related view may be that morphology may provide clues in comprehension. It may be argued that instances in which morphology matches should facilitate comprehension and instances when morphology contradicts should disrupt comprehension. For example, it has been noted that cross-linguistically Agents in an active sentence tend to appear first in a sentence (i.e., appear higher in the syntactic structure and linearly before objects). Additionally, NPs that are Agents tend to be marked with nominative Case, while NPs that are Themes tend to be marked with accusative case. It may be argued that in actives and *wh*-questions this straightforward mapping facilitates comprehension, whereas in passives this mapping is complicated and this interferes with comprehension.

Again, the data in Tables 9.10 and 9.11 marginally support this hypothesis. Ignoring truncated passives, which are a problem for nearly every account, there are serious problems with this hypothesis. Scrambled actives maintain the straightforward nominative-Agent mapping, and yet performance is at chance.

A second problem concerns relative clauses. The relative clause stimuli presented to the patients were of two types. First, the object relative clauses were of the type OO, in which the object of the main clause is the object of the relative clause. In this situation, the head noun receives accusative case from the matrix verb, and this Case matches the Case it would receive in the embedded clause. As Theme is canonically assigned to NPs with accusative Case, comprehension should be facilitated. As given in Table 9.10, Korean Broca's patients are above chance on object relatives.

In the second type of relative clause, however, this is not true. In the OS type of relative clause, the object of the matrix clause is the subject of the embedded clause. The matrix verb assigns accusative to the head noun but the embedded verb would assign nominative Case. As Theme is canonically assigned to an NP with accusative case, and as the NP is an Agent, comprehension should be disrupted. Broca's patients performed above chance. Thus, although morphology may provide input to the interpretation process, it appears not to be a determining factor in categorizing the Korean Broca's data.

Overall, each of the alternatives can explain small portions of the comprehension data. None of the alternatives, however, seems to partition the Korean Broca's data as well as the movement hypothesis. Thus, data from Korean Broca's comprehension support the hypothesis that comprehension patterns are best characterized along the theoretical lines of syntactic movement.

9.3.3 Evaluation of Accounts

As described above in Section 9.3.1, no single account can explain all of the data found in this study. This section will further evaluate each of the four linguistic accounts by considering additional evidence.

Linear Approaches

Trace Deletion Hypothesis (TDH)

The TDH can account for the core cases of active/passive and subject/object relative. It also makes the correct prediction for *wh*-questions and is the only account to correctly predict the surprising above chance performance on quantified passive. However, scrambling is a serious problem for the account.

Although the TDH was one of the earliest attempts to account for patterns of sparing and loss with syntactic properties of sentences, the account has trouble accounting for data other than scrambling as well. Beretta, Piñango, Patterson and Harford (1999) point out that the TDH cannot account for passives with post-verbal subjects in Spanish. In these constructions, the subject moves rightward to a position following the verb and by-phrase. Consider (9-1).

(9-1)	Es	mojado	t_i	por	[el	elefante]	[el	mono]$_j$
	is	soaked		by	the	elephant	the	monkey

'The monkey is soaked by the elephant'

(Beretta et al., 1999)

In (9-1) the first NP *el elefante* 'the elephant' receives Agent syntactically (as the object of the preposition *by*), while the second NP *el mono* 'the monkey' does not receive Agent by the R-strategy because it is not in first position. As in the Korean case, moving down the Thematic Hierarchy, the second NP would be assigned Theme. As this matches normal assignment, patients are predicted to be above chance. However, Beretta et al. (1999) report that patients performed at chance.

Another empirical problem comes from Beretta and Munn (1998). They argue that if agrammatic patients are truly assigning two agents in a passive, then given a choice in which there actually are two agents performing an action on a third character in a picture, they should choose this picture consistently. That is, patients should interpret (9-3) as they do (9-2).

(9-2) The giraffe and the woman kicked the dog.

(Beretta and Munn, 1998)

(9-3) The giraffe was kicked by the woman kicked.

(Beretta and Munn, 1998)

In (9-2) there are two Agents (*the giraffe*, *the woman*), both of whom kicked the dog. The TDH predicts that agrammatic patients will assign Agent to both the giraffe and the woman in the passive in (9-3). Given a picture that depicts a giraffe and a woman kicking a dog, patients should incorrectly choose this over a picture depicting a giraffe and a dog kicking a woman. However, Beretta and Munn (1998) report that patients consistently avoided this choice. They conclude that patients do not assign double Agents in passive sentences.

In addition to empirical problems, there are theoretical problems for the TDH, as well. Beretta (2001) argues that the primary motivation for the TDH was to describe agrammatic data in theoretical terms such that the data would fall on either side of a theoretical (syntactic) divide, and traces were argued to be such a divide. However, Beretta notes that what divides agrammatic data is only partially the trace; it is the R-strategy that truly divides the agrammatic data. That is, the deletion of a trace has no consequence other than to signal the need for a heuristic strategy. Thus, the TDH is not truly a syntactic account of agrammatism.

Another theoretical criticism leveled against the TDH is the use of the Thematic Hierarchy as a syntactic construct. As discussed in Chapters 4 and 5, empirically the use of the Thematic Hierarchy leads the TDH to make the wrong predictions. Theoretically there are problems as well. Piñango (1999) points out that the Thematic Hierarchy is simply a generalization that describes the relation between thematic roles and grammatical relations for the purpose of mapping onto syntactic structure (Grimshaw, 1990; Jackendoff, 1972, 1990). As such, it was not intended to be an independent syntactic construct. Thus, not only does the hierarchy not help in accounting for Korean data, theoretically Piñango argues that use of the hierarchy is invalid. Overall, then, in addition to the inability to account for important Korean data, the TDH is plagued with empirical and theoretical problems.

Argument Linking Hypothesis (ALH) and Mapping Hypothesis (MH)

Although the ALH and MH make different assumptions and implement their models in different ways, they are broadly similar in that the locus of the impairment is seen as a disruption of the mapping mechanism. Given that the two accounts are similar and perform in similar ways on the Korean data, I will discuss them together. As shown in Section 9.3.1, the ALH and MH can account for the core asymmetry between active and passive, as well as truncated passive, *wh*-questions, object relative clauses and actives with quantified subjects.

In terms of passives with quantified subjects, with the exception of the TDH, this construction is a problem for all accounts. The TDH can account for the data only by stipulation of a referentiality constraint.

Although the ALH and MH take into account syntactic properties without relying on non-linguistic processes and can be linked to several deficit models such as delayed activation and/or rapid decay of syntactic information (e.g., Friederici, 1995; Haarmann and Kolk, 1991) or memory impairments (e.g., Caplan and Waters, 1999), their hypotheses still rest squarely on linear assignment. This creates problems precisely when elements are moved into canonical order. Overall, it seems clear that Broca's patients are not simply mapping thematic roles from argument structure to syntactic structure in a linear fashion and that a primarily linear account is not to be preferred.

A Structural Approach

Double Dependency Hypothesis (DDH)

Because the DDH accounts for comprehension patterns with reference to syntactic dependencies rather than linear assignment of thematic roles, it can not only account for the data in this study but also for the data above that is problematic for the linear accounts.

Despite its strengths, there is one objection raised against the DDH. Grodzinsky (1995) argues that his below chance data on fear-type passives is fatal for the DDH, as the DDH cannot theoretically make below chance predictions.

Beretta (2001) points out that Grodzinsky's evidence is quite weak. First, there are known problems with patient inclusion in the psych-passive data cited by Grodzinsky. Neither of the patients fit the standard criteria of (i) classification as Broca's aphasia on standardized aphasia batteries, (ii) lesions consistent with Broca's aphasia (i.e., left frontal), and (iii) performance in the canonical manner on core contrasts in English (active/passive, subject/object relative). Second, Beretta also notes that there are few observations per subject, which increases the risk of statistical error. Finally, both Beretta and Campbell (2001) and Piñango (2000) report that four patients in each study, who conform to the patient criteria above, performed at chance on fear-type passives. Indeed, Grodzinsky, himself, reports at chance performance on fear-type passives and above chance performance on frighten-type passives in a truth judgment task reported in Balogh and Grodzinsky (1996). Thus, empirical data supports Beretta and Campbell's (2001) conclusion that the DDH better accounts for the psych data.

9.3.4 Linear versus Structural Approaches

In addition to how well the four hypotheses account for the Korean data, a larger theoretical research question asked in Chapter 2 was whether the impairment in Broca's aphasia is best characterized as a linear assignment deficit or a structural deficit. Based upon discussions in previous chapters and the evaluation of the accounts above, it appears that empirically and theoretically linear-based approaches cannot successfully account for the Korean data or the wide range of cross-linguistic data. It seems clear from the Korean data that Broca's patients are not simply assigning thematic roles canonically in all constructions; an appeal to both syntactic movement and syntactic structure appears necessary. Thus, a structural approach such as the DDH that does not resort to heuristics is to be preferred.

9.3.5 Syntactic Debates in Korean

The fourth research question asked whether Korean Broca's data provide further evidence in three areas of debate in Korean syntax. The debates in this study involved syntactic movement or non-movement analyses for Korean passives, relative clauses, and *wh*-questions.

To answer this question, I appealed to data from Broca's patients in these constructions. Those patients who showed sensitivity to scrambling in active sentences, where movement is clear, were tested to see if they show a dissociation in the sentence types under investigation. In the passive, there is a debate as to whether Korean *hi*-passives are derived via syntactic movement. One analysis argues that the *–hi* passive is lexical and, like English adjectival passives, involves not syntactic movement but rather a shift in the lexicon resulting in the passive construction. A second analysis argues, however, that the passive passes many diagnostic tests for movement and should be analyzed at involving movement similar to the passive in English. Broca's patients performed at chance on Korean passives. It was concluded that data from Korean Broca's aphasia provide further support for the syntactic movement analysis.

The second debate concerned relative clauses. Non-movement hypotheses argue that movement analyses cannot account for several types of relative clause that do not obey movement constraints (e.g., Subjacency) and argue that the gap in a relative clause is created by a base-generated *pro*. Movement analyses claim that movement constraints do in fact operate in Korean relativization and argue that the gap in a relative clause is a trace created by movement of an empty operator. Broca's patients performed above chance on both subject and object relative clauses. It was concluded that this supports a non-movement analysis.

Finally, *wh*-words in Korean remain *in situ*, and thus do not move overtly at S-structure. One analysis argues that *in-situ wh*-phrases move at the syntactic level of LF. The second argues that no LF movement is required to account for syntactic behavior. In Korean *wh*-questions, patients were above chance on both subject and object *wh*-questions. The results of the study are confounded in that there is no real support for either analysis. It is clear that there is no overt movement in Korean *wh*-questions. What is not clear is whether it is the lack of overt movement or referentiality or some other property that accounts for the above chance performance. Given the performance on quantified passives, there appears to be no direct correlation between movement and performance on these constructions. Thus, no firm conclusion can be inferred in this debate.

9.4 Conclusion

Overall, the findings of this dissertation expand the knowledge base of the nature of aphasia by providing data from Korean aphasia. The findings also contribute to linguistic theory by providing neuropsychological data from aphasia in specific syntactic areas, and, as Newmeyer (2000) points out, by extending the range of applicable methods used to investigate syntactic theories. This dissertation also provides a crucial test of the four leading linguistic accounts of aphasia patterns. Although I have characterized important patterns of sparing and loss in terms of syntactic movement and thematic assignment, it is clear that this is not the only deficit in Broca's comprehension. Thus, not only is further research required to address the questions raised in this study but also to investigate questions in other linguistic and processing domains.

APPENDIX A

ACTIVE STIMULI

Active

1.	kyengchal-i	kirin-ul	cha-n-ta
	policeman-Nom	giraffe-Acc	kick-pres-decl
	'The policeman kicks the giraffe.'		
2.	kirin-i	kyengchal-ul	cha-n-ta
	giraffe-Nom	policeman-Acc	kick-pres-decl
	'The giraffe kicks the policeman.'		
3.	so-ka	kae-lul	ccoch-nun-ta
	cow-Nom	dog-Acc	chase-pres-decl
	'The cow chases the dog.'		
4.	kae-ka	so-lul	ccoch-nun-ta
	dog-Nom	cow-Acc	chase-pres-decl
	'The dog chases the cow.'		
5.	yeca-ka	kirin-ul	mi-n-ta
	girl-Nom	giraffe-Acc	push-pres-decl
	'The woman pushes the giraffe.'		
6.	kirin-i	yeca-lul	mi-n-ta
	giraffe-Nom	woman-Acc	push-pres-decl
	'The giraffe pushes the woman.'		
7.	kae-ka	namca-lul	ccik-nun-ta
	dog-Nom	man-Acc	photograph-pres-decl
	'The dog photographs the man.'		
8.	namca-ka	kae-lul	ccik-nun-ta
	man-Nom	dog-Acc	photograph-pres-decl
	'The man photographs the dog.'		
9.	yorisa-ka	naktha-lul	kku-n-ta
	baker-Nom	camel-Acc	drag-pres-decl
	'The baker drags the camel.'		
10.	naktha-ka	yorisa-lul	kku-n-ta
	camel-Nom	baker-Acc	drag-pres-decl
	The camel drags the baker.'		

11.	elwukmal-i	yorisa-lul	mwu-n-ta
	zebra-Nom	baker-Acc	bite-pres-decl
	'The zebra bites the baker.'		
12.	yorisa-ka	elwukmal-ul	mwu-n-ta
	baker-Nom	zebra-Acc	bite-pres-decl
	'The baker bites the zebra.'		
13.	kyengchal-i	so-lul	mwukk-nun-ta
	policeman-Nom	cow-Acc	tie-pres-decl
	'The policeman ties the cow.'		
14.	so-ka	kyengchal-ul	mwukk-nun-ta
	cow-Nom	policeman-Acc	tie-pres-decl
	'The cow ties the policeman.'		
15.	naktha-ka	wuisa-lul	ep-nun-ta
	camel-Nom	doctor-Acc	carry-pres-decl
	'The camel carries the doctor.'		
16.	wuisa-ka	naktha-lul	ep-nun-ta
	doctor-Nom	camel-Acc	carry-pres-decl
	'The doctor carries the camel.'		
17.	naktha-ka	wuisa-lul	tu-n-ta
	camel-Nom	doctor-Acc	lift-pres-decl
	'The camel lifts the doctor.'		
18.	wuisa-ka	naktha-lul	tu-n-ta
	doctor-Nom	camel-Acc	lift-pres-decl
	'The doctor lifts the camel.'		
19.	namca-ka	yeca-lul	tep-nun-ta
	man-Nom	woman-Acc	cover-pres-decl
	'The man cover the woman.'		
20.	yeca-ka	namca-lul	tep-nun-ta
	woman-Nom	man-Acc	cover-pres-decl
	'The woman covers the man.'		

Scrambled Active

1. kirin-ul kyengchal-i cha-n-ta
giraffe-Acc policeman-Nom kick-pres-decl
'The policeman kicks the giraffe.'

2. kyengchal-ul kirin-i cha-n-ta
policeman-Acc giraffe-Nom kick-pres-decl
'The giraffe kicks the policeman.'

3. kae-lul so-ka ccoch-nun-ta
dog-Acc cow-Nom chase-pres-decl
'The cow chases the dog.'

4. so-lul kae-ka ccoch-nun-ta
cow-Acc dog-Nom chase-pres-decl
'The dog chases the cow.'

5. kirin-ul yeca-ka mi-n-ta
giraffe-Acc girl-Nom push-pres-decl
'The woman pushes the giraffe.'

6. yeca-lul kirin-i mi-n-ta
woman-Acc giraffe-Nom push-pres-decl
'The giraffe pushes the woman.'

7. namca-lul kae-ka ccik-nun-ta
man-Acc dog-Nom photograph-pres-decl
'The dog photographs the man.'

8. kae-lul namca-ka ccik-nun-ta
dog-Acc man-Nom photograph-pres-decl
'The man photographs the dog.'

9. naktha-lul yorisa-ka kku-n-ta
camel-Acc baker-Nom drag-pres-decl
'The baker drags the camel.'

10. yorisa-lul naktha-ka kku-n-ta
baker-Acc camel-Nom drag-pres-decl
'The camel drags the baker.'

11. yorisa-lul elwukmal-i mwu-n-ta
baker-Acc zebra-Nom bite-pres-decl
'The zebra bites the baker.'

12. elwukmal-ul yorisa-ka mwu-n-ta
zebra-Acc baker-Nom bite-pres-decl
'The baker bites the zebra.'

13. so-lul kyengchal-i mwukk-nun-ta
cow-Acc policeman-Nom tie-pres-decl
'The policeman ties the cow.'

14. kyengchal-ul so-ka mwukk-nun-ta
policeman-Acc cow-Nom tie-pres-decl
'The cow ties the policeman.'

15. wuisa-lul naktha-ka ep-nun-ta
doctor-Acc camel-Nom carry-pres-decl
'The camel carries the doctor.'

16. naktha-lul wuisa-ka ep-nun-ta
camel-Acc doctor-Nom carry-pres-decl
'The doctor carries the camel.'

17. wuisa-lul naktha-ka tu-n-ta
doctor-Acc camel-Nom lift-pres-decl
'The camel lifts the doctor.'

18. naktha-lul wuisa-ka tu-n-ta
camel-Acc doctor-Nom lift-pres-decl
'The doctor lifts the camel.'

19. yeca-lul namca-ka tep-nun-ta
woman-Acc man-Nom cover-pres-decl
'The man cover the woman.'

20. namca-lul yeca-ka tep-nun-ta
man-Acc woman-Nom cover-pres-decl
'The woman covers the man.'

APPENDIX B

PASSIVE STIMULI

Passive

1.	kyengchal-i	kirin-ekey	chae-i-n-ta
	policeman-Nom	giraffe-by	kick-pass-pres-decl
	'The policeman is kicked by the giraffe.'		
2.	kirin-i	kyengchal-ekey	chae-i-n-ta
	giraffe-Nom	policeman-by	kick-pass-pres-decl
	'The giraffe is kicked by the policeman.'		
3.	so-ka	kae-ekey	ccoch-ki-n-ta
	cow-Nom	dog-by	chase-pass-pres-decl
	'The cow is chased by the dog.'		
4.	kae-ka	so-ekey	ccoch-ki-n-ta
	dog-Nom	cow-by	chase-pass-pres-decl
	'The dog is chased by the cow.'		
5.	yeca-ka	kirin-ekey	mil-li-n-ta
	woman-Nom	giraffe-by	push-pass-pres-decl
	'The woman is pushed by the giraffe.'		
6.	kirin-i	yeca-ekey	mil-li-n-ta
	giraffe-Nom	woman-by	push-pass-pres-decl
	'The giraffe is pushed by the woman.'		
7.	namca-ka	kae-ekey	ccik-hi-n-ta
	man-Nom	dog-by	photograph-pass-pres-decl
	'The man is photographed by the dog.'		
8.	kae-ka	namca-ekey	ccik-hi-n-ta
	dog-Nom	man-by	photograph-pass-pres-decl
	'The dog is photographed by the man.'		
9.	yorisa-ka	naktha-ekey	kkul-li-n-ta
	baker-Nom	camel-by	drag-pass-pres-decl
	'The baker is dragged by the camel.'		
10.	naktha-ka	yorisa-ekey	kkul-li-n-ta
	camel-Nom	baker-by	drag-pass-pres-decl
	'The camel is dragged by the baker.'		

11.	elwukmal-i	yorisa-ekey	mwul-li-n-ta
	zebra-Nom	baker-by	bite-pass-pres-decl
	'The zebra is bitten by the baker.'		
12.	yorisa-ka	elwukmal-ekey	mwul-li-n-ta
	baker-Nom	zebra-by	bite-pass-pres-decl
	'The baker is bitten by the zebra.'		
13.	kyengchal-i	so-ekey	mwukk-i-n-ta
	policeman-Nom	cow-by	tie-pass-pres-decl
	'The policeman is tied by the cow.'		
14.	so-ka	kyengchal-ekey	mwukk-i-n-ta
	cow-Nom	policeman-by	tie-pass-pres-decl
	'The cow is tied by the policeman.'		
15.	naktha-ka	wuisa-ekey	ep-hi-n-ta
	camel-Nom	doctor-by	carry-pass-pres-decl
	'The camel is carried by the doctor.'		
16.	wuisa-ka	naktha-ekey	ep-hi-n-ta
	doctor-Nom	camel-by	carry-pass-pres-decl
	'The doctor is carried by the camel.'		
17.	naktha-ka	wuisa-ekey	tul-li-n-ta
	camel-Nom	doctor-by	lift-pass-pres-decl
	'The camel is lifted by the doctor.'		
18.	wuisa-ka	naktha-ekey	tul-li-n-ta
	doctor-Nom	camel-by	lift-pass-pres-decl
	'The doctor is lifted by the camel.'		
19.	namca-ka	yeca-ekey	tep-hi-n-ta
	man-Nom	woman-by	cover-pass-pres-decl
	'The man is covered by the woman.'		
20.	yeca-ka	namca-ekey	tep-hi-n-ta
	woman-Nom	man-by	cover-pass-pres-decl
	'The woman is covered by the man.'		

Scrambled Passive

1.	kirin-ekey	kyengchal-i	chae-i-n-ta
	giraffe-by	policeman-Nom	kick-pass-pres-decl
	'The policeman is kicked by the giraffe.'		
2.	kyengchal-ekey	kirin-i	chae-i-n-ta
	policeman-by	giraffe-Nom	kick-pass-pres-decl
	'The giraffe is kicked by the policeman.'		
3.	kae-ekey	so-ka	ccoch-ki-n-ta
	dog-by	cow-Nom	chase-pass-pres-decl
	'The cow is chased by the dog.'		
4.	so-ekey	kae-ka	ccoch-ki-n-ta
	cow-by	dog-Nom	chase-pass-pres-decl
	'The dog is chased by the cow.'		
5.	kirin-ekey	yeca-ka	mil-li-n-ta
	giraffe-by	woman-Nom	push-pass-pres-decl
	'The woman is pushed by the giraffe.'		
6.	yeca-ekey	kirin-i	mil-li-n-ta
	woman-by	giraffe-Nom	push-pass-pres-decl
	'The giraffe is pushed by the woman.'		
7.	kae-ekey	namca-ka	ccik-hi-n-ta
	dog-by	man-Nom	photograph-pass-pres-decl
	'The man is photographed by the dog.'		
8.	namca-ekey	kae-ka	ccik-hi-n-ta
	man-by	dog-Nom	photograph-pass-pres-decl
	'The dog is photographed by the man.'		
9.	naktha-ekey	yorisa-ka	kkul-li-n-ta
	camel-by	baker-Nom	drag-pass-pres-decl
	'The baker is dragged by the camel.'		
10.	yorisa-ekey	naktha-ka	kkul-li-n-ta
	baker-by	camel-Nom	drag-pass-pres-decl
	'The camel is dragged by the baker.'		

11.	yorisa-ekey	elwukmal-i	mwul-li-n-ta
	baker-by	zebra-Nom	bite-pass-pres-decl
	'The zebra is bitten by the baker.'		
12.	elwukmal-ekey	yorisa-ka	mwul-li-n-ta
	zebra-by	baker-Nom	bite-pass-pres-decl
	'The baker is bitten by the zebra.'		
13.	so-ekey	kyengchal-i	mwukk-i-n-ta
	cow-by	policeman-Nom	tie-pass-pres-decl
	'The policeman is tied by the cow.'		
14.	kyengchal-ekey	so-ka	mwukk-i-n-ta
	policeman-by	cow-Nom	tie-pass-pres-decl
	'The cow is tied by the policeman.'		
15.	wuisa-ekey	naktha-ka	ep-hi-n-ta
	doctor-by	camel-Nom	carry-pass-pres-decl
	'The camel is carried by the doctor.'		
16.	naktha-ekey	wuisa-ka	ep-hi-n-ta
	camel-by	doctor-Nom	carry-pass-pres-decl
	'The doctor is carried by the camel.'		
17.	wuisa-ekey	naktha-ka	tul-li-n-ta
	doctor-by	camel-Nom	lift-pass-pres-decl
	'The camel is lifted by the doctor.'		
18.	naktha-ekey	wuisa-ka	tul-li-n-ta
	camel-by	doctor-Nom	lift-pass-pres-decl
	'The doctor is lifted by the camel.'		
19.	yeca-ekey	namca-ka	tep-hi-n-ta
	woman-by	man-Nom	cover-pass-pres-decl
	'The man is covered by the woman.'		
20.	namca-ekey	yeca-ka	tep-hi-n-ta
	man-by	woman-Nom	cover-pass-pres-decl
	'The woman is covered by the man.'		

TRUNCATED PASSIVE

1. kyengchal-i chae-i-n-ta
   policeman-Nom kick-pass-pres-decl
   'The policeman is kicked.'

2. kirin-i chae-i-n-ta
   giraffe-Nom kick-pass-pres-decl
   'The giraffe is kicked.'

3. so-ka ccoch-ki-n-ta
   cow-Nom chase-pass-pres-decl
   'The cow is chased.'

4. kae-ka ccoch-ki-n-ta
   dog-Nom chase-pass-pres-decl
   'The dog is chased.'

5. yeca-ka mil-li-n-ta
   woman-Nom push-pass-pres-decl
   'The woman is pushed.'

6. kirin-i mil-li-n-ta
   giraffe-Nom push-pass-pres-decl
   'The giraffe is pushed.'

7. namca-ka ccik-hi-n-ta
   man-Nom photograph-pass-pres-decl
   'The man is photographed.'

8. kae-ka ccik-hi-n-ta
   dog-Nom photograph-pass-pres-decl
   'The dog is photographed.'

9. yorisa-ka kkul-li-n-ta
   baker-Nom drag-pass-pres-decl
   'The baker is dragged.'

10. naktha-ka kkul-li-n-ta
    camel-Nom drag-pass-pres-decl
    'The camel is dragged.'

11. elwukmal-i mwul-li-n-ta
    zebra-Nom bite-pass-pres-decl
    'The zebra is bitten.'

12. yorisa-ka mwul-li-n-ta
baker-Nom bite-pass-pres-decl
'The baker is bitten.'

13. kyengchal-i mwukk-i-n-ta
policeman-Nom tie-pass-pres-decl
'The policeman is tied.'

14. so-ka mwukk-i-n-ta
cow-Nom tie-pass-pres-decl
'The cow is tied.'

15. naktha-ka ep-hi-n-ta
camel-Nom carry-pass-pres-decl
'The camel is carried.'

16. wuisa-ka ep-hi-n-ta
doctor-Nom carry-pass-pres-decl
'The doctor is carried.'

17. naktha-ka tul-li-n-ta
camel-Nom lift-pass-pres-decl
'The camel is lifted.'

18. wuisa-ka tul-li-n-ta
doctor-Nom lift-pass-pres-decl
'The doctor is lifted.'

19. namca-ka tep-hi-n-ta
man-Nom cover-pass-pres-decl
'The man is covered.'

20. yeca-ka tep-hi-n-ta
woman-Nom cover-pass-pres-decl
'The woman is covered.'

APPENDIX C

RELATIVE CLAUSE STIMULI

Subject Relative Clause

1.	kyengchal-ul	cha-nun	kirin-ul	karukyo-cwuseyo
	policeman-acc	kick-rel	giraffe-acc	point out-imper
	'Point to the giraffe who kicks the policeman.'			
2.	kirin- ul	cha-nun	kyengchal-ul	karukyo-cwuseyo
	giraffe-acc	kick-rel	policeman-acc	point out-imper
	'Point to the policeman who kicks the giraffe.'			
3.	so-lul	ccoch-nun	kae-lul	karukyo-cwuseyo
	cow-acc	chase-rel	dog-acc	point out-imper
	'Point to the dog who chases the cow.'			
4.	kae-lul	ccoch-nun	so-lul	karukyo-cwuseyo
	dog-acc	chase-rel	cow-acc	point out-imper
	'Point to the cow who chases the dog.'			
5.	yeca-lul	mi-nun	kirin-ul	karukyo-cwuseyo
	girl-acc	push-rel	giraffe-acc	point out-imper
	'Point to the giraffe who pushes the woman.'			
6.	kirin-ul	mi-nun	yeca-lul	karukyo-cwuseyo
	giraffe-acc	push-rel	woman-acc	point out-imper
	'Point to the woman who pushes the giraffe.'			
7.	kae-lul	ccik-nun	namca-lul	karukyo-cwuseyo
	dog-acc	photograph-rel	man-acc	point out-imper
	'Point to the man who photographs the dog.'			
8.	namca-lul	ccik-nun	kae-lul	karukyo-cwuseyo
	man-acc	photograph-rel	dog-acc	point out-imper
	'Point to the dog who photographs the man.'			
9.	yorisa-lul	kku-nun	naktha-lul	karukyo-cwuseyo
	baker-acc	drag-rel	camel-acc	point out-imper
	'Point to the camel who drags the baker.'			
10.	naktha-lul	kku-nun	yorisa-lul	karukyo-cwuseyo
	camel-acc	drag-rel	baker-acc	point out-imper
	'Point to the baker who drags the camel.'			

11.	elwukmal-ul	mwu-nun	yorisa-lul	karukyo-cwuseyo
	zebra-acc	bite-rel	baker-acc	point out-imper

'Point to the baker who bites the zebra.'

12.	yorisa-lul	mwu-nun	elwukmal-ul	karukyo-cwuseyo
	baker-acc	bite-rel	zebra-acc	point out-imper

'Point to the zebra who bites the baker.'

13.	kyengchal-ul	mwukk-nun	so-lul	karukyo-cwuseyo
	policeman-acc	tie-rel	cow-acc	point out-imper

'Point to the cow who ties the policeman.'

14.	so-lul	mwukk-nun	kyengchal-ul	karukyo-cwuseyo
	cow-acc	tie-rel	policeman-acc	point out-imper

'Point to the policeman who ties the cow.'

15.	naktha-lul	ep-nun	wuisa-lul	karukyo-cwuseyo
	camel-acc	carry-rel	doctor-acc	point out-imper

'Point to the doctor who carries the camel.'

16.	wuisa-lul	ep-nun	naktha-lul	karukyo-cwuseyo
	doctor-acc	carry-rel	camel-acc	point out-imper

'Point to the camel who carries the doctor.'

17.	naktha-lul	tu-nun	wuisa-lul	karukyo-cwuseyo
	camel-acc	lift-rel	doctor-acc	point out-imper

'Point to the doctor who lifts the camel.'

18.	wuisa-lul	tu-nun	naktha-lul	karukyo-cwuseyo
	doctor-acc	lift-rel	camel-acc	point out-imper

'Point to the camel who lifts the doctor.'

19.	namca-lul	tep-nun	yeca-lul	karukyo-cwuseyo
	man-acc	cover-rel	woman-acc	point out-imper

'Point to the woman who covers the man.'

20.	yeca-lul	tep-nun	namca-lul	karukyo-cwuseyo
	woman-acc	cover-rel	man-acc	point out-imper

'Point to the man who covers the woman.'

Object Relative Clause

1.	kyengchal-i	cha-nun	kirin-ul	karukyo-cwuseyo
	policeman-nom	kick-rel	giraffe-acc	point out-imper

‘Point to the giraffe who the policeman kicks.’

2.	kirin-i	cha-nun	kyengchal-ul	karukyo-cwuseyo
	giraffe-nom	kick-rel	policeman-acc	point out-imper

‘Point to the policeman who the giraffe kicks.’

3.	so-ka	ccoch-nun	kae-lul	karukyo-cwuseyo
	cow-nom	chase-rel	dog-acc	point out-imper

‘Point to the dog who the cow chases.’

4.	kae-ka	ccoch-nun	so-lul	karukyo-cwuseyo
	dog-nom	chase-rel	cow-acc	point out-imper

‘Point to the cow who the dog chases.’

5.	yeca-ka	mi-nun	kirin-ul	karukyo-cwuseyo
	girl-nom	push-rel	giraffe-acc	point out-imper

‘Point to the giraffe who the woman pushes.’

6.	kirin-i	mi-nun	yeca-lul	karukyo-cwuseyo
	giraffe-nom	push-rel	woman-acc	point out-imper

‘Point to the woman who the giraffe pushes.’

7.	kae-ka	ccik-nun	namca-lul	karukyo-cwuseyo
	dog-nom	photograph-rel	man-acc	point out-imper

‘Point to the man who the dog photographs.’

8.	namca-ka	ccik-nun	kae-lul	karukyo-cwuseyo
	man-nom	photograph-rel	dog-acc	point out-imper

‘Point to dog who the man photographs.’

9.	yorisa-ka	kku-nun	naktha-lul	karukyo-cwuseyo
	baker-nom	drag-Rel	camel-acc	point out-imper

‘Point to the camel who the baker drags.’

10.	naktha-ka	kku-nun	yorisa-lul	karukyo-cwuseyo
	camel-nom	drag-rel	baker-acc	point out-imper

‘Point to the baker who the camel drags.’

11.	elwukmal-i	mwu-nun	yorisa-lul	karukyo-cwuseyo
	zebra-nom	bite-rel	baker-acc	point out-imper
	'Point to baker who the zebra bites.'			
12.	yorisa-ka	mwu-nun	elwukmal-ul	karukyo-cwuseyo
	baker-nom	bite-rel	zebra-acc	point out-imper
	'Point to the zebra who the baker bites.'			
13.	kyengchal-i	mwukk-nun	so-lul	karukyo-cwuseyo
	policeman-nom	tie-rel	cow-acc	point out-imper
	'Point to the cow who the policeman ties.'			
14.	so-ka	mwukk-nun	kyengchal-ul	karukyo-cwuseyo
	cow-nom	tie-rel	policeman-acc	point out-imper
	'Point to the policeman who the cow ties.'			
15.	naktha-ka	ep-nun	wuisa-lul	karukyo-cwuseyo
	camel-nom	carry-rel	doctor-acc	point out-imper
	'Point to baker who the camel carries.'			
16.	wuisa-ka	ep-nun	naktha-lul	karukyo-cwuseyo
	doctor-nom	carry-rel	camel-acc	point out-imper
	'Point to camel who the baker carries.'			
17.	naktha-ka	tu-nun	wuisa-lul	karukyo-cwuseyo
	camel-nom	lift-rel	doctor-acc	point out-imper
	'Point to doctor who the camel lifts.'			
18.	wuisa-ka	tu-nun	naktha-lul	karukyo-cwuseyo
	doctor-nom	lift-rel	camel-acc	point out-imper
	'Point to the camel who the doctor lifts.'			
19.	namca-ka	tep-nun	yeca-lul	karukyo-cwuseyo
	man-nom	cover-rel	woman-acc	point out-imper
	'Point to woman who the man covers.'			
20.	yeca-ka	tep-nun	namca-lul	karukyo-cwuseyo
	woman-nom	cover-rel	man-acc	point out-imper
	'Point to man who the woman covers.'			

APPENDIX D

WH-QUESTION STIMWULI

Subject Wh-Questions

1.	nwu-ka	kae-lul	mwul-eyo?
	Who-Nom	dog-Acc	bite-Q
	'Who bites the dog?'		(Giraffe → Dog → Zebra)
2.	nwu-ka	kae-lul	mwul-eyo?
	Who-Nom	dog-Acc	bite-Q
	'Who bites the dog?'		(Giraffe ← Dog ← Zebra)
3.	nwu-ka	so-lul	mwul-eyo?
	Who-Nom	cow-Acc	bite-Q
	'Who bites the cow?'		(Camel → Cow → Elephant)
4.	nwu-ka	so-lul	mwul-eyo?
	Who-Nom	cow-Acc	bite-Q
	'Who bites the cow?'		(Camel ← Cow ← Elephant)
5.	nwu-ka	mal-ul	cha-eyo?
	Who-Nom	horse-Acc	kick-Q
	'Who kicks the horse?'		(Tiger → Horse → Pig)
6.	nwu-ka	mal-ul	cha-eyo?
	Who-Nom	horse-Acc	kick-Q
	'Who kicks the horse?'		(Tiger ← Horse ← Pig)
7.	nwu-ka	kirin-ul	cha-eyo?
	Who-Nom	giraffe-Acc	kick-Q
	'Who kicks the giraffe?'		(Sheep → Giraffe → Camel)
8.	nwu-ka	kirin-ul	cha-eyo?
	Who-Nom	giraffe-Acc	kick-Q
	'Who kicks the giraffe?'		(Sheep ← Giraffe ← Camel)
9.	nwu-ka	taeci-lul	kkul-eyo?
	Who-Nom	pig-Acc	drag-Q
	'Who drags the pig?'		(Cow → Pig → Sheep)
10.	nwu-ka	taeci-lul	kkul-eyo?
	Who-Nom	pig-Acc	drag-Q
	'Who drags the pig?'		(Cow ← Pig ← Sheep)

6. nwu-ka naktha-lul kkul-eyo?
Who-Nom camel-Acc drag-Q
'Who drags the camel?' (Zebra → Camel → Tiger)

nwu-ka naktha-lul kkul-eyo?
Who-Nom camel-Acc drag-Q
'Who drags the camel?' (Zebra ← Camel ← Tiger)

7. nwu-ka yang-ul mil-eyo?
Who-Nom sheep-Acc push-Q
'Who pushes the sheep?' (Horse → Sheep → Dog)

nwu-ka yang-ul mil-eyo?
Who-Nom sheep-Acc push-Q
'Who pushes the sheep?' (Horse ← Sheep ← Dog)

8. nwu-ka horangi-lul mil-eyo?
Who-Nom tiger-Acc push-Q
'Who pushes the tiger?' (Elephant → Tiger → Giraffe)

nwu-ka horangi-lul mil-eyo?
Who-Nom tiger-Acc push-Q
'Who pushes the tiger?' (Elephant ← Tiger ← Giraffe)

9. nwu-ka elwukmal-ul ttayli-eyo?
Who-Nom zebra-Acc hit-Q
'Who hits the zebra?' (Tiger → Zebra → Pig)

nwu-ka elwukmal-ul ttayli-eyo?
Who-Nom zebra-Acc hit-Q
'Who hits the zebra?' (Tiger ← Zebra ← Pig)

10. nwu-ka kirin-ul ttayli-eyo?
Who-Nom giraffe-Acc hit-Q
'Who hits the giraffe?' (Sheep → Giraffe → Camel)

nwu-ka kirin-ul ttayli-eyo?
Who-Nom giraffe-Acc hit-Q
'Who hits the giraffe?' (Sheep ← Giraffe ← Camel)

Object Wh-Questions

1.	kae-ka	nwugu-lul	mwul-eyo?
	dog-Nom	Who-Acc	bite-Q
	'Who does the dog bite?'		(Giraffe → Dog → Zebra)
2.	kae-ka	nwugwu-lul	mwul-eyo?
	dog-Nom	Who-Acc	bite-Q
	'Who does the dog bite?'		(Giraffe ← Dog ← Zebra)
3.	so-ka	nwugwu-lul	mwul-eyo?
	cow-Nom	Who-Acc	bite-Q
	'Who does the cow bite?'		(Camel → Cow → Elephant)
4.	so-ka	nwugwu-lul	mwul-eyo?
	cow-Nom	Who-Acc	bite-Q
	'Who does the cow bite?'		(Camel ← Cow ← Elephant)
5.	mal-i	nwugwu-lul	cha-eyo?
	horse-Nom	Who-Acc	kick-Q
	'Who does the horse kick?'		(Tiger → Horse → Pig)
6.	mal-i	nwugwu-lul	cha-eyo?
	horse-Nom	Who-Acc	kick-Q
	'Who does the horse kick?'		(Tiger ← Horse ← Pig)
7.	kirin-i	nwugwu-lul	cha-eyo?
	giraffe-Nom	Who-Acc	kick-Q
	'Who does the giraffe kick?'		(Sheep → Giraffe → Camel)
8.	kirin-i	nwugwu-lul	cha-eyo?
	giraffe-Nom	Who-Acc	kick-Q
	'Who does the giraffe kick?'		(Sheep ← Giraffe ← Camel)
9.	taeci-ka	nwugwu-lul	kkul-eyo?
	pig-Nom	Who-Acc	drag-Q
	'Who does the pig drag?'		(Cow → Pig → Sheep)
10.	taeci-ka	nwugwu-lul	kkul-eyo?
	pig-Nom	Who-Acc	drag-Q
	'Who does the pig drag?'		(Cow ← Pig ← Sheep)

11. naktha-ka nwugwu-lul kkul-eyo?
camel-Nom Who-Acc drag-Q
'Who does the camel drag?' (Zebra → Camel → Tiger)

12. naktha-ka nwugwu-lul kkul-eyo?
camel-Nom Who-Acc drag-Q
'Who does the camel drag?' (Zebra ← Camel ← Tiger)

13. yang-i nwugwu-lul mil-eyo?
sheep-Nom Who-Acc push-Q
'Who does the sheep push?' (Horse → Sheep → Dog)

14. yang-i nwugwu-lul mil-eyo?
sheep-Nom Who-Acc push-Q
'Who does the sheep push?' (Horse ← Sheep ← Dog)

15. horangi-ka nwugwu-lul mil-eyo?
tiger-Nom Who-Acc push-Q
'Who does the tiger push?' (Elephant → Tiger → Giraffe)

16. horangi-ka nwugwu-lul mil-eyo?
tiger-Nom Who-Acc push-Q
'Who does the tiger push?' (Elephant ← Tiger ← Giraffe)

17. elwukmal-i nwugwu-lul ttayli-eyo?
zebra-Nom Who-Acc hit-Q
'Who does the zebra hit?' (Tiger → Zebra → Pig)

18. elwukmal-i nwugwu-lul ttayli-eyo?
zebra-Nom Who-Acc hit-Q
'Who does the zebra hit?' (Tiger ← Zebra ← Pig)

19. kirin-i nwugwu-lul ttayli-eyo?
giraffe-Nom Who-Acc hit-Q
'Who does the giraffe hit?' (Sheep → Giraffe → Camel)

20. kirin-i nwugwu-lul ttayli-eyo?
giraffe-Nom Who-Acc hit-Q
'Who does the giraffe hit?' (Sheep ← Giraffe ← Camel)

APPENDIX E

QUANTIFIED SUBJECTS STIMULI

Quantified Subjects Active

1.	motun	kyengchal-i	kirin-ul	cha-n-ta
	every	policeman-Nom	giraffe-Acc	kick-Pres-Decl
	'Every policeman kicks the giraffe.'			
2.	motun	kirin-i	kyengchal-ul	cha-n-ta
	every	giraffe-Nom	policeman-Acc	kick-Pres-Decl
	'Every giraffe kicks the policeman.'			
3.	motun	so-ka	kae-lul	ccoch-nun-ta
	every	cow-Nom	dog-Acc	chase-Pres-Decl
	'Every cow chases the dog.'			
4.	motun	kae-ka	so-lul	ccoch-nun-ta
	every	dog-Nom	cow-Acc	chase-Pres-Decl
	'Every dog chases the cow.'			
5.	motun	yeca-ka	kirin-ul	mi-n-ta
	every	girl-Nom	giraffe-Acc	push-Pres-Decl
	'Every woman pushes the giraffe.'			
6.	motun	kirin-i	yeca-lul	mi-n-ta
	every	giraffe-Nom	woman-Acc	push-Pres-Decl
	'Every giraffe pushes the woman.'			
7.	motun	kae-ka	namca-lul	ccik-nun-ta
	every	dog-Nom	man-Acc	photograph-Pres-Decl
	'Every dog photographs the man.'			
8.	motun	namca-ka	kae-lul	ccik-nun-ta
	every	man-Nom	dog-Acc	photograph-Pres-Decl
	'Every man photographs the dog.'			
9.	motun	yorisa-ka	naktha-lul	kku-n-ta
	every	baker-Nom	camel-Acc	drag-Pres-Decl
	'Every baker drags the camel.'			

10.	motun	naktha-ka	yorisa-lul	kku-n-ta
	every	camel-Nom	baker-Acc	drag-Pres-Decl
	'Every camel drags the baker.'			
11.	motun	elwukmal-i	yorisa-lul	mwu-n-ta
	every	zebra-Nom	baker-Acc	bite-Pres-Decl
	'Every zebra bites the baker.'			
12.	motun	yorisa-ka	elwukmal-ul	mwu-n-ta
	every	baker-Nom	zebra-Acc	bite-Pres-Decl
	'Every baker bites the zebra.'			
13.	motun	kyengchal-i	so-lul	mwukk-nun-ta
	every	policeman-Nom	cow-Acc	tie-Pres-Decl
	'Every policeman ties the cow.'			
14.	motun	so-ka	kyengchal-ul	mwukk-nun-ta
	every	cow-Nom	policeman-Acc	tie-Pres-Decl
	'Every cow ties the policeman.'			
15.	motun	naktha-ka	wuisa-lul	ep-nun-ta
	every	camel-Nom	doctor-Acc	carry-Pres-Decl
	'Every camel carries the doctor.'			
16.	motun	wuisa-ka	naktha-lul	ep-nun-ta
	every	doctor-Nom	camel-Acc	carry-Pres-Decl
	'Every doctor carries the camel.'			
17.	motun	naktha-ka	wuisa-lul	tu-n-ta
	every	camel-Nom	doctor-Acc	lift-Pres-Decl
	'Every camel lifts the doctor.'			
18.	motun	wuisa-ka	naktha-lul	tu-n-ta
	every	doctor-Nom	camel-Acc	lift-Pres-Decl
	'Every doctor lifts the camel.'			
19.	motun	namca-ka	yeca-lul	tep-nun-ta
	every	man-Nom	woman-Acc	cover-Pres-Decl
	'Every man cover the woman.'			
20.	motun	yeca-ka	namca-lul	tep-nun-ta
	every	woman-Nom	man-Acc	cover-Pres-Decl
	'Every woman covers the man.'			

Quantified Subjects Passive

1.	motun	kyengchal-i	kirin-ekey	chae-i-n-ta
	every	policeman-Nom	giraffe-by	kick-Pass-Pres-Decl
	'Every policeman is kicked by the giraffe.'			
2.	motun	kirin-i	kyengchal-ekey	chae-i-n-ta
	every	giraffe-Nom	policeman-by	kick-Pass-Pres-Decl
	'Every giraffe is kicked by the policeman.'			
3.	motun	so-ka	kae-ekey	ccoch-ki-n-ta
	every	cow-Nom	dog-by	chase-Pass-Pres-Decl
	'Every cow is chased by the dog.'			
4.	motun	kae-ka	so-ekey	ccoch-ki-n-ta
	every	dog-Nom	cow-by	chase-Pass-Pres-Decl
	'Every dog is chased by the cow.'			
5.	motun	yeca-ka	kirin-ekey	mil-li-n-ta
	every	woman-Nom	giraffe-by	push-Pass-Pres-Decl
	'Every woman is pushed by the giraffe.'			
6.	motun	kirin-i	yeca-ekey	mil-li-n-ta
	every	giraffe-Nom	woman-by	push-Pass-Pres-Decl
	'Every giraffe is pushed by the woman.'			
7.	motun	namca-ka	kae-ekey	ccik-hi-n-ta
	every	man-Nom	dog-by	photograph-Pass-Pres-Decl
	'Every man is photographed by the dog.'			
8.	motun	kae-ka	namca-ekey	ccik-hi-n-ta
	every	dog-Nom	man-by	photograph-Pass-Pres-Decl
	'Every dog is photographed by the man.'			
9.	motun	yorisa-ka	naktha-ekey	kkul-li-n-ta
	every	baker-Nom	camel-by	drag-Pass-Pres-Decl
	'Every baker is dragged by the camel.'			
10.	motun	naktha-ka	yorisa-ekey	kkul-li-n-ta
	every	camel-Nom	baker-by	drag-Pass-Pres-Decl
	'Every camel is dragged by the baker.'			

11.	motun	elwukmal-i	yorisa-ekey	mwul-li-n-ta
	every	zebra-Nom	baker-by	bite-Pass-Pres-Decl
	'Every zebra is bitten by the baker.'			
12.	motun	yorisa-ka	elwukmal-ekey	mwul-li-n-ta
	every	baker-Nom	zebra-by	bite-Pass-Pres-Decl
	'Every baker is bitten by the zebra.'			
13.	motun	kyengchal-i	so-ekey	mwukk-i-n-ta
	every	policeman-Nom	cow-by	tie-Pass-Pres-Decl
	'Every policeman is tied by the cow.'			
14.	motun	so-ka	kyengchal-ekey	mwukk-i-n-ta
	every	cow-Nom	policeman-by	tie-Pass-Pres-Decl
	'Every cow is tied by the policeman.'			
15.	motun	naktha-ka	wuisa-ekey	ep-hi-n-ta
	every	camel-Nom	doctor-by	carry-Pass-Pres-Decl
	'Every camel is carried by the doctor.'			
16.	motun	wuisa-ka	naktha-ekey	ep-hi-n-ta
	every	doctor-Nom	camel-by	carry-Pass-Pres-Decl
	'Every doctor is carried by the camel.'			
17.	motun	naktha-ka	wuisa-ekey	tul-li-n-ta
	every	camel-Nom	doctor-by	lift-Pass-Pres-Decl
	'Every camel is lifted by the doctor.'			
18.	motun	wuisa-ka	naktha-ekey	tul-li-n-ta
	every	doctor-Nom	camel-by	lift-Pass-Pres-Decl
	'Every doctor is lifted by the camel.'			
19.	motun	namca-ka	yeca-ekey	tep-hi-n-ta
	every	man-Nom	woman-by	cover-Pass-Pres-Decl
	'Every man is covered by the woman.'			
20.	motun	yeca-ka	namca-ekey	tep-hi-n-ta
	every	woman-Nom	man-by	cover-Pass-Pres-Decl
	'Every woman is covered by the man.'			

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