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Final (z)-devoicing in Chicano English

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1. Introduction

Compared to many English dialects, Chicano English (ChE) has received relatively little scholarly attention. The situation has improved in recent years with the appearance of a number of survey articles and full-length studies (e.g. Bayley 2008; Bayley & Santa Ana 2004; Fought 2003; Mendoza-Denton 1999; Santa Ana & Bayley 2004) and studies of individual variables and communities (e.g. Bayley 1994, 1999; Fought 1999; Mendoza-Denton 2008; Santa Ana 1992, 1996). However, many ChE features await full investigation. Final (z)-devoicing, e.g. boy[z] —> boy[s], is one such feature.[1] This study, based on more than 1,800 tokens extracted from sociolinguistic interviews with adolescents and young adults in a public housing project in a south Texas *barrio*, shows that (z)-devoicing is systematic and subject to multiple linguistic and social constraints. Multivariate analysis shows that devoicing is conditioned by features of the preceding and following segments, with preceding non-liquid voiced consonants and voiceless following segments favoring devoicing and preceding vowels and voiced following segments favoring voicing. Results also show that devoicing is constrained by morphological status, with devoicing more likely for inflectional (z) than when it is part of a monomorpheme. In addition, although the prevalence of devoicing in ChE is often attributed to Spanish interference (e.g. Thompson 1975), the results of this study show that devoicing is more common among speakers who claim English as their first language than among speakers who claim Spanish as their L1. Moreover, speakers who evidence a desire to leave the community are less likely to produce the devoiced variant than those who express no such desire. We discuss the implications of these results with emphasis on both the linguistic and social conditioning factors.

2. Previous Research

Devoicing of word-final (z) is a feature of many English dialects including

Chicano English (Doviak & Hudson-Edwards 1980; Metcalf 1972; Penfield & Ornstein-Galicia 1985; Thompson 1975), Maori English (Holmes 1996), Jewish English in Michigan (Knack 1991), and, as shown in an experimental study, in the speech of young men and women from the US Midwest and West (Smith 1997). As Smith observes, devoicing is not a random process. Although speakers vary considerably in their overall frequency of devoicing, Smith shows that their rank ordering in different contexts is similar. Devoicing is favored when the fricative is adjacent to a voiceless consonant and in contexts where articulatory effort tends to be reduced.

Despite the fact that (z)-devoicing is found in a wide range of English dialects, it has been viewed as a stereotypical feature of Chicano English, attributable to interference from Spanish. Thompson (1975), for example, in a study of Chicanos in Austin, Texas, describes "Spanish-influenced" pronunciation as "occurrence of [s] where word-final [z] would be expected…" (19). Thompson also claimed that the extent of devoicing was correlated with different attitudes toward the role of language, particularly in work domains. Sawyer (1970), in a study of San Antonio Spanish-English bilinguals, referred to (z)-devoicing as the most persistent feature of a bilingual accent. Doviak and Hudson-Edwards (1980), however, in a study of Chicano children in New Mexico, note that (z)-devoicing was common among in the speech of children whose first language was English.

Although final (z)-devoicing has been widely recognized as a prominent ChE feature, previous studies did not take advantage of the multivariate analytic techniques developed in sociolinguistics. In this study, we employ the techniques of multivariate analysis to address the following questions:

- Is the (z)-devoicing in the English of young Mexican Americans in a south Texas barrio systematic?
- If (z)-devoicing is systematic, what are the linguistic constraints, i.e. which linguistic environments favor devoicing and which disfavor devoicing?
- What is the role of the speakers' first language in (z)-devoicing?
- What is the role of the speakers' current patterns of language use in (z)-devoicing?
- What is the relationship between speakers' aspirations and their use of the devoiced variant?

3. Methods

3.1. Data

The data analyzed here were collected between 1992 and 1995 in "Buena Vista Courts" (a pseudonym), a public housing project in San Antonio, Texas. The

project is located on the west side of San Antonio in the city's oldest *barrio*. Residents of the Courts are overwhelmingly of Mexican-origin and all have incomes below the federal poverty line (see Bayley 1994 for a detailed description).

Speakers were interviewed by bilingual Latino/a graduate students at the University of Texas at San Antonio and encouraged to speak in their language of choice. Interviews dealt with speakers' life histories and topics of current community concern. From a larger sample, we selected thirteen adolescents and young adults who used a sufficient amount of English for analysis during at least one interview. Speakers were chosen to represent a range of speech styles as well as a range of perspectives and life goals. Table 1 shows their demographic characteristics.

Table 1. Speakers' Demographic Characteristics

Speaker	Sex	Age	Birthplace	L1	Home language	Highest grade
001	F	15	Laredo	English	Eng./Span.	7
003	F	16	San Antonio	Spanish	Eng./Span.	9
005	F	15	San Antonio	English	Eng./Span.	9
007	F	15	Chicago	English	Eng./Span.	8
008	M	15	San Antonio	Spanish	Span./Eng.	8
009	F	18	San Antonio	Spanish	Span./Eng.	12
011	F	19	St. Louis	English	Eng./Span.	8
015	F	17	San Antonio	Spanish	Eng./Span.	8
016	M	18	San Antonio	Spanish	Spanish	9
020	M	17	San Antonio	Spanish	Spanish	8
021	F	19	San Antonio	English	Eng./Span	8
022	M	20	Los Angeles	English	English	13
024	M	16	San Antonio	Spanish	Spanish	7

As shown in Table 1, many of the young people in this community are behind grade level. Indeed, a number have dropped out of school entirely. Speaker 001 ("Alicia"), for example had recently returned to San Antonio after having run away for over a year. She had been involved in various questionable activities in North Texas during the time she was away from home. When we met her, she was participating in a rehabilitation program run by a local evangelical church. Other speakers, however, exhibited considerable determination to escape the life of poverty they had experienced. Speaker 022 ("Keith"), for example, had completed high school and was attending community college. His Anglo girlfriend lived outside of the Courts. Finally, as the summary of demographic characteristics illustrates, "Buena Vista" is a bilingual community. All of the speakers except Keith reported that they regularly use at least some Spanish at home, a fact that our observations in the community confirmed.

3.2. Coding

All data were coded by Messing. Interviews were first converted to digital format, then played using Windows Media Player. Each word-final /z/ was coded for one dependent variable and multiple independent variables, discussed below. The voice identity of the segment was transcribed aurally, with any potentially ambiguous segments analyzed for voice identity with Praat phonetics software (Boersma & Weenik 2005).

Spectrograms of two tokens extracted using Praat, both produced by speaker 9, an 18 year-old female, are shown below. Figure 1 shows the voiced variant, with a following voiced obstruent, in the context “she does but ...”. Figure 2 shows the devoiced variant, in an utterance final context, “ya she does”.

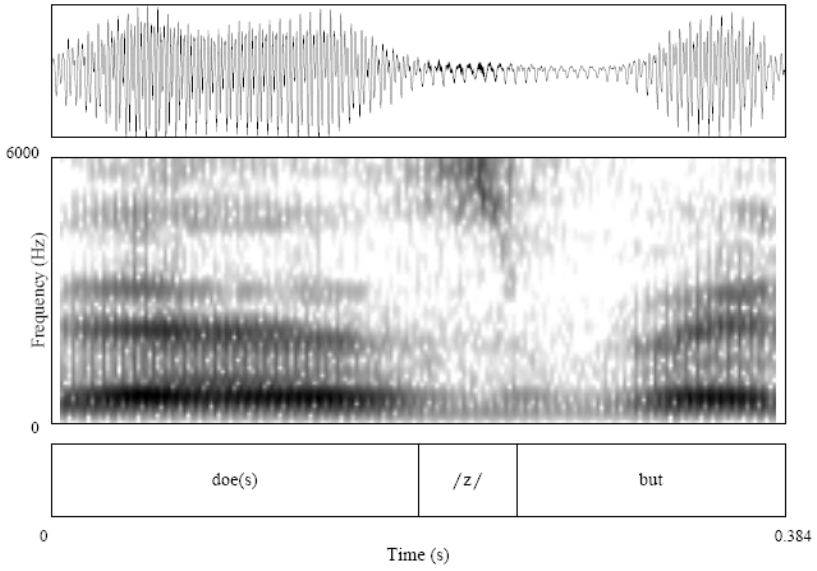

Figure 1. Voiced (z) in *does*

All tokens were coded for a range of possible linguistic and social factors. Linguistic factors included morphological class (monomorpheme, plural, 3rd person singular present, possessive, contracted copula), features of the preceding segment (voiced consonant, liquid, vowel), features of the following segment (voiced consonant, liquid, glide, vowel, voiceless consonant, [s]), and syllable stress. Social factors included gender, reported first language, current home language, and education.

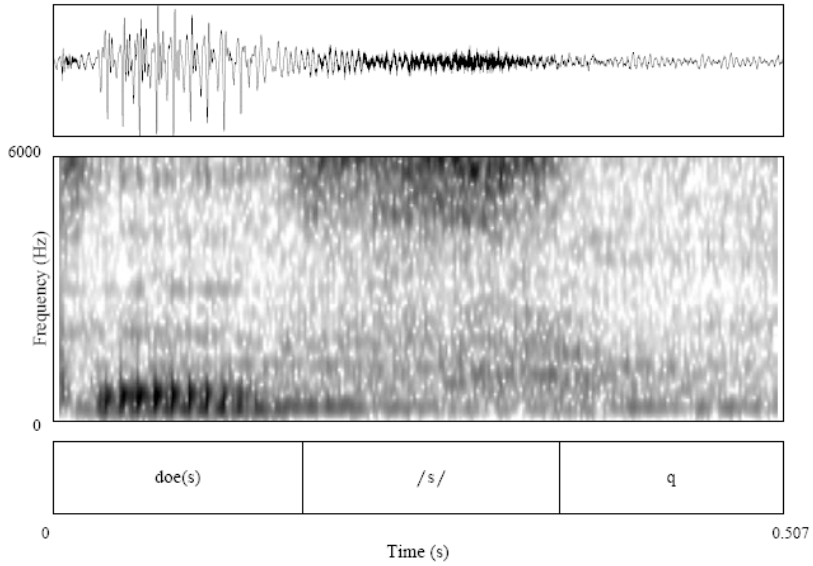

Figure 2. Devoiced (z) in *does*.

3.3. Analysis

Data were analyzed with GoldVarb X (Sankoff, Tagliamonte, & Smith 2005), a specialized application of logistic regression that has long been used in studies of sociolinguistic variation. The program allows the researcher to test simultaneously the effect of a large number of factors on the choice of a linguistic variant, in this case voicing or devoicing of final /z/. GoldVarb includes procedures for testing the statistical significance of factor groups and of individual factors within groups. Results are reported as factor weights, with weights between 0 and .5 disfavoring the use of a variant, in this case devoiced /z/, and weights between .5 and 1.0 favoring the variant. Factor weights, however, must be interpreted in terms of the input value, that is the overall likelihood that the variant of interest will be used, regardless of the presence of absences of any other factor in the environment.

4. Results

Overall, final (z)-devoicing is extremely common in the speech of Buena Vista young people. Of 1,825 tokens analyzed, 714, or 39.1 percent, were devoiced.

Moreover, the results of multivariate analysis show a complex patterning. Devoicing is constrained by features of the preceding and following segments and morphological class. Among the linguistic factors, only syllable stress failed to reach statistical significance. Results for linguistic factors that reached statistical significance at the .05 level are shown in Table 2.

Table 2. Results: Linguistic Constraints

Factor group	Factor	N	% –vcd	Weight	Range
Following	[s]	75	77.3	.845	
segment	Pause	295	66.1	.779	
	Voiceless consonant	198	62.1	.742	
	Voiced consonant	491	31.9	.423	
	Vowel or glide	766	24.7	.326	.519
Preceding	Voiced consonant	454	50.7	.594	
segment	Vowel	1056	34.4	.487	
	Liquid	315	38.1	.407	.187
Morphological	Plural, contracted				
class	copula, possessive	1041	46.6	.574	
	3 sg. present	102	35.3	.462	
	Monomorpheme	682	28.2	.394	.180
Total	Input	1825	39.1	.370	

Notes: Where appropriate, factors that did not differ significantly from one another have been combined. X^2/cell = 1.1594; log-likelihood = – 1011.900.

As Table 2 shows, devoicing is constrained by the voicing of the preceding and following segments. The following segment is the first order constraint, with a range of .519 between the factor that most favors devoicing ([s]), and the least favorable factor (vowel or glide). Voiceless following segments favor the devoiced variant, while voiced following segments favor the voiced variant. However, even when the following segment is voiced, speakers still devoice /z/ at a rate of between 24.7 and 31.9 percent. The preceding segment also had a significant effect on a speaker's choice of variant. Voiced consonants other than liquids favored devoicing, while vowels and liquids disfavored devoicing. Finally, the morphological class to which the variable belonged also had an effect. With the exception of third person singular -s, devoicing was favored when the variable was an inflectional morpheme and disfavored when it was part of a monomorpheme.

As shown in Table 3, several social factors also reached statistical significance. Because all of the young women reported using both Spanish and English at home, while the young men reported three different patterns of current home language use, the factor groups for gender and current home language were combined into a single factor group. Results for the combined factor group indicate that females are more likely to produce the devoiced variant, followed

by males who report using both English and Spanish at home. Devoicing is disfavored by males who report using only Spanish or only English at home.

Perhaps the most surprising result concerns reported first language. Although, as noted above, (z)-devoicing has often been attributed to Spanish influence, speakers who claimed English as a first language are significantly more likely to choose the devoiced variant (.559) than speakers who claimed Spanish as their first language (.460). This result, combined with studies documenting the process in other dialects, suggests that final (z)-devoicing cannot be regarded simply as the result of Spanish interference, although in the community studied here, it may well have originated in Spanish contact. However, it is now a salient feature of the English spoken by young Chicanos for whom English is the dominant language. We explore this issue further in the following discussion of four representative individuals.

Table 3. Results: Social Constraints

Factor group	Factor	N	% –vcd	Weight	Range
Gender by	F, Eng. & Span.	952	46.5	.589	
home language	M, Eng. & Span.	171	41.5	.545	
	M, Spanish	496	30.6	.434	
	M, English	206	22.8	.235	.354
Reported L1	English	738	42.7	.559	
	Spanish	1087	36.6	.460	.099
Total	Input	1825	39.1	.370	

In recent years, many sociolinguists have moved away from classifying speakers according to predetermined social categories such as gender, class, and ethnicity and begun to look at how speakers position themselves vis-à-vis the various communities in which they participate (see e.g. Eckert 2000; Mendoza-Denton 2008). In accord with recent developments in the field, we looked closely at four speakers who differed radically in their rates of (z)-devoicing, as well as in their use of other vernacular features. Two speakers, “Alicia” and “Don”, had lived most of their lives in the Courts and participated fully in the vernacular culture. Alicia had left school after the 7th grade and, as noted above, had recently returned to San Antonio after spending a year as a runaway. Don, who still attended school, spent his time with a handful of friends in the Courts. In addition to speaking Chicano English vernacular, he was among the most prolific code-switchers in the corpus. In fact, the majority of his sentences contain at least one switch.

The other two individuals examined here represent a very different orientation and set of aspirations. “Bettina” was very much involved in school and often spoke about her desire to move to a better environment. In fact, when she was asked to name a person she admired, she named her cousin, an engineering student at Texas A&M University who had managed to escape from gang life.

Bettina hoped to follow in his footsteps. Keith, at 20, was one of the older speakers in the corpus and one of the few who had completed high school. He attended a local community college and planned to enter the military to develop a skill and be able to complete a university degree. Like all speakers in the study, he had receptive ability in Spanish, but unlike most of the youth in Buena Vista, he seldom spoke the language and, at least in our interviews, he never code-switched.

As the data in Table 4 show, the effect of the different orientations on the rate of (z)-devoicing is dramatic. Don devoices final /z/ at a rate of nearly 70 percent, compared to an average rate of slightly more than 39 percent for the entire corpus. Alicia, who devoices final /z/ at a rate of 57 percent, is not far behind. Bettina and Keith, two of the speakers with orientations that extend beyond the Courts, contrast sharply with Alicia and Don. Bettina devoices /z/ at a rate of only 25 percent, while Keith has the lowest devoicing rate in the corpus – 22.8 percent.

Table 4. The Effect of Orientation: Results for Four Individuals

Speaker	Orientation	% –vcd	Weight
"Alicia"	Courts	57.0	.696
"Don"	Courts	69.8	.720
"Bettina"	External	25.0	.336
"Keith"	External	22.8	.279
All speakers		39.1	.363

The results in Table 4, however, do raise another issue. Given their widely varying rates of (z)-devoicing, can these four speakers – and by extension the other speakers in the corpus – all be considered members of the same speech community? To answer this question, we return to the results of the analysis that included individual speakers. Table 5 shows percentages of devoicing by following segment by the four speakers examined in detail as well as in the corpus as a whole. Note that we have combined a number of factors because when we consider speakers individually cells are necessarily smaller than they would be with a group and therefore subject to greater statistical fluctuation.

Table 5. (z)-devoicing by Following Segment: Percentages for Four Individuals

	Following Segment	
Speaker	Voiced consonant, vowel, glide	Voiceless consonant, pause
"Alicia"	49	71
"Don"	62	77
"Bettina"	11	64
"Keith"	14	48
All speakers	27	66

As Table 5 shows, all four speakers devoiced (z) more frequently when it was followed by a voiceless consonant or a pause than when it was followed by a voiced segment. Moreover, the same pattern holds for all individuals in the corpus. In a similar fashion all speakers except one, Alicia, devoiced (z) more frequently when it functioned as an inflectional morpheme than when it was part of a monomorpheme. And, Alicia devoiced the same percentage of inflectional morphemes and monomorphemes.

On the basis of the individual results, then, we can say that the speakers examined here fulfill Guy's (1991) criterion for membership in a speech community, as least with respect to (z)-devoicing. That is, speakers may vary in the rate in which they select a particular variant, in this case the devoiced variant, but they are all subject to the same linguistic constraints on the variation.

5. Discussion and Conclusion

At the end of section 2 above, we raised five questions concerning (z)-devoicing in ChE. We are now in a position to answer those questions, at least with respect to the young people in one urban community. First, as suggested by Doviak and Hudson-Edwards (1980), (z)-devoicing is systematic. Second, the process is subject to multiple linguistic constraints. The results for the features of the preceding and following segments generally agree with Doviak and Hudson-Edwards' results. Previous studies did not, however, consider the potential effect of morphological class, which we also found to be statistically significant.

With respect to the role of social constraints, we suggest that the finding that speakers who claimed English as an L1 were more likely to devoice final (z) than those who claimed Spanish as an L1 provides additional evidence that ChE should be considered as an ethnic dialect rather than a transitory phenomenon. Speakers' L1 appears to have only a minor role in the prevalence of (z)-devoicing. Rather, other factors are more important. For example in the results presented here, gender and current home language have greater influence on the extent of (z)-devoicing than the speaker's L1. Like most people in Buena Vista, the young women in our study used both Spanish and English at home. Young men's patterns of home language use were much more varied. However, regardless of their patterns of home language use, young men were significantly less likely to devoice final (z) than were young women. This is true even of the young men who reported using mostly Spanish at home.

Finally, we suggest that individual attitudes towards life in the Courts and individual aspirations have a major influence on the extent to which speakers devoice final (z), and presumably on the extent to which they use other ChE features as well. Speakers like Alicia and Don, whose lives are circumscribed by

the environment of the Courts, exhibit very high rates of (z)-devoicing. Speakers like Bettina and Keith, who aspire to or who have actually begun to move beyond the world of the Courts, exhibit relatively low rates of (z)-devoicing. We would argue that the results for the individuals presented in Tables 4 and 5 above constitute further evidence of the need for more finely nuanced studies of language variation. The four speakers whose individual results we have presented are clearly members of the same speech community. Equally clearly, however, their individual orientations strongly affect their linguistic behavior. Future studies need to take these individual factors into account.

Note

[1] In variationist sociolinguistics, the linguistic variable is considered a structural unit and enclosed in parentheses (Chambers 2009). Thus, (z) refers to the sociolinguistic variable investigated here; [z] and [s] refer to the phonetic realizations.

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Anaphoric Resolution in Conjunction and Quantificational Structures in Discourse Representation Theory

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1. Introduction

1.1 Purpose

This paper proposes a left-to-right analysis of anaphora within the bottom-up version of Discourse Representation Theory, in which the principles of anaphoric resolution do not resort to any particular syntactic theory and are defined solely in terms of lexical information and accessibility between discourse representation structures and discourse referents.

1.2 Scope

The data to be discussed in this paper include anaphora and cataphora in conjunction structures as in (1) through (3) and in quantification structures as in (4).

(1) a. If Smith$_1$ likes her$_2$, he$_1$ supports Jane$_2$
b. If he$_1$ likes her$_2$, Smith$_1$ supports Jane$_2$.
c. *He$_1$ supports her$_2$, if Smith$_1$ likes Jane$_2$.
(2) a. Because Jane$_1$ hit him$_2$, Smith$_2$ screamed.
b. *He$_1$ screamed, because Jane$_2$ hit Smith$_1$.
(3) a. Maria$_1$ owns a donkey$_2$ and she$_1$ loves it$_2$.
b. *She$_1$ owns it$_2$ and Maria$_1$ loves a donkey$_2$.
(4) a. *A senator who likes him$_1$ supports every representative$_1$.
d. Every senator$_1$ meets most representatives who support him$_1$.

2. Motivation

Many works in Discourse Representation Theory, including Kamp (1981), and Kamp, Genabith, and Reyle (to appear), have focused on principles of anaphoric resolution in conditional sentence constructions and generalized-quantificational constructions. Most of them, however, have

limited their focus only on conditional and quantificational structures of the form *if* S_1 *then* S_2 or *QP VP*, such as *If* $John_1$ *loves* her_2, he_1 *courts* $Mary_2$ and *Every* boy_1 *loves a girl who loves* him_1, where conditional conjunctions or quantifiers occur in sentence initial position. The other types of conditional or quantified sentences, S_1 *if* S_2 or *NP V QP*, where conditional conjunctions or quantifiers occur in non-sentence-initial position as in $John_1$ *courts* $Mary_2$ *if* he_1 *loves* her_2, *He_1 *courts* $Mary_2$ *if* $John_1$ *loves* her_2, and **A girl who loves* him_1 *loves every* boy_1, have been rarely discussed. Just a few of papers including Robert (1987), Asher and Wada (1989), and van Deemter (1990) have discussed them in Discourse Representation Theory, but most of them except Chung (1992, 2004, 2008) and Kamp and Reyle (1993) have attributed the grammaticality of those sentences in question to the violation or non-violation of something other than accessibility, such as Binding Condition C. Kamp, Genabith, and Reyle (to appear) just state that conjunction structures such as *When* he_1 *saw* her_2 $John_1$ *waved to* $Mary_2$, and *He_1 *waved to* her_2 *when* $John_1$ *sawMary*$_2$, require a complex analysis but do not discuss what it would be like.

I will briefly discuss Kamp and Reyle (1993)'s view and Kamp, Genabith, and Reyle (to appear)'s in this section and will introduce an extended analysis of Chung (2004, 2008) in the next section.

2.1 Kamp and Reyle (1993)

Kamp and Reyle (1993: 282-5) suggest two ways to build a DRS for a reading of (5) in which the object NP has scope over the subject.

(5) A problem about the environment preoccupies every serious politician.

One is to let the universal quantifier phrase cause the ongoing DRS to change into duplex DRS of $K_1 \Rightarrow K_2$. Kamp and Reyle, however, do not elaborate this in details because they think it would introduce an additional element of complexity into their formalism. The other way they suggest is to loosen the constraints on the order of application of the construction rules. This allows the universal quantifier phrase in the object position to be processed before the subject, as shown in (6a) and (6b).

(6) a.

x serious politician(x)	⇒	a problem about the environment preoccupies x

b.

x serious politician(x)	⇒	y problem about the environment(y) y preoccupies x

This loosening of the constraints on the order of application of the construction rules, however, might wrongly allow an undesirable coreferential reading. For example, such a loosened order of application of the construction rules may allow the object NP *a girl who does not like Bill* in (7) to be processed before the subject NP *he*, so that the discourse referent introduced by the proper name *Bill* is available for the pronoun *he*. This would result in an undesirable coreferential reading of the two.

(7) *He$_1$ loves a girl who does not like Bill$_1$.

To resolve such problem, Kamp and Reyle postulate a constraint that a pronoun in subject position cannot be linked to a discourse referent that already occurs in a corresponding object position. There still remains a problem with such loosening of the application order of the construction rules. The problem is that it may block possible anaphoric links between pronouns in object position and their antecedents in subject position. For example, when the object NP has a wide scope over the subject NP in (8) below, the object NP *a book they needed* would be processed before the subject *most boys* in (8). When *they* is processed, there would be no discourse referent for it to be identified with. And, the discourse referent for *most boys* would be introduced into a DRS which is not accessible from the pronoun. Thus, the coreferential reading of *they* and *most boys* would be wrongly blocked.

(8) Most boys$_1$ found a book they$_1$ needed.

Another problem with Kamp and Reyle's analysis is that it may not be able to rule out undesirable coreferential readings between proper or common nouns and pronouns in structures like (9).

(9) *He$_1$ supports her$_2$, if Smith$_1$ likes Jane$_2$.

In their analysis, conditional clauses are processed in the left sub-DRS while their main clauses are processed in the right sub-DRS. And, the discourse referents introduced by nominal expressions in a conditional clause are accessible from any expressions in the corresponding main clause. Their analysis, thus, would wrongly allow the coreference between *Smith* and *he* in (9). The coreferential reading between *Smith* and *he* in (10) would be wrongly blocked in a similar fashion in their analysis, since there would not be any discourse referent available for it to be identified with when it is processed.

(10) Smith$_1$ supports Jane$_2$, if he$_1$ likes her$_2$.

2.2 Kamp, Genabith, and Reyle (to appear)

Kamp, Genabith, and Reyle (to appear: 156) point out that, when the subordinate clause precedes the main clause as in (11a) and (11c), resolution

may go in either direction, with the main clause serving as context for the justification of presuppositions arising within the subordinate clause as well as the other way round.

(11) a. Because Tom_1 liked $Bree_2$, he_1 voted for her_2.
b. Tom_1 voted for $Bree_2$, because he_1 liked her_2.
c. Because he_1 liked her_2, Tom_1 voted for $Bree_2$.
d. *He_1 voted for her_2, because Tom_1 liked $Bree_2$.

They, however, do not discuss how such resolution could be explained. They just state that these cases require a more complex analysis. They do not address possible and non-possible coreferential readings between two noun phrases in those structures discussed in the previous section.

3. Dynamic Discourse Representation Theory

This section introduces a left-to-right analysis of anaphoric resolution in the bottom-up version of Discourse Representation Theory, which revises and extends the analysis proposed in Chung (2004, 2008). I will call the analysis introduced here as Dynamic Discourse Representation Theory to distinguish it from other variants of DRT. The term 'dynamic' would be redundant because Discourse Representation Theory itself has been regarded as a dynamic semantics. I will, however, use it to emphasize that the analysis I propose is more dynamic than other variants of DRT.

3.1 Some basic rules

As I did in Chung (1992, 2004, 2008), I assume the following three basic construction rules.

(12) a. Every sentence introduces a new DRS into the ongoing DRS.
b. Every NP introduces a discourse referent into the DRS in which it is processed.
c. Discourse referents and conditions can percolate up to a higher DRS.

These three rules are similar to the construction rules of Sandt (1992) and Kamp, Genabith, and Reyle (to appear). I would not discuss them in details here.

I also assume the following construction rules, as in Chung (1992, 2004, 2008).

(13) a. Operators in non-sentence-initial positions cause the ongoing DRS to split into two DRSs with the same index.
b. DRSs with the same indexes are regarded as one and the same one in terms of accessibility.
c. Non-identity rules: A discourse referent x for a pronoun α in DRS K_i cannot be identified with a discourse referent y for a

non-pronounβsuch that *y* is introduced to DRS K_i later than *x*, (unless *y* is for a definite description and there is *z* such that *z* immediately embeds *x* and does not embed *y*).

The rules in (13) are the ones which make my analysis different from other analyses.

In the following sections, I will illustrate how Dynamic Discourse Represent Theory (henceforth DDRT) can explain the grammaticality of coreferential readings discussed in the previous sections.

3.2 Anaphoric resolution in conjunction structures

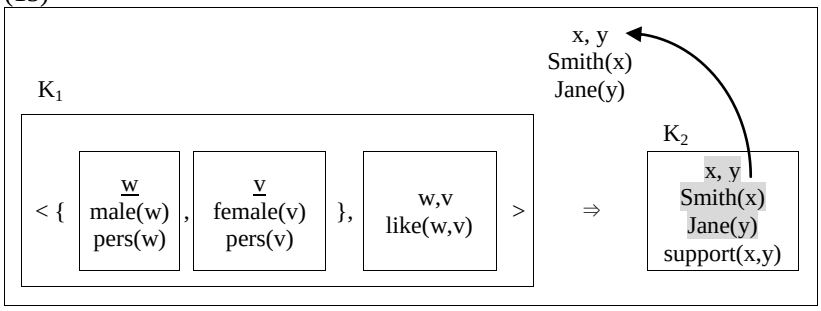
3.2.1 Conditional structures

Consider the following two examples.

(14) a. If he_1 likes her_2, $Smith_1$ supports $Jane_2$.
b. *He_1 supports her_2, if $Smith_1$ likes $Jane_2$.

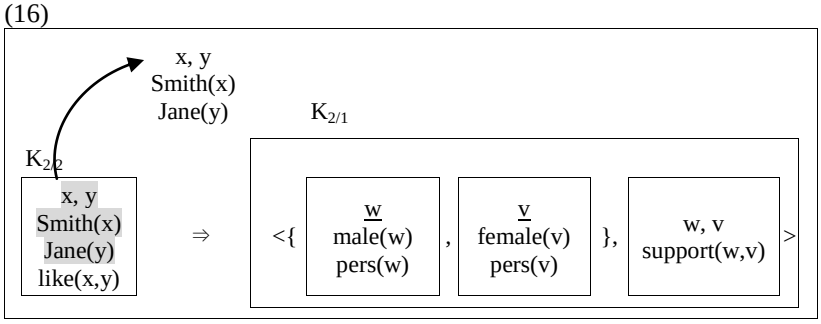
(14a) will generate a preliminary DRS (15). The conditional clause is first processed in the left DRS before the main clause in the right DRS. The discourse referents and conditions introduced by the two proper names are introduced first into the sub-DRS K_2 and then are percolated to the main DRS.

(15)



However, the main clause in (14b) will be processed before the conditional clause, following construction rule (13a). When the conditional clause is processed, the sub-DRS K_2 for the main clause is split into two DRSs $K_{2/1}$ and $K_{2/2}$ with the same index, as shown in (16).

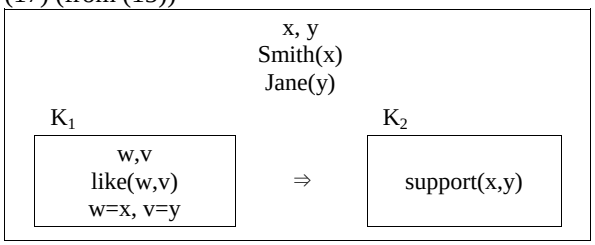
(16)



Here, the second index represents the order of construction. That is, sub-DRS $K_{2/1}$ is constructed before sub-DRS $K_{2/2}$.

In (15), the discourse referents percolated to the main DRS, *x* and *y*, are accessible from the discourse referents in sub-DRS K_1. DRS (15) thus can be further developed to DRS (17) with the identity conditions *w=x* and *v=y*.

(17) (from (15))



In (16), however, such anaphoric links are blocked by the Non-Identity Rule in (13c) because *x* and *y* are introduced into sub-DRS $K_{2/2}$ after w and v are introduced into sub-DRS $K_{2/1,}$ and all of those discourse referents are regarded to be in the same DRS in terms of accessibility, as defined in Construction rule (13b). Thus, DRS (16) cannot be further developed. This explains why (14b) with the intended coreferential readings is regarded to be ungrammatical.

3.2.2 Subordinate structures

In this section, I discuss anaphoric links in subordinate structures such as *when*-clauses, *before*-clauses, and *because*-clauses.

First, I assume that, unlike Kamp, Genabith and Reyle (to appear)'s claim, anaphoric links in these subordinate structures should not be analyzed in the same way as those in coordinate structures are. This assumption is based on the different patterns of anaphoric links in subordinate and coordinate structures, as shown in (18) and (19).

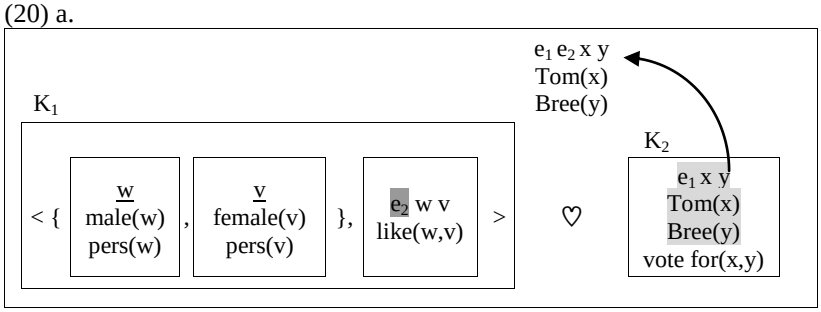
(18) a. Because Tom_1 liked $Bree_2$, he_1 voted for her_2.
b. Tom_1 voted for $Bree_2$, because he_1 liked her_2.
c. Because he_1 liked her_2, Tom_1 voted for $Bree_2$.
d. *He_1 voted for her_2, because Tom_1 liked $Bree_2$.

(19) a. Maria$_1$ owns a donkey$_2$ and she$_1$ loves it$_2$.
b. ?*She$_1$ owns a donkey$_2$ and Maria$_1$ loves it$_2$.
c. *She$_1$ owns it$_2$ and Maria$_1$ loves a donkey$_2$.
d. *And Maria$_1$ owns a donkey$_2$, she$_1$ loves it$_2$.

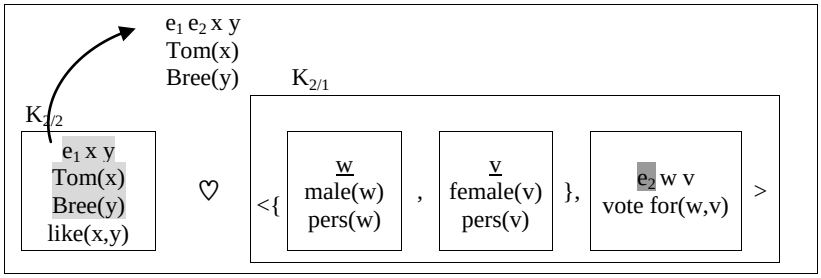
In subordinate structures, pronouns may precede their antecedents, as shown in (18c), while they cannot in coordinate structures.

I further assume that the main clause is *interpreted and evaluated* in the context established by the subordinate clause. This assumption has been shared by many studies including Heim (1982), Hinrichs (1986), Enç (1987), Partee (1987), and Chung (1989, 2008). Given this assumption and the construction rules in (13), the preliminary DRSs for (18c) and (18d) would be like (20a) and (20b), respectively.

(20) a.



b.



The discourse referents introduced by the two proper names, *x* and *y*, are accessible from the discourse referents introduced by the two pronouns, *w* and *v*. Thus, two identity conditions *x=w* and *y=v* can be added to (20a). Such anaphoric links, however, are not allowed in (20b), for the exactly same reason as we discussed regarding DRS (16).

This proves that DDRT can successfully explain possible and non-possible anaphoric links in subordinate structures.

3.2.3 Coordinate structures

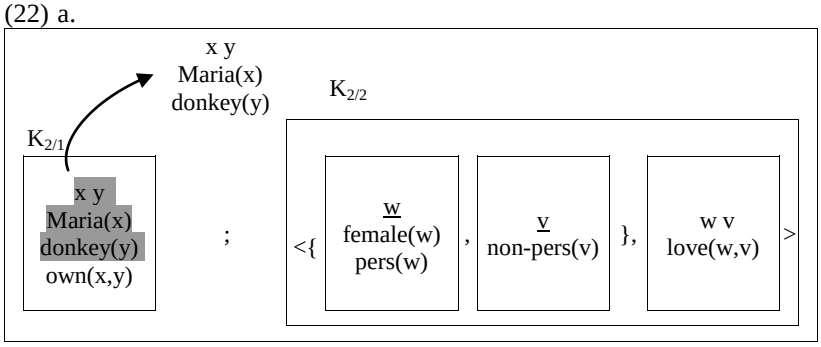
I propose that coordinate structures also cause the ongoing DRS to split into two DRSs with the same index as subordinate structures following their main structures do. But unlike in the case of subordinate structures, the new sub-DRS is generated on the right to the ongoing DRS. This means that any

discourse referent introduced by the first conjunct can serve as an antecedent for the anaphoric pronouns in the second conjunct, and that the discourse referents introduced by the second conjunct cannot serve as local context for the justification of a presupposition triggered by the second conjunct.

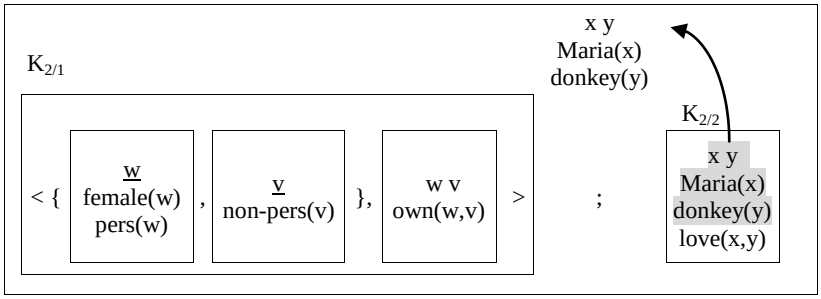
Under this assumption, (21a) and (21b) will generate (22a) and (22b), respectively, as their preliminary DRS.

(21) a. Maria$_1$ owns a donkey$_2$ and she$_1$ loves it$_2$.
b. *She$_1$ owns it$_2$ and Maria$_1$ loves a donkey$_2$.
c. ?/*She$_1$ owns a donkey$_2$ and Maria$_1$ loves it$_2$.
(Kamp and Reyle 1993:215)

(22) a.



b.



In (22a), *x* and *y* are accessible to *w* and *v*, and two identity conditions *x=w* and *v=y* can be added. But, in (22b), such anaphoric links are blocked by the Non-Identity Rule in (13).

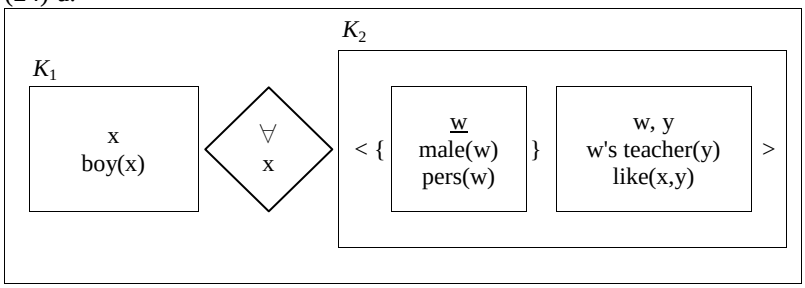
3.2.4 Quantification structures

The grammaticality of the quantification structures in (23) is explained in the exactly same fashion as the grammaticality of the conditional structures in section 3.2.1 is.

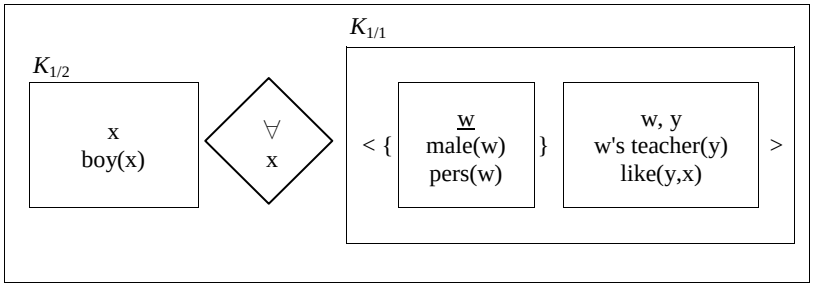
(23) a. Every boy$_1$ likes his$_1$ teacher.
b. *His$_1$ teacher likes every boy$_1$.

(24a) and (24b) are a preliminary DRS for (23a) and (23b), respectively.

(24) a.

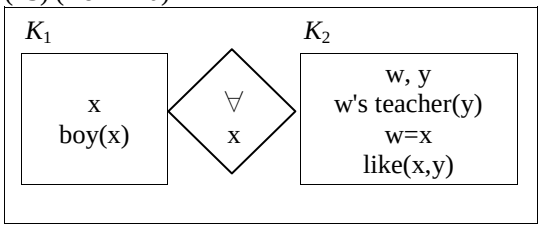


b.



In (24a), the discourse referent for the quantifier phrase, *x*, is accessible to the discourse referent for the pronoun, *w*. The identity condition of *x*=*w*, therefore, can be added to (24a), deriving DRS (25). However, addition of the same identity condition to (24b) is blocked by the Non-Identity Rule, because *x* and *w* are regarded to be in the same DRS and *w* is introduced before *x*.

(25) (from 24a)

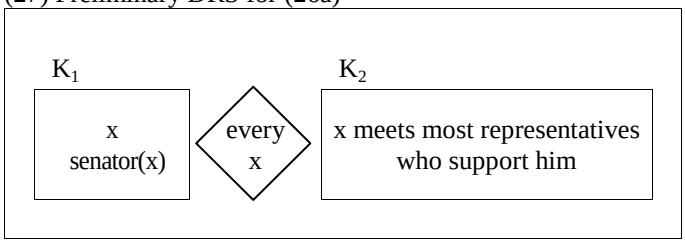


Let's examine more complex quantification structures such as (26).

(26) a. Every senator$_1$ meets most representatives who support him$_1$.
b. Most senators$_1$ meet every representative who supports them$_1$.
c. *A senator who likes him$_1$ supports every representative$_1$.
d. *Every woman who likes them$_1$ supports most candidates$_1$.
e. *Most representatives who support him$_1$ meet every senator$_1$.

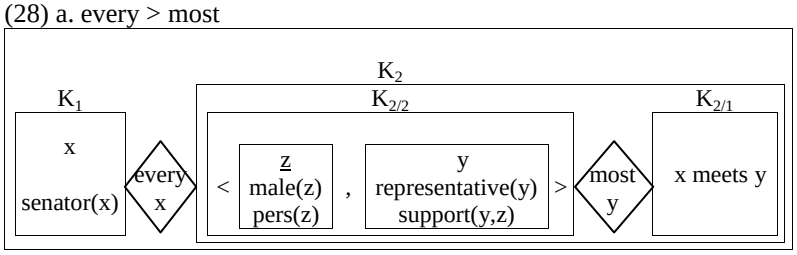
The preliminary DRS for (26a) would be like (27).

(27) Preliminary DRS for (26a)

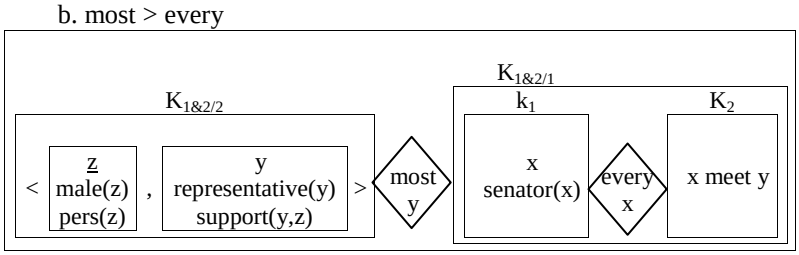


(27) can be further developed either to (28a) or to (28b), depending which quantifier phrase has wider scope.

(28) a. every > most

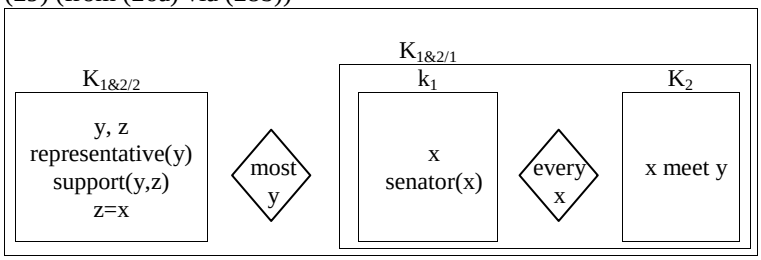


b. most > every



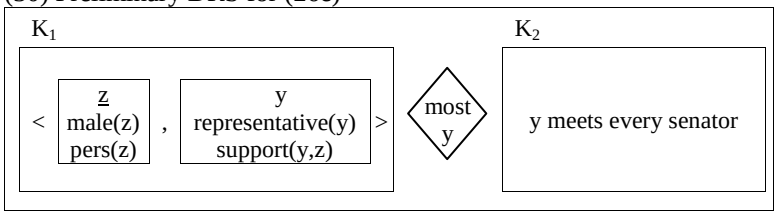
In both DRSs (28a) and (28b), the discourse referent introduced by the universal quantifier phrase, *x*, is accessible from the discourse referent introduced by the pronoun, *z*. This means that the pronoun *he* can be coreferential with the universal quantifier phrase *every senator*, no matter which quantifier phrase has wider scope in (26a). For the sake of saving space, only one of the final DRSs we can derive from (26a) is given below.

(29) (from (26a) via (28b))



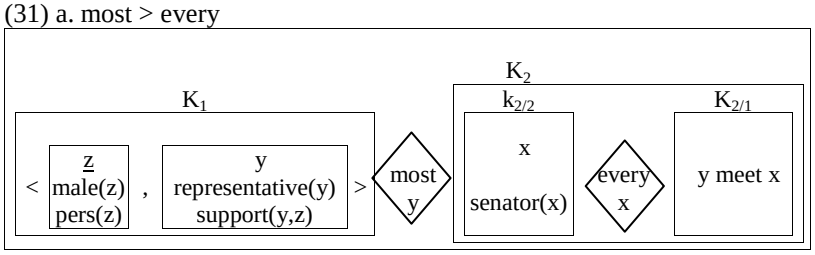
On the contrary to (26a), (26e) cannot have the intended coreferential reading, no matter whether *every senator* has scope over *most representatives* or not. DRS (30) is the preliminary DRS for (26e).

(30) Preliminary DRS for (26e)

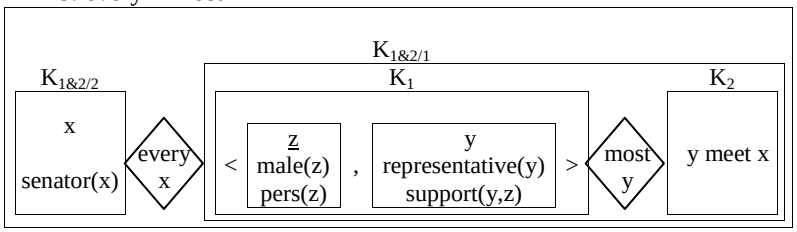


From (30), two different DRSs can be derived, depending on which quantifier phrase has wider scope. (31a) would be derived when *most representatives* has scope over *every senator*. (31b) is the one to be derived if *every senator* has wider scope.

(31) a. most > every



b. every > most



In neither of (31a) and (31b) can an identity condition $x=z$ be derived. x is simply inaccessible to z in (31a). In (31b), x is accessible to z, but the identification of x with z is prevented by the Non-Identity Rule.

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A Paradox of English Determination: the Construction of Complex Number Expressions

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1. Introduction

In this paper, we investigate some points of interaction among complex number constructions. Possibly *the* most thorny issue, for English, is the question of determiner agreement. In simple cases, determiners (like *a, this, those*) agree with the number morphologically encoded on their noun. But in English (as in many other languages), numbers interact with agreement in non-straightforward ways. An example can be seen in (1a), in which multiple constructions interact to produce a singular-agreement determiner with a plural noun. As can be seen by comparison to other similar phrases, neither the singular agreement of the determiner *a* (1b), nor the grammaticality of range expressions combined with any kind of shared determiner (1c) can be taken for granted.

(1) a. an absolutely mind-boggling million to billion star clusters
b. these/*a thirty to forty clusters
c. *the/*those/*a (from) million to billion clusters

Before we can discuss how the constructions interact to produce the attested grammaticality (section 5), we must first describe the constituent constructions: complex number expressions (section 2), the *whopping*-pattern (section 3), and the range construction (section 4).

2. Number expressions

There are several different basic classes of numbers: [1]

- Simple numbers: *one, seven, eighty-seven* (all numbers < 100, excluding *dozen*.)
- Dependent numbers: *dozen, hundred, thousand, million*
- Complex number expressions: *one million, four hundred, three thousand*

forty-five; complex numbers have a multiplier (***four*** *hundred*) and may have an addition (*four hundred* ***(and) fifty***); see (6).

Simple numbers and complex numbers have identical external syntax; both, for example, require and project nominal structures which, as usual, have number agreement between determiner and head noun (2a) and allow "N' ellipsis" (2b), i.e., they can be pumped to NP (see Michaelis (to appear) on a similar type of pumping construction). They are also both usable as multipliers in the Complex number construction (2c).[2]

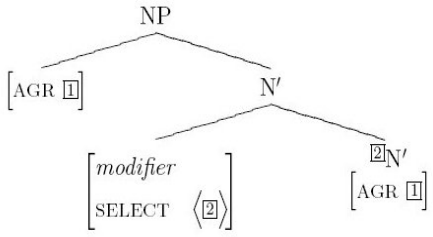
(2) a. those/#that **three (hundred)** people/*person
b. There were **three (hundred)**.
c. **three (hundred)** million

The external syntax of Dependent numbers is somewhat different. There are essentially two patterns: 1) they can be multiplied, creating complex numbers (3a), or 2) they can combine with an N' (as the other numbers do), but in this case they produce an N' that requires a determiner (3b)—most surprisingly, when the NP is indefinite, they require the singular determiner *a* (3c). As always, determiners may not iterate (3d).

(3) a. Three thousand admirals participated.
b. The thousand admirals who participated were....
c. A thousand admirals participated.
d. *The a thousand / A the thousand...

We capture the behavior of numbers with the following constructions (4-6). In (4) we show the usual case wherein a nominal modifier selects an N', producing an N' with identical CAT features (including part-of-speech and morphological marking); the specifier in the leftmost branch, furthermore, selects the upper N' whose agreement characteristics are identical to those of the head noun.[3]

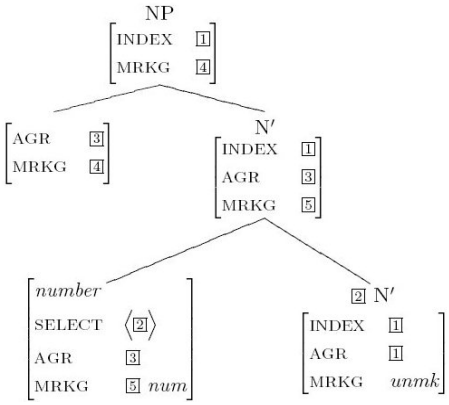
(4) Normal Modifier with N' and specifier



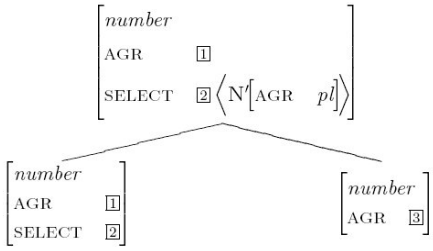
In (5), we describe how numbers combine successively with a head noun and then with a determiner whose agreement selection may not match that of the

original noun. The basic simplifying assumption is that the difference between the simple and dependent numbers is essentially what kind of determiner agreement their lexical entries require. The most important point to note is the AGR feature of the specifier (the determiner, for all purposes herein), which must be identical to that of the number, not the AGR value of the noun, as in (3c). This allows us to write lexical entries for dependent numbers (e.g. *hundred*) which idiosyncratically have singular agreement features, while the simple numbers (e.g. *twenty*) have agreement identical to the N' they select. Verbal number agreement instead uses the value of INDEX, which is the same on the original noun and the resulting NP (hence plural verbal agreement for *a hundred people know*).[4] The marking (MRKG) *num* ensures that one cannot iterate application of numbers (*the *three five* pianists).

(5) Numbers with N' and specifier



(6) Complex number construction



In (6), we show the construction that builds complex numbers, taking its AGR value from its left daughter (note the difference between *a hundred thousand*

and **a two thousand*). In combination with (5) and the AGR values of the lexical entries for simple and dependent numbers, the patterns of singular and plural agreement exemplified in (2) and (3) are explained.[5]

3. The *whopping* pattern

Consider now the sentences in (7), which seem to violate the constraint that *a* is paired with a dependent number.

(7) a. an [amazing/outstanding/whopping] [six/sixty/six hundred/hundred] admirals
b. [det] [AdjP] [number expression] [nominal]
c. a [tall/smart/loud] [six/sixty/six hundred/hundred] kids

(8) a whopping one/*a thousand admirals

With an intervening adjective like *whopping*, the NP may have a singular determiner such as *a* regardless of the number of the head noun. More strikingly, any variety of number expression—simple, complex, dependent—becomes possible, except for determined number expressions (8), which we have analyzed above (5-6) not as types of number, but rather as full NPs. Note that the ungrammaticality of (8) provides further evidence that despite any functional similarity between *a* and *one*, they are syntactically distinct.[6]

We do not here explore the semantic restrictions on the sort of adjective that may participate in this construction. There do seem to be several classes, outlined in (9), but the analysis remains in the early stages. Most (9a-d), but not all (9e-f), describe the quantity itself.

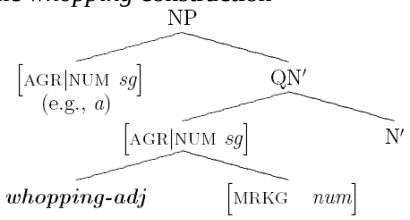
(9) a. Quantity increment: additional, further, extra
b. Quantity description: mere, scant, paltry, good, full, whole, generous
c. Typicality: unprecedented, estimated, typical, reported
d. Affective: whopping, amazing, outstanding
e. Event duration description: quick, busy, hectic
f. Description (of item) dependent on quantity?: a lucky three
g. *a tall/short/intelligent thirty students

Among the morphosyntactic properties of this construction that must be described is the fact that, with an intervening adjective, the NP may have *a* as a determiner, regardless of the number of the head noun or number. This further confirms what the previous section showed: not only is NP-internal agreement not purely based on the agreement features of the determiner and head noun, but in some cases, like those in (7), even the inherent agreement features on a number may be overridden.

The construction must further allow for any variety of number expression: simple, dependent, or complex, with the exception of determined number

expressions (8).[7] We capture all the above facts with a special class of adjectives, which we here dub *whopping-adjectives* (meant to include, perhaps with subclasses, all those varieties outlined in (9)), illustrated in (10).

(10) The *whopping* construction



The *whopping-adj* specifies its own agreement value (singular), and whatever specifier the number or head noun might have expected is "swallowed up." Then, by virtue of the construction in (5), or by other QNP-producing constructions in the language, the specifier is forced to show singular agreement. Note that because the adjective selects a *num*-marked, and not a *det*-marked, constituent, *whopping* patterns with determined numbers are ruled out (11).

(11) a whopping {one/*a} thousand admirals.

We see from the constructions set out in this and the previous section that the number features that must hold of the NP's determiner is a function of exactly which number expression constructions, including the *whopping* pattern, license the NP. The picture is considerably more complex than even that described in Kim 2003, in which NP-internal agreement is mediated by a single feature that remains constant throughout the NP. Further exploration of this topic should include the integration our NP-internal findings with the facts of NP-external (e.g., subject-verb) agreement (on which Kim 2003 provides much of the requisite data and analysis).

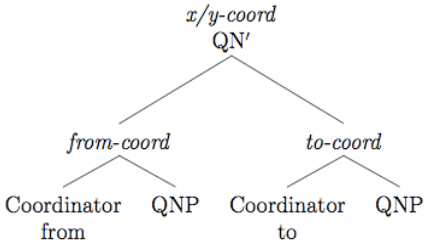
4. Range-denoting *from-x-to-y*

Consider now the range denoting *from-x-to-y* construction, which is illustrated in (12). In general, any place where *x* can go, this larger construction can go as well.

(12) a. Generally, (from) 30 to 40 people show up.
b. You might see (from) ten admirals to twenty admirals every night.
c. Just a quote will run you (from) one (hundred) to two hundred dollars.
d. He ran (from) a dozen to a hundred miles a week.

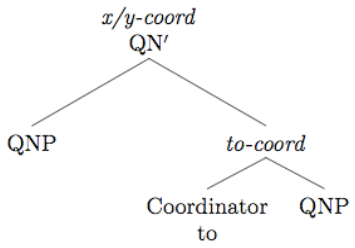
As argued by Hirose (2007), this is a correlative coordinate structure, comparable to *both...and* and *neither...nor*[8], as shown in (13). (Here and below, QN' is a convenient abbreviation for an N' with MRKG *num*, and analogously QNP is an NP built from such an N'. See (5).)

(13) The *from-x-to-y* construction



Note that there is another version of this construction without *from*, also illustrated in (12). The structure of this version is given in (14).

(14) The *x-to-y* construction



As seen in (13) and (14), the mother node in this construction is a QN'. This accounts for three distributional facts: 1) the combination with a determiner (15a), 2) *from-x-to-y* constructs cannot have a multiplier (15b-c) because the complex number construction, which introduces multipliers, selects a number rather than a QN', and 3) the construct can be pumped to a determinerless NP (12).

(15) a. the/those (from) three to four people
b. *a/five from hundred to thousand dollars
c. *a/five from dozen to a/five hundred dollars

The fact that the coordinates are QNPs accounts for several restrictions on *from-x-to-y*. Dependent numbers, as they are not QNPs, cannot stand alone in the x/y slot, as illustrated in (16a). (16b) shows that an alternative analysis in

which the coordinates are simply numbers is untenable, as it would predict that a single element can satisfy a constraint from both coordinates—in our case, a lone multiplier applying to two dependent numerals (cf. the grammatical (16c) which shows a single determiner applying to coordinated count nouns).

(16) a. *from hundred to thousand star clusters
b. *a/five hundred to thousand star clusters
c. my friend and neighbor

5. *Whopping* plus *from-x-to-y*

Having analyzed two rather different number expression-licensing constructions, we turn now to the possibility of combining them: that is, determining if a single number expression may be licensed by both constructions simultaneously. This is, at first blush, theoretically possible: the sister of a *whopping-adj* must have a marking value of *num*—i.e., it must be a number expression. This is exactly the sort of expression that is produced by the *from-x-to-y* and *x-to-y* range constructions.

Placing a *(from)-x-to-y* expression into a *whopping* expression, however, results in a grammaticality pattern that is not entirely predictable:

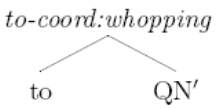
(17) a. * a whopping from 3/30/300 to 4/40/400 admirals
b. a whopping 3/30/300 to 4/40/400 admirals
c. a mind-boggling million to billion star clusters
c'. * a million to billion star clusters
d. a whopping dozen to two dozen admirals
d'. * a dozen to two dozen admirals
e. * a whopping a hundred to a hundred fifty balloons

Several restrictions are placed on the sister to the *whopping-adj* that would not have been predicted if the two constructions simply combined by general means. First, as illustrated by (17a,b), the *from*-less range construction must be used.[9] Second, although dependent numbers are normally prohibited in *x*/y slots of the range construction (16a,b), they are permitted with the addition of a *whopping-adjective* (17c/c', 17d/d'). Finally, we see that determined numerals are no longer permitted (17e), though the range construction normally allows them (12d).

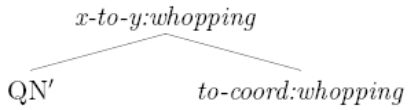
The existence of idiosyncratic constraints on the combination of these two particular constructions means that a separate set of constructions must be posited. In particular, two constructions are necessary. First, there is a special lexical entry for the coordinator *to* that selects a QN' (a *num*-marked non-maximal (undetermined) nominal expression, such as *three hundred* or simply *hundred*). Call this lexical entry *to-coord:whopping*, a subtype of *to:coord* (shown in (18a) post-combination with a QN'). It produces phrases such as *to two dozen* or *to million*. The phrase projected by this lexical entry will only be

licensed as a right daughter of another construction (18b) that combines the *to-coord:whopping* phrase with another QN', which appears to the left. The result, something like *dozen to two dozen*, is analogous to the *x-to-y* construction in (14), but with QN' rather than QNP coordinates. This structure is further restricted to only appear as the sister of a *whopping-adj*, the result of this indicated in (18c).[10] This, along with constraints discussed in previous sections, guarantees the pattern of grammaticality illustrated in (17).

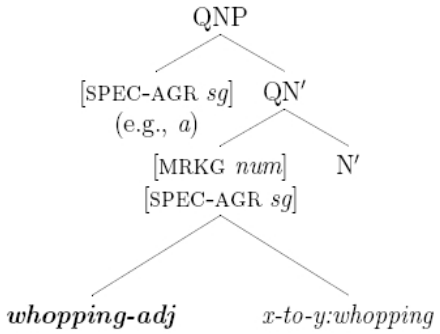
(18) a.



b.



c.



6. Conclusions and Outlook

Whether one comes from a generative or construction grammar tradition, grammar is always considered compositional, in the sense that sentences should be explainable by a distinct set of grammatical processes and/or interrelations. However, it is unpredictable what level of detail is necessary to explain patterns of interpretation and grammaticality.

In such cases as the one investigated here, it is tempting to hypothesize that the constructions we identified in sections 3 and 4 (the *whopping* construction and the *range* construction) are the *real* constructions, and the facts in section 5 are somehow derivative—i.e. due to some principle beyond the composition

described in the constructions themselves. There is, however, no way to predict *a priori* that, instead of just being incompatible, there would be a special version of the *range* construction (18) that would be usable only with the *whopping* construction, structured specifically to resolve the conflict. If incompatibilities were freely resolvable in this way, there would be no ungrammatical sentences. Although there is an interesting relationship (both semantic and structural) between the regular *range* construction and the *x-to-y:whopping* pattern, the full interpretation of how and what kind of conflict-resolving special constructions can be created lies outside our scope here, in the realm of historical linguistics and acquisition. Since limitations on the kinds of historical relationships that can arise are not part of syntax, it is important for our syntactic theory to be agnostic about how detailed our constructions will have to be, and be capable of representing whatever level of detail is necessary to model the data.

It is clear that further complexity will be necessary to explain even the narrow topic that we focus on here, the morphosyntax of NP-internal agreement. Within the constructions we posit, the restrictions on the types of adjectives that fit the *whopping* pattern and their semantic contribution to the noun phrase must be fully spelled out. In addition, our account must mesh with subject-predicate agreement, which is affected by both syntactic and semantic features, and with the wide range of NP-internal facts summarized by Kim (2003). Only in a theory unencumbered by stipulations of possible complexity will such a full description of agreement be possible.

7. Notes

[1]For the basic categories involved, we largely follow Huddleston and Pullum's (2002) 19.5.10, other than grouping together *simple, derivative*, and *compound* together as *simple* (since these distinctions are morphologically rather than syntactically relevant). Our analysis of number composition is different, however. In particular, Huddleston and Pullum's (2002) assumes that *a* is equivalent to a multiplier for building complex number expressions from dependent numbers. Our data show that this is not so simple. See section 3 below.

[2]Clearly considerably more detail must be injected to restrict which complex numbers can actually be produced (e.g. the multiplier must be smaller than the base in complex numbers). These details are irrelevant here.

[3]Although in (4-5) we have represented an AGR feature on the specifier itself, this is purely for convenience of presentation. Our analysis is entirely compatible with proposals in HPSG (Van Eynde 2006) and the current SBCG assumptions (Sag 2007) in which the specifier has a SELECT feature which selects an N' with the specified agreement value.

[4]The implementation of the constraints on AGR in SBCG require the *hd-func-cxt* (Sag 2007: 54) to constrain AGR to be identical in the *functor* daughter and the phrasal mother node. Virtually all other constructions would constrain AGR to be the same in the *head* daughter and the mother node. There is no structural difference between this and the behavior of the MRKG feature. An alternative requiring no change in the constructions would be to make this a subfeature of MRKG, which would then take non-atomic values.

[5] There is, in point of fact, a complication in that, for some speakers, simple numbers may also take singular agreement specifically when they occur in definite noun phrases: *that hundred senators, #that thirty senators, *a thirty senators.* This fact does not require further constructional gymnastics. With the constructions we already have, an additional simple-number lexical entry with AGR *sing*

can encode this constraint by SELECTing an N' which is definite.

[6]See Huddleston and Pullum (2002: 1718) for the more usual analysis in which *a* is considered a mere variant of *one*.

[7]This constitutes further evidence that despite any functional similarity between *a* and *one*, they are syntactically distinct.

[8]We follow Huddleston and Pullum's (2002) phrase structure for correlative coordinate structures. On their account, the *from* should be a determiner. However, because the placement of, e.g., *both* is slightly broader than that of *from* (both to the men and the women, but *from one hundred to thousand), we remain agnostic regarding its category.

[9]Other constructions in the language do select the construction with *from*, e.g., *anywhere*: *anywhere *(from) 200 to 400 people*.

[10] The restriction in the occurrence of is achieved by making *x-to-y:whopping* a special subtype of *number* which is referred to only in the *whopping* construction. Other constructions which call for numbers (in particular, the noun-modification construction) will refer to a type which is incompatible with *x-to-y:whopping*.

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Computational Cognitive Modeling of Reading Comprehension at the Word Level

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1 Introduction

A problem for all natural language processing systems is that computers perform perfectly and consistently and humans perform imperfectly and inconsistently. In order to address this problem in the context of a cognitively plausible reading comprehension model, one must model the ability of humans to comprehend orthographical variation at the word level. We will present a computational cognitive model of reading comprehension of lexical variants.

The Synthetic Teammate project hopes to create a synthetic air vehicle operator (AVO), or pilot, capable of interacting with a human navigator and photographer in an Uninhabited Aerial Vehicle (UAV) training simulation. Part of this interaction involves successful communication in a natural language. A key commitment of the project is development of a synthetic teammate that is both functional and cognitively plausible. To achieve this, we are using the ACT-R Cognitive Architecture (Anderson et al., 2004) combined with a theory of linguistic representation (Ball, 2007a) motivated by principles of Cognitive and Construction Grammar (cf. Langacker, 1987) and a theory of language processing (Ball, 2007b) motivated by psycholinguistic evidence supporting the incremental and interactive determination of meaning (cf. Crocker, 1999).

ACT-R is a theory of human cognition founded on 30+ years of cognitive psychological research and implemented in a computational system. A key element of the cognitive architecture is a Declarative Memory (DM) consisting of symbolic chunks of knowledge (e.g. chunks corresponding to knowledge of words). Another key element is a Production System consisting of productions which are matched against the current context. The matching production with the highest utility is selected for execution at each step in cognitive processing. The current context is reflected in a collection of buffers containing symbolic chunks, which have either been retrieved from memory, constructed during processing, or perceptually encoded from the external environment. During

memory retrievals, the most highly activated DM chunk that is consistent with the current context and retrieval template is selected for processing. This spreading activation memory retrieval mechanism is crucial to the process of word recognition.

The language comprehension model, which is focused on the encoding of *R*eferential and *R*elational meaning, is called Double *R* (Ball 2004). Currently, the model processes natural language conveyed via English orthography in the form of text chats (Ball, Heiberg, Silber 2007). The language comprehension aspect of the synthetic teammate is a model implemented in ACT-R that projects constructions based on the linguistic input (Ball 2007b). Lexical items in the input activate corresponding word chunks in Declarative Memory, which in turn project constructions (e.g. transitive verb construction) that are integrated with the representation of the preceding input.

Previously, the retrieval of DM chunks for words corresponding to lexical inputs depended on exact string matches. When the input was imperfect or not stored in any form of memory, the model ignored it altogether. This is a problem because imperfect input occurs often when the participants in the training situations use text chat to communicate. The participants frequently make spelling errors and typos, abbreviate words, use special algebraic forms, irregular punctuation, spelling variants, and unique numbers. These variations were the focus of my efforts, and I dealt with each to some extent by extending the model in a cognitively plausible manner.

In order to handle the variability, the model was changed to match more closely the reading processes of humans. Rather than reading entire strings and integrating them into a grammatical construction only when it is a perfect match to a stored lexical item, the model breaks down the string into its constituent parts. The lexical item is then activated based on the parts, and selected if it has the highest activation. The task differs from word recognition tasks in that the words are presented within the context of sentences and can be influenced by the context. Further, symbols, numbers, and multi-unit words must be dealt with in addition to individual words.

The model is meant to describe a competent reader, not a learning reader. It is assumed that word recognition involves mapping orthographic input directly into DM representations without recourse to phonetic processing (although a phonetic mapping is not precluded). Based on graphic cues, the reading model selects a word. Any individual piece of a word is less important than the word as a whole, but the individual pieces add up to the cues that the model uses. All of this information is put into corresponding buffers to spread activation to words containing matching information. The model does not treat each word as a sum of its parts, ignoring the complete form altogether. Rather, if the word as a whole does not match, and thereby activate, an item in the lexicon, the closest match can be retrieved based on the cues that do match. In this way, it is similar to McClelland & Rumelhart's Interactive Activation model (1981).

2 Lexicon Structure

In DM retrieval, the ACT-R Declarative Memory Module calculates the activation across all DM chunks that match a retrieval template, selecting the most highly activated DM chunk for retrieval. The retrieval template provides hard constraints on memory retrieval (e.g. only consider word chunks). Only DM chunks matching the retrieval template are eligible for retrieval. The spreading activation mechanism provides soft constraints on retrieval. Activation spreads from context buffers to matching chunks in DM (Anderson et al 2004). Chunks are composed of a chunk name, chunk type, and slots. For example:

pilot isa word-with-letters P I L O T

Activation spreads from context buffers to the matching slots in DM chunks. In addition to activation spread from the context buffers, DM chunks have a base level activation based on their prior history of use. Total chunk activation is a combination of context activation and base level activation. Typically, one production is used to retrieve a chunk from DM and another production that matches the retrieved DM chunk decides how to process the retrieved chunk.

2.1 Words

In the language comprehension model, basic word chunks have slots for letters, word-length, word-symbol (the whole word, correctly spelled), and the first five trigrams. The word-symbol chunk exists solely to ensure that if there is an exact match in the lexicon, it will be the most highly activated. The word chunks are indexed with parts of speech and the root form of the word. Different types of lexical items may have different chunk types. Specifically, multi-unit words, such as “dining room,” have information for all of the constituent units. There are also lexical entries for commonly used abbreviations and acronyms of the same form as basic words.

2.2 Numbers

Numbers are treated differently than all-letter strings by the model. There is a great deal of evidence that Arabic digit strings have a different representation in the lexicon than words composed of letters. Polk and Farah (1995) conducted a study to show how visual perception of digits differs from the perception of letters in adults. Postal workers competent in parsing Canadian postal codes, which are composed of letters and digits, and control subjects were presented

with a target letter followed by arrays of letters or arrays of letters and digits. They were asked to press a key saying whether the target was present. The postal workers showed less of an alphanumeric effect in their reaction times, but the difference was significant for all subjects. Further, many case studies of dyscalculia have noted that other language functions can be preserved even though digit comprehension and production is dysfunctional (e.g. McCloskey, Caramazza, Basili (1985), Marangolo, Nasti, Zorzi (2004)). For this reason, I am comfortable distinguishing numbers from words in the model in two ways—by "chopping" digits off from letters strings in the visual module, and by structuring number strings differently from words in declarative memory. The lexicon contains several hundred numbers at intervals of ten, with information for each about the number of ones, tens, hundreds, etc.

2.3 Abbreviations

Abbreviations hold a similar place in the model's lexicon as other spelling variants. We can decide which are common enough to be added to the declarative memory. For example, "alt" is used so widely and consistently in the text chat corpus to refer to "altitude," it can be safely added to the lexicon. The abbreviations are indexed in the lexicon so that they are returned as the abbreviated word if they are familiar enough. On the other hand, a more ambiguous abbreviation is better left out of the lexicon. Though "A" is sometimes used in the text chats to indicate "altitude," it is easily confused with the determiner and is not as widely used as other abbreviations. The model likely will not correctly recognize "A" as meaning altitude, which is plausible as the same behavior as humans.

Symbols are treated in much the same way as abbreviations in the model. Just as for abbreviations, unknown or ambiguous symbols should not be recognized. The model does not yet have the capability to infer the correct interpretation of a symbol or abbreviation based on its context. Each word is seen and encoded as a separate entity from the rest of the input. There are buffers that hold previously selected lexical items so that multi-unit words can be activated and part of speech information can be influenced, but that is all so far.

3 Analyzing Input

The text input into the model is analyzed using productions. It is taken from the visual module and broken down into relevant information. This information is put into buffers to spread activation to entries in the lexicon. The following sections explain which cues were encoded by the model, why, and how.

3.1 Word length

A review of the literature leads one to believe that word length has a mixed effect on word recognition. Some studies show that words above and below a certain range of lengths are recognized more slowly because of their number of letters, while other studies show the opposite (see New, Ferrand, Pallier, Brysbaert (2006) for a comparison of results of such studies). Because of the lack of a firm consensus on this matter, I did not implement a sophisticated word length effect in the model. Rather, I took for granted that short words are more likely to activate short words in the lexicon, and long words are more likely to activate long words in the lexicon, regardless of the time it would take to recognize which long or short word has been presented to the reader.

In the language comprehension model, incoming text is analyzed for word length and the value is put into the word-length buffer. The word-length buffer spreads the second most activation, after the word-symbol buffer, to the lexicon. If a misspelled word is different in length from the correct spelling by a large proportion, it is less likely to be identified correctly by the model. In order to activate near matches, the model spreads some activation to words with lengths one more or one less than that of the input. However, the activation spread of the actual length of the input is much higher.

3.2 Letters and letter order

For competent readers, misspelled words activate the intended lexical items because they contain the same letters for the most part. Perea and Lupker (2003, 2004) have shown that words with transposed letters prime the correct word, even when the precise position of the letters in the word is incorrect. Further, it has been shown that all of the letters of a word can be transposed, yet the jumbled string will still prime the intended word (Guerrera 2004). This suggests that letters spread activation, regardless of their position in a word. In the model, each letter of the word spreads activation to words in the lexicon containing those letters.

When words are misspelled, the order of the correct letters has a limited effect on how easily the word is recognized. A famous recent internet meme claimed that Cambridge scientists had found that only the first and last letter of a word must be in the correct position for the word to be recognized (see the website of an actual Cambridge scientist, Matthew Davis, at http://www.mrc-cbu.cam.ac.uk/~mattd/Cmabrigde/index.html for a fuller discussion and possible analyses). The meme was not completely incorrect, however—while the order of letters in the middle of words does not have to be perfect (Rawlinson 1976), correct letter order, especially near the beginning and end of words, facilitates recognition (McCusker, Gough, Bias 1981).

In order to mimic the importance of first letters for human readers, the first few letters of a word spread the most activation in the model. The first letter of the input spreads the most activation, with each successive letter spreading less. Trigrams are used to identify the context of up to the first five letters. Absolute position is not given except for word boundaries. For example, if the input were "dog", the trigram would be (WB = word boundary):

WBdo dog ogWB

The first five trigrams of the input string are determined and spread activation to the trigrams in the word chunks of the declarative module. By activating the trigrams of lexical items as well as the letters, it is possible to select words not just as a bag-of-letters, but also according to the correct relational position and order of the letters. The trigrams spread more activation than the letters, with the first trigram spreading the most.

3.3 Numbers

Just as misspelled words were previously passed over without interpretation, digit strings that were not in DM were ignored completely. It is not practical to include every number that could possibly be mentioned in the chats. There were a few hundred numbers in DM, but none could be selected unless it was an exact match.

To change that, I did several things. I added digits to DM and changed the vision module to differentiate between letters and digits, as mentioned above. The encoding production in the comprehension model was changed to treat digit strings differently than other words. The length of the digit string is calculated and used to determine the number of ones, tens, hundreds, and thousands. The largest unit is put into the letter-1 buffer, the second largest in the letter-2 buffer, and so on. Trigrams and word-symbols are not used for digit strings.

4 Model Performance

The model retrieves the most highly activated lexical item from the lexicon. For each of the different types of input that the model encounters, I will explain how the correct lexical item is activated.

4.1 Misspelled words and typos

By encoding the words at the letter level and using soft constraints to select lexical items, it is possible to retrieve the correct spelling of a word based on an incorrect text input. When text input does not have an exact match, the letters,

trigrams, and word length are sufficient to retrieve the intended word. For example, given the word "alititude," ALTITUDE would be selected. The word length is different, the second trigram is different, and the third letter is different between the input and the correct word. Yet there are enough similarities to spread more activation to the correct spelling of the word than to any other word. Of course this is not guaranteed. It is possible that the misspelled word could match a real word other than the word intended. In that case, the unintended word would be retrieved rather than the correct word—just as in real people (Andrews 1996). Or, a misspelled word could activate more than one possible intended word, such as "hed"—it could activate both HEAD and SHED, since the first letter would be highly activated in the former and the third trigram would be highly activated in the latter. This is a variation of the neighborhood effect (Grainger et al 1989), though for humans, of course, the decision between "head" and "shed" would likely be clear from the context of the sentence.

4.2 Missing spaces

Another issue for misspelled words is missing spaces. Often in hastily typed text chats, people miss not only letters, but spaces as well. This results in words being put together as a single string. When this happens, generally the first word of the two (or more) is correctly selected. The rest of the string is ignored and the model moves on to the next word in the input. Since this happens fairly frequently, I changed the model by adding some productions that could split up words still based on activation.

The primary method of handling this problem was within the comprehension model itself. The process of encoding input text, and activating and selecting lexical items is repeated before moving on to the next word of the input. The model generally selects the correct first word because first letters and trigrams spread more activation than later letters. For example, the input "hareaspeed" (a combination of the waypoint named "HAREA" and the word "speed") would first be broken down into letters and trigrams, which would all be put into their respective buffers; word-length and word-symbol would also be calculated and put into their buffers; and the original input in its original form is put into a buffer for later comparison. The next few productions then fire for retrieving the lexical item, and HAREA is retrieved because it has the highest activation.

After retrieval, the retrieved lexical item is compared to the input word. If there is a difference in length of two or more letters, the selected item is subtracted from the input string and the leftover string, in this example "speed," is put into another buffer. The leftover string is then encoded just as it would have been had it been separated by a space in the original input. After the selection is made, the production to check for leftovers fires again, and if the

difference between the input and selected item is less than two letters, the next word is attended to.

4.3 Spelling variants

In the text chat corpus, there were occasionally variants in the way things were spelled that were not mistakes per se, as often the words had no established correct spelling. This problem is primarily about multi-unit words such as "h-area" and "h area", rather than about acceptable variants. Some variants, such as "harea," can be treated as an acceptable spelling of the word, and I focused on "h-area" and "h area." Because of ACT-R's chop-string feature which uses punctuation like "-" to divide linguistic input into pieces, "h-area" is interpreted as three different units:

h - area

This sort of chopping means that it has to be interpreted as three separate words. It also means that the word-symbol is of no use for multi-unit words—they can only be activated by their constituent parts and not by the word as a whole.

4.4 Multi-unit words

For the purposes of this model, multi-unit words are defined as those that have punctuation embedded in the word, or words that have two or more constituent parts. An example is "h-area." Multi-unit words are treated in much the same way as singleton words in the model. Treating multi-unit words as "words-with-spaces" is acceptable because this portion of the model is unconcerned with parsing, though it has been argued that because they are not syntactically alterable units, they should not be parsed in any case (Sag et al 2002).

Multi-unit words do not require any additional productions. Rather, it is important that they be stored in declarative memory differently than single-unit words. The units that make up the word must be available individually, yet activate the entire word. For example, given the input "h area," we want H to be selected before moving on to the next word. Then when "area" is encoded and spreads activation, the activation from the first unit as well as the second unit will have activated the H-AREA item. AREA will not be retrieved as a single unit word because the activation for H-AREA will be higher. The context in which "area" is seen determines whether H-AREA is activated enough to over-rule AREA. If fewer than two of the three constituents of H-AREA are seen, it is not selected.

4.5 Numbers

When a digit string is encountered, it is encoded and its digits spread activation to chunks in the declarative memory. If it is an exact match to a number chunk, that number will be selected because it will have the highest activation. If it is not an exact match, the number with the largest matching units will be selected. For example, there is no 891-NUM chunk in DM. When "891" is encoded, EIGHT-HUNDREDS, NINE-TENS, and ONE-ONES are put into the letter-1, letter-2, and letter-3 buffers, respectively. This would activate the chunk in DM called 890-NUM, which has eight-hundreds and nine-tens it its slots. If there were numbers in increments of one-hundred rather than ten, 800-num would have been selected because it has the largest matching unit.

Numbers with decimals in them are treated in a similar way as the multi-unit words. Because of the chop-string function in the vision module of ACT-R, a digit string such as "98.5" is broken into three separate strings:

"98" "." "5"

When two digit strings occur next to each other, the model interprets them individually. However, if a digit string is immediately preceded by a period, this activates the decimal chunks rather than the number chunks. The "5" in the above example, therefore, would activate FIVE-TENTHS rather than FIVE.

5 Summary

At this point, the model can handle simple misspellings, numbers that are not in the model's lexicon, abbreviations, and some symbols. The variability is handled without use of serial searches, sophisticated word-length effects, or phonological information. It is limited from achieving full functionality as well as cognitive plausibility by its inability to handle lexical ambiguity. There are words that have more than one part of speech, for example "speed." But we currently have a limited capability to decide in any given sentence which part of speech is called for by an ambiguous word (e.g. words following determiners are biased to be nouns and words following auxiliary verbs and "to" are biased to be verbs). Even more interesting are the cases when a misspelled word is ambiguous. If two words are equally activated, the model has no reliable method of choosing the correct lexical item, though the choice may be clear to humans.

6 Next Steps

One weakness of the current ACT-R architecture lies in the visual system. The location of fixations is determined by word boundaries and does not take into account word length or frequency when determining fixation duration or movement. Moreover, only one word can be perceived at a time, regardless of how long or common that word is, so that given the phrase "a cat," "a" is fixated and retrieved before attention moves to "cat", and no information from cat is perceived before the attention shift. In other words, there is no parafoveal perception that could activate "cat" in declarative memory before attention is moved to the second word. Punctuation is also fixated separately from letters, so that a word such as "didn't" is seen as three perceptual units: "did", "'", and "t." Three separate fixations also requires three separate retrievals for such words. This is not cognitively plausible.

A possible mechanism to fix this problem is currently being considered. The vision module would still fixate according to word boundaries, but if the fixated word were short enough, the first few letters of the next word would also be perceived. Those letters would spread a small amount of activation to declarative memory. Punctuation would also be included in fixations with letters, which would facilitate the retrieval of contractions and other multi-unit words, and eliminate extra retrievals.

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Sentential Complementation in Italian Sign Language

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1. Introduction

The aim of this paper is to analyze the strategies of sentential complementation in Italian Sign Language (LIS). Although LIS can be reasonably considered a head-final language with an unmarked subject object verb (SOV) word order (see for instance, Geraci 2004 and Cecchetto *et al*. 2006, but Volterra *et al*. 2004 for a different perspective), sentential complements systematically avoid the canonical object position, and occur either in clause final position or in clause initial position. However, the canonical object position (namely, the position between the main subject and the main verb) is available when the sentential complement is embedded in a complement taking predicate (CPT) with a control structure. The structural difference between control complements on one hand and fully sentential complements on the other correlates with a different behavior when wh-extraction from the complement clause is considered.

The paper is organized as follows: Section 2 introduces some general properties of LIS. Section 3 illustrates the strategies of sentential complementation in LIS, while section 4 presents data on wh-extraction. The syntactic analysis for the data in sections 3 and 4 is given in section 5. Section 6 concludes the paper.

2. General Properties of LIS

This section describes some general properties of the variety of LIS signed by our informants. The idea is to offer some background information to guide the reader who is not familiar with LIS (see Cecchetto *et al*. 2006 and Cecchetto *et al*. 2009 for a more complete description). LIS basic word order is SOV as the sentence in (1) shows.[1] Other word orders can be produced as well, provided that the proper "intonation" is realized by a raised eyebrows facial expression.[2]

This way, both OSV and SVO word order are possible as well. When this happens, the positioning of the eyebrows reveals that a process of topicalization has displaced the object in the OSV order in (2a). Possibly, what happens in (2b) is that the object moves out of the VP and the remnant VP is then topicalized, originating the SVO order.

(1) GIANNI COFFE ORDER

(2) a. COFFEE GIANNI ORDER
re
b. GIANNI ORDER COFFEE
re
'Gianni ordered a coffee'

Lexical elements that plausibly sit in the functional projections in the clausal domain appear in post-verbal position. For instance, modals, the aspectual marker DONE and the negative markers all appear post-verbally, as shown in (3).

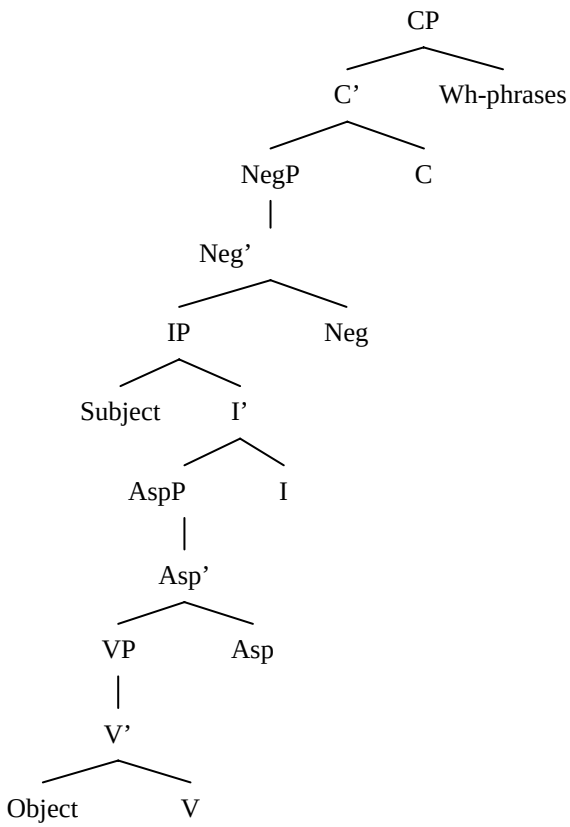
(3) a. GIANNI METER 80 JUMP CAN
'Gianni can jump 1.80 mt.'
b. GIANNI HOUSE BUY DONE
'Gianni bought a house'
c. GIANNI CONTRACT SIGN NOT
'Gianni didn't sign the contract'

An interesting property that LIS shares with many other sign languages (American Sign Language and Indo-Pakistani Sign Language, to mention two of them) is the position of wh-signs in content questions. Wh-signs are naturally found in the right periphery of the sentence in LIS, as illustrated by the examples in (4):

(4) a. GIANNI BUY WHAT
'What did Gianni buy?'
b. HOUSE BUY WHO
'Who bought a house?'

If we add these facts up, LIS can be considered a head-final language, as shown by the structure in (5). The verb follows the object and the functional heads that host the aspectual marker (DONE), modals and negation all follow the main verb. As for the clause final position of wh-signs in LIS, we assume that LIS instantiates genuine rightward movement to a right-branching spec,CP position, as extensively argued for by Cecchetto *et al.* (2009).

(5)



3. Sentential Complements in LIS

While the distribution of NP complements is relatively flexible, producing SOV, OSV and SVO word orders, the distribution of sentential complements is more constrained in LIS. Cecchetto *et al*. (2006) and Geraci *et al*. (2008) report that in the case of sentential complements two word orders are found: either the sentential complement precedes the main subject and verb complex, as in (6a) or the sentential complement follows the main verb, as illustrated by (6b). Crucially, the canonical object position between the main subject and the main verb, which is found with NP-type complements, is unavailable with sentential complements, as shown by the ungrammaticality in (6c).

(6) a. PIERO CONTRACT SIGN GIANNI KNOW
b. GIANNI KNOW PIERO CONTRACT SIGN
'Gianni knows that Piero signed the contract'
c. * GIANNI PIERO CONTRACT SIGN KNOW

The explanation provided in Cecchetto *et al*. (2006) for the contrast in (6) is based on the observation, originally made for spoken languages, that center embedded structures are hard to parse (see for instance Miller and Chomsky, 1963). What is peculiar about LIS is that, while spoken languages tend to avoid multiple levels of center embedding, LIS seems to avoid center embedded structures entirely. Geraci *et al*. (2008), after showing experimentally that that short-term memory for LIS signs is reduced, propose that the absence of center embedding is a way to cope with short-term memory limitations.

The examples in (6) illustrate two instances of a more general set of complementation strategies available in LIS. These strategies are summarized in (7).

(7) *Strategies of complementation in LIS*

a. *Left peripheral complements*
- $O_{sentential}$ S V
- $O_{sentential}$ S $PE_{resumptive\ pronoun}$ V

b. *Right peripheral complements*
- S V $O_{sentential}$
- S V $O_{sentential}$ (S) V
- SV what $O_{sentential}$

The two sets of strategies that LIS signers may adopt in order to produce sentential complements are investigated in the next two sections, while section 3.3 presents some data on sentential complements in control structures.

3.1 Left peripheral complements

Two main options are available for left peripheral complements: signers may produce an OSV order, as in (8a) or they may use a sort of resumptive pronoun (here glossed as PE), as in (8b).[3]

(8) a. PIERO BIKE FALL GIANNI TELL
re
'Gianni said that Piero fell from the bike'

b. PIERO CAR STEAL MARIA PE TELL
re
'Maria said that Piero stole a car'

The order in which the left peripheral sentential complement precedes the main verb is widely attested across the CPT classes (utterance predicates, propositional attitude predicates, commentative predicates, etc).

Although further research is needed on a wider number of signers, it seems that signers tend to use only one of the two strategies, even if they recognize the other strategy as grammatical as well.

A further observation that can be drawn from the examples in (8) is that, whether a resumptive pronoun is used or not, eyebrows are raised when the sentential complement is articulated. Eyebrow raising indicates that the sentential complement plausibly sits in a topic position, and that the complement itself is part of a more complex sentence, namely that it is subordinate to the main predicate. Indeed the spreading of the raised eyebrow facial expression observed in the previous examples would be ungrammatical if it were found in independent clauses. This last observation is crucial, since otherwise there wouldn't be much evidence that the two clauses are part of the same sentence. This is particularly relevant for the variant with the resumptive pronoun, where the argument structure of the main predicate is fully satisfied by the pronominal element.

3.2 Right peripheral complements

Contrary to what happens with left-peripheral complements, the situation of right-peripheral complements is more articulated. Three options are available, but they are not equally available across signers. Even within the same semantic class of complement taking predicates, there seems to be no uniformity. The three options are illustrated in (9):

(9) a. GIANNI SURE YESTERDAY MARIA LEAVE
'Gianni is sure that Maria left yesterday'
b. ? GIANNI$_i$ TELL PIERO BIKE FALL IX$_i$ TELL
'Gianni said that Piero fell from the bike'
c. GIANNI TELL WHAT PIERO CAR STEAL
'Gianni said that Piero stole a car'

In sentence (9a) (as in (6b) above), the sentential complement is found after the main verb, producing an SVO order. This strategy is available with most propositional attitude predicates, but not with TELL and negative desiderative predicates.

Sentence (9b) involves the repetition of the main subject (generally in a pronominal form, indicated by IX in (9b)) and the main predicate. This option is generally available for the utterance predicate TELL and propositional attitude predicates, but for other utterance predicates, like SAY, WARN, etc. Although

they are produced, these sentences are less than fully acceptable, since signers regard them as redundant (this is indicated by the ? diacritic).

The strategy displayed by the example in (9c) is the most general one for postverbal sentential complements (though not necessarily the most commonly used) in that it is available for all kind of CTPs. In (9c), the main predicate TELL is followed by the wh-sign WHAT and then by the sentential complement. When faced with examples like (9c), a natural move would be to interpret them as bi-clausal constructions: The first clause being a regular wh-question and the second clause being the corresponding answer. That this cannot be the case is shown by the fact that signers themselves don't feel these examples as question-answer pairs. For instance, a signer cannot interrupt the utterance after the wh-sign and wait for an answer by the addressee. Secondly, if they were question-answer pairs, we would expect the same strategy to be available also when the subject is questioned. However, a sentence like (10) can only be interpreted as a rhetorical question.

(10) MILK BUY WARN WHO? GIANNI
'Who bought the milk? Gianni, of course'

3.3 Sentential complements and control structures

Along with fully sentential complements, the typology of sentential complementation also allow for infinitival sentences to fill the complement position of a complement taking predicate. This is the case of control structures, i.e. when the subject of an infinitival clause must be anaphorically dependent on a specific argument of the matrix clause, be it the subject, as in the case of (11a), or the object as in (11b):

(11) a. John began to cry
b. John forced Mary to eat pizza.

Crucially, the sentential complement in control structures may sit in the canonical object position between the main subject and the main verb, as shown in (12). The same possibility is also found with other kinds of CTPs, when used in control structures, as shown in (13). The canonical object position is also available when the controller is an argument different from the main subject, as in the case of object control predicates like 'FORCE' in (14).

(12) MASON GARAGE BUILD BEGIN DONE
'The mason began to build the garage'

(13) a. GIANNI CONTRACT SIGN FORGET
'Gianni forgot to sign the contract'
b. GIANNI COW MILK TRY
'Gianni tried to milk the cow'

(14) COOK MARIA MEAT EAT FORCE
'The cook forced Maria to eat meat'

However, the strategies illustrated in sections 3.1 and 3.2 are still available with control structures. In particular, the complement can be found in the left periphery of the sentence with eyebrow raising, as in (15a) or it can be found in clause final position after the wh-sign 'WHAT', as in (15b):

re
(15) a. CONTRACT SIGN GIANNI FORGET
b. GIANNI FORGET WHAT CONTRACT SIGN
'Gianni forgot to sign the contract'

4. Wh-movement in Complement Taking Predicate Constructions

Fully sentential complements and control complements interact differently with the syntactic operation of wh-movement, producing an interesting asymmetry when wh-extraction is considered. These interactions are illustrated in this section, starting from the case of wh-questions on the matrix subject.

Both fully sentential and control complements allow for wh-questions to be realized on the matrix subject. Like in simple subject wh-questions (see (4a) above), the wh-subject is regularly found sentence finally, as shown by the examples in (16):

(16) a. ___ PIETRO CONTRACT SIGN FORGET WHO
'Who forgot that Pietro signed the contract?'
b. ___ MILK BUY FORGET WHO
'Who forgot to buy the milk?'

The asymmetry emerges in the case of wh-extraction from the clausal complement. With fully sentential complements, wh-elements cannot move out of the subordinate clause and target the right peripheral position. Wh-movement is banned both when the sentential complement is in clause initial position, as in (17), and when the sentential complement is in postverbal position, as in (18):

(17) a. * PIERO ___ BUY GIANNI FORGET WHICH
b. * PIERO ___ BUY GIANNI FORGET WHAT
Lit: What did Gianni forget that Piero has bought?

(18) a. * GIANNI FORGET PIERO ___ BUY WHAT
b. * GIANNI FORGET PIERO ___ BUY WHICH
Lit: What did Gianni forget that Piero has bought?

However, wh-extraction from the complement is possible with control structures, where the embedded complement is found in canonical object position and the wh-element is in the right periphery of the main clause. This is illustrated by a case of subject control verb in the example in (19a), and by an object control verb in the example in (19b):

(19) a. GIANNI ___ BUY FORGET WHICH
'What did Gianni forget to buy?'
b. DAD ___ EAT FORCE WHICH
'What did Dad force (the child) to eat?'

To sum up, an asymmetry is found between fully sentential complements and control complements, in that only from the latter it is possible to extract a wh-phrase and create a matrix wh-question.

5. The Analysis of Complement Taking Predicates in LIS

The two main strategies of complementation illustrated in section 3 are the result of different constructions and are analyzed separately.

The two options for left peripheral complements summarized in (20) are analyzed as base-generated adjunct topics, with a resumptive pronoun (or its null counterpart) filling the argument position. This analysis immediately accounts for the distribution of the raised eyebrows facial expression co-occurring with the sentential complement found in the examples in (8) above.

(20) *Left peripheral complements*
a. $[_{CP} \ldots [_{topic} O_{sentential}] [_{IP} S \text{ pro } V]$
b. $[_{CP} \ldots [_{topic} O_{sentential}] [_{IP} S \ PE_{resumptive\ pronoun} \ V]$

Switching to right peripheral complements, the two options in (21a) and (21b) are derived from the same underlying structure, while the option exemplified in (21c) is treated separately.

(21) *Right peripheral complements*
a. [SV] $O_{(sentential)}$
b. [SV] $O_{(sentential)}$ [(S) V]
c. SV what $O_{(sentential)}$

The derivation for the two strategies in (21a,b) starts with an underlying SOV order, which is disrupted by scrambling the sentential object to a position on the left higher than the sentential subject. The resulting OSV order is probably due to a general strategy of avoiding center embedded structures. Once object scrambling has occurred, movement of the remnant IP produces the SVO configuration illustrated in (21a). Assuming the copy theory of movement (Chomsky 1995), the option in (21b) can be considered like a case of multiple spell out of the (lower) copy created by the remnant movement chain. The approach just illustrated is summarized in (22):

(22) *Derivation of the options in (21a,b)*
a. Base Word Order S $O_{sentential}$ V
b. Object Scrambling $O_{sentential}$ [S t_O V]
c. Remnant movement [S t_O V] $O_{sentential}$ t_{SV} (option 21a)
d. Lower copy spell-out [S t_O V] $O_{sentential}$ [(S) t_O V] (option 21b)

Turning to the case in (21c), how to derive this option is not obvious. Further investigation is especially needed with regard to the non-manual component on the sentential complement. However, a possible approach is to analyze this construction as a case of focalization of the sentential complement. This would explain why a wh-sign is used instead of a resumptive pronoun, like the one found in the cases of topicalized sentences. One possibility is to analyze this construction as the LIS equivalent of a pseudo-cleft sentence (see Branchini 2006 for further discussion of the construction in LIS and Davidson, Caponigro and Mayberry, in press for a similar construction in ASL).

Since control complements may sit in canonical object position, a standard analysis of these constructions may be given, as shown in (24):

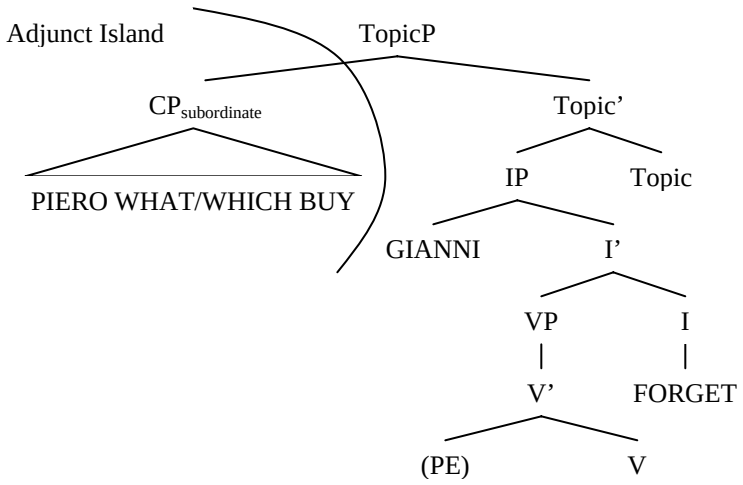
(24) [$_{CP}$ … [$_{IP}$ S [$O_{control\ complement}$] V] …]

Turning to the asymmetry observed in section 4 between wh-extraction from sentential complements and control complements, the main facts now follow from the analysis developed here.

For left peripheral complements, wh-extraction is ruled out since it would involve extraction of a wh-phrase from an adjunct island. This is illustrated by the structure in (26):

(25) * [… [$_{Topic}$ PIERO ___ BUY] [$_{IP}$ GIANNI FORGET] WHAT]

(26)

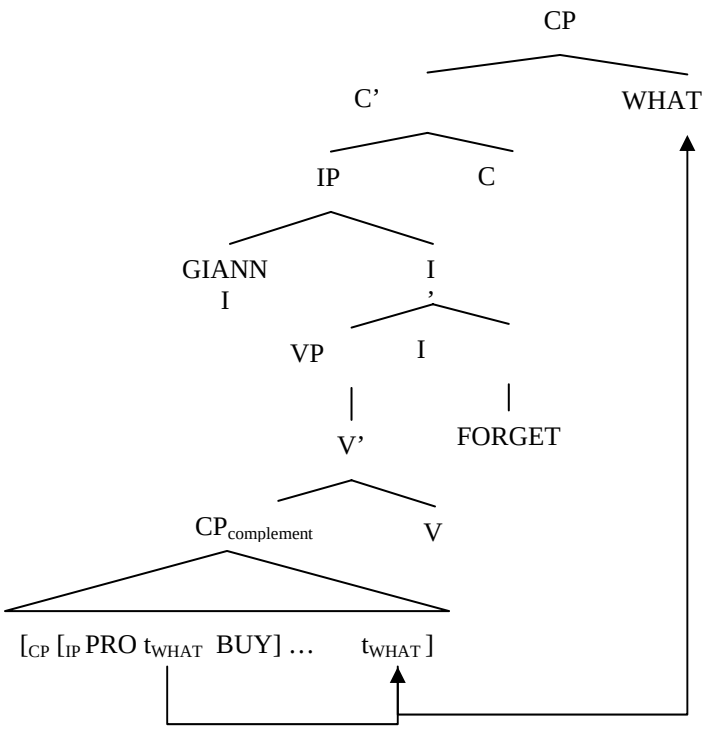


As for right peripheral complements, the ungrammaticality of wh-extraction shown by the examples in (18) above is quite unexpected. This is so, because in principle elements inside scrambled phrases are not frozen in place (see Rizzi 2006). Although we don't have independent evidence for this, our speculation is that the impossibility of wh-extraction might be due to a language specific constraint on extraction from displaced constituent.[4]

Finally, wh-movement from control complements is allowed since the control complement does not undergo any displacement. The wh-phrase may move cyclically from the embedded complement to the matrix spec,CP position, targeting the embedded spec,CP as an intermediate step. Cyclic rightward wh-movement in control sentences in LIS is illustrated by structure (28):

(27) [… [$_{IP}$ GIANNI [$_{CP}$ PRO t_{WHAT} BUY t_{WHAT}] FORGET] … WHAT $_{CP}$]

(28)



6. Final Remarks

Although LIS is an SOV language, full sentential complements are not found embedded between the matrix subject and the matrix verb. The sentential complement is found either in the left periphery of the matrix clause (in topic position), or in the right periphery of the matrix clause (due to a combination of object scrambling and remnant movement or to a process of focalization). Both complementation strategies prevent full sentential complement from sitting in a center embedded position.

This fact can be explained by assuming, as proposed in Cecchetto *et al*. (2006), that center embedding, even if kept at level one, creates an overload for the working memory in LIS and thus the grammar of LIS provides some strategies to avoid such a configuration. However, the grammar of LIS is also sensitive to the distinction between full sentential complements and control complements. While the former are not allowed in center embedded position, the latter are perfectly grammatical. Although at present direct evidence for a defective tense phrase in control structures in LIS is missing, we tentatively assume that the reason why control structures allow for center embedding is that they allow

for a strong degree of cohesion between the main and the subordinate clause (on the role of tense for syntactic complexity see Gibson, 1998). This degree of cohesion depends on the infinitival status of the embedded complement.

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[1] The glosses for LIS sentences follow the standard convention of using capitalized words for signs.

[2] Facial expressions and body postures are systematically used in sign languages for grammatical purposes and can be considered as the counterpart of prosody in the visual modality (among others, see Nespor and Sandler, 1996). Again, following the standard convention, a line above the glosses indicates the distribution of these non-manual markers. In the text examples in (2), the line above the glosses indicates the spreading of the raised eyebrows (re) during the manual articulation of the signs.

[3] Interestingly, the form of the resumptive pronoun is identical to the relative element used in the (co)rrelative construction in LIS discussed in Cecchetto *et al*. (2006) and Branchini and Donati (in press.).

[4] A possible way of implementing this speculation is to argue that derived positions (e.g. scrambling) are generally island for extraction and that movement out of such islands is governed by language specific parameters. In the case of LIS, no extraction would be possible from any derived form. Since under the current generative frameworks (at least since Kayne 1994) no structural distinction is made between base-generated adjuncts and derived positions, the impossibility of moving the wh-sign out of the scrambled object could be ultimately reduced to a case of adjunct island violation.

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Perception of Sub-Phonemic Contrasts: Comparison of Behavioral and Event-Related Potential Methodologies

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1. Introduction

The event-related potential (ERP) technique can provide insight into mental processes which occur whether or not subjects are consciously aware of them (see Luck, 2005). Groups of neurons firing in response to particular types of stimuli produce positive or negative electrical potentials at characteristic locations on the scalp during particular timeframes. When recorded and averaged over many trials, the background noise tends to zero and the response pattern consistently associated with the stimulus present in each trial remains; such patterns are called ERP components, and many are associated with linguistic processes.

The mismatch-negativity (MMN) component is a negative deflection seen at central midline scalp sites about 200 msec after the presentation of a "deviant" acoustic stimulus occurring among a train of "standard" acoustic stimuli (Näätänen et al, 1978). For example, it can be elicited by an occasional high-frequency tone occurring among a series of low-frequency tones. It also shows sensitivity to linguistic phenomena such as phonemic distinctions, and can be elicited even if subjects are not actively attending the sounds. The MMN has been described as the result of an inconsistency between an incoming stimulus and the automatically formed, short-term memory trace created from preceding stimuli (Näätänen & Winkler, 1999). Here we report preliminary analysis from an experiment seeking to determine how sensitive the MMN might be, relative to behavioral measures, to the sub-phonemic processing associated with the perception of long-distance vowel-to-vowel (VV) coarticulation.

2. Methodology

2.1 Participants

The 17 participants (6 female; age range [18, 24], age mean and SD 19.4, 1.8) were undergraduates at the University of California at Davis who received course credit for participating, were native speakers of American English and were uninformed as to the purpose of the study.

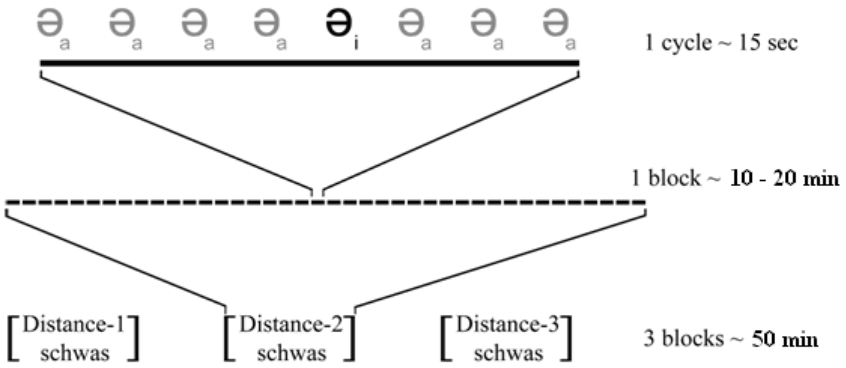


Figure 1. Each block consisted of 40 consecutive cycles of eight vowels each for the distance-1 condition and 80 cycles for the distance-2 and -3 conditions, with one randomly-placed [i]-colored schwa per cycle.

2.2 Stimuli

The stimuli were schwas or schwa-like vowels taken from recordings of speakers saying the following sentences:

"It's fun to look up at a key." (context = [i])

"It's fun to look up at a car." (context = [a])

The final vowels, [i] and [a], exert different coarticulatory influence on the preceding vowels; Grosvald (in press) has found that for some speakers, such effects can extend over at least three vowels' distance, and that even such long-distance effects are perceptible to some listeners. The vowels undergoing these coarticulatory effects will be referred to here as "distance-1," "distance-2" and "distance-3" target vowels, according to their distance from the context vowel. Therefore the distance-1, -2 and -3 target vowels are the vowels in the words "a," "at" and "up," respectively. The recordings were taken from two speakers who showed significant context-related formant frequency differences at these three distances. Stimuli were normalized for duration, amplitude, and f0.

The stimuli were organized into cycles consisting of eight stimuli each, with one [i]-colored schwa randomly positioned within seven [a]-colored schwas. These cycles were grouped into three blocks, with 40 or 80 cycles per block. The number of cycles in the distance-1 block was set at only 40 since earlier work had indicated that the distance-1 schwas were very easily distinguishable

by subjects (see Grosvald, in press), and that MMNs were readily elicited in this condition. Blocks for the distance-2 and -3 stimuli consisted of 80 cycles each.

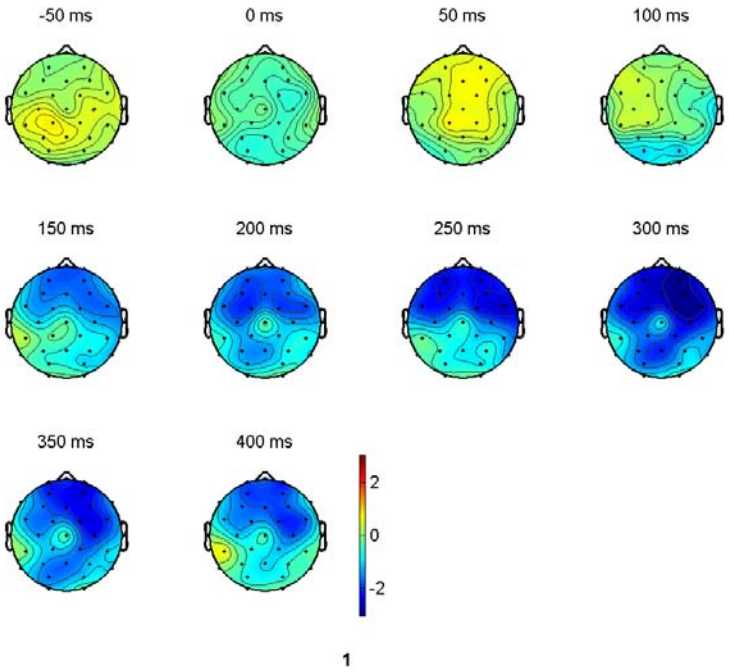
Stimuli were presented 1.2-1.4 s apart within each cycle of eight stimuli, with short blink breaks of 2.8-3.1 s between each cycle and longer breaks of 10.8-11.1 s every ten cycles. The sequencing of the task is shown in Figure 1. Although the figure shows the three blocks in distance-condition order 1, 2 and 3, ordering of the three blocks for a given subject was made randomly. Since this experiment was intended to evoke the MMN, subjects did not have a response task, so they simply sat in a chair while the sounds played and were asked stay alert by watching a silent film playing on a portable DVD player positioned in front of the subject. After participating in the MMN experiment, subjects performed a behavioral perception task with the same stimuli so that behavioral and MMN responses could be compared.

2.3 Electroencephalogram (EEG) recording

EEG data was recorded continuously from 32 scalp locations at frontal, parietal, occipital, temporal and central sites, using AgCl electrodes attached to an elastic cap (BioSemi). Eye movements were monitored by means of two electrodes placed above and below the left eye and two others located adjacent to the left and right eye. All electrodes were referenced to the average of the left and right mastoids. The EEG was digitized online at 256 Hz and filtered offline below 30 Hz. Scalp electrode impedance threshold values were set at 20 kΩ. Epochs began 200 ms before stimulus onset and ended 600 ms after. Artifact rejection thresholds were set at ±100 μV and rejection was performed automatically. ERP averages over epochs were calculated for each subject at each electrode for each context (standard [a] and deviant [i]) and distance condition (1, 2 or 3). Analysis was performed using EEGLAB (Delorme & Makeig, 2004). Two subjects were excluded because of a persistently high proportion of rejected trials due to artifacts (>50%), leaving 15 participants whose data was used in the analysis.

3. Results and Discussion

Negative deflections in the deviant contexts were seen for distance conditions 1 and 2, with distributions and latencies generally consistent with MMN-type effects, though with somewhat greater latency, as can be seen in the topological maps shown in Figure 2 and the waveforms presented in Figure 3. It is possible that this greater latency reflects delayed processing for hard-to-distinguish but still perceptibly different stimuli (cf. Tiitinen et al, 1994). This would also be consistent with the smaller amplitudes seen in the distance-2 condition, where the context-related differences are subtler than those in the distance-1 condition (cf. Näätänen, 2001).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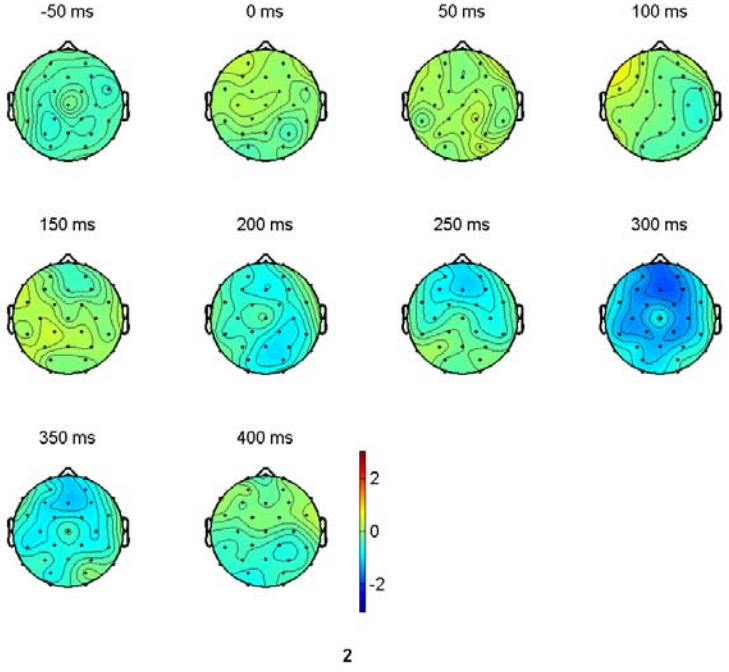
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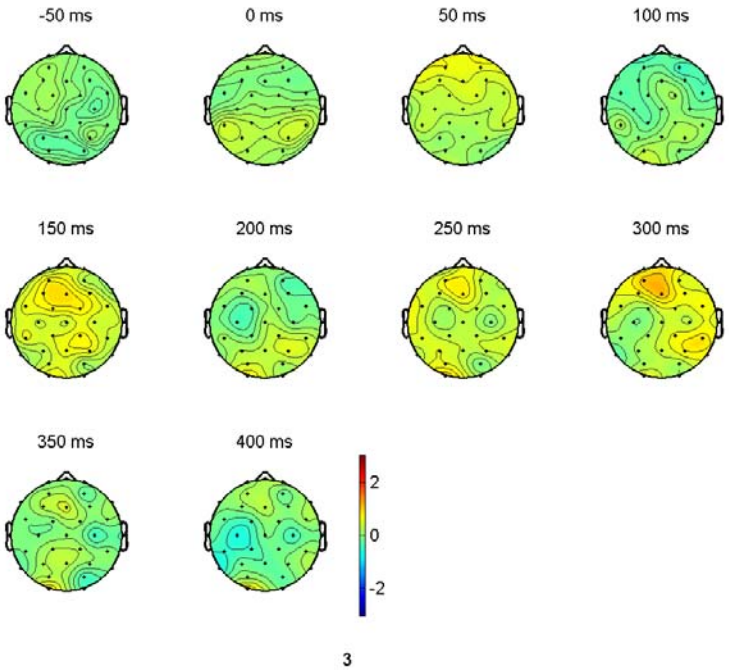


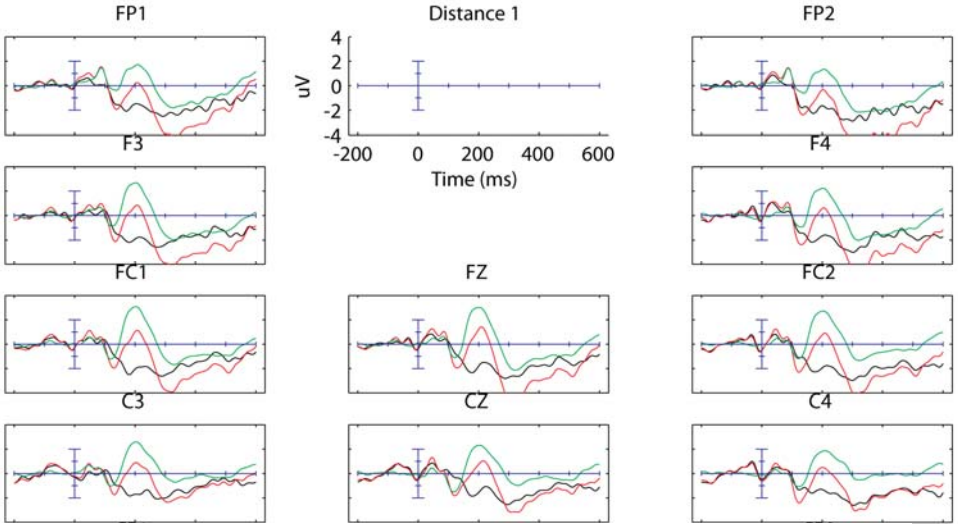
Figure 2. Topographical maps showing grand averages of difference waves (deviant - standard) at 50-ms intervals in the range [-50 ms, 400 ms] for distance conditions 1, 2 and 3. The top, middle and bottom sets of images correspond to those distance conditions in that order. Units on the scale are microvolts.

While the latency of the MMN component is typically expected to fall in the neighborhood of 200 ms, the effects seen here appear to be strongest closer to 300 ms. Therefore, for the purposes of the group testing whose results are about to be presented, mean amplitude over the time interval from 275 to 325 ms was used. ANOVA testing was first performed on the group data for each distance condition with within-subject factors of hemisphere (left, mid, or right), anteriority (anterior, central, or posterior), and vowel context ([i] or [a]) in the time range [275 ms, 325 ms]. Greenhouse-Geisser and Sidak adjustments were performed as appropriate and are reflected in the results reported here.

At distances 1 and 2, highly significant effects and interactions related to electrode site and context vowel were found. At distance 1, there were significant main effects of hemisphere ($F(1.36, 19.0)=11.0$, $p<0.01$), anteriority ($F(1.78, 24.9)=25.5$, $p<0.001$) and vowel context ($F(1, 14)=14.9$, $p<0.01$), and a hemisphere-anteriority interaction ($F(2.04, 28.5)=6.42$, $p<0.01$). At distance 2, there were main effects of hemisphere ($F(1.75, 24.5)=15.2$, $p<0.001$), anteriority ($F(1.22, 17.1)=14.9$, $p<0.01$) and vowel context ($F(1, 14)=11.1$, $p<0.01$), and

hemisphere-anteriority ($F(1.78, 24.9)=4.82$, $p<0.05$) and hemisphere-vowel ($F(1.83, 25.6)=4.48$, $p<0.05$) interactions. Both effects were in the expected direction, with greater negativity in the deviant context relative to the standard context, showing up most strongly at frontal midline sites in both of the distance-1 and -2 conditions. At distance 3, only the effects of hemisphere and anteriority were significant ($F(1.33, 18.6)=7.94$, $p<0.01$ and $F(1.46, 20.5)=10.2$, $p<0.01$, respectively), although there was a marginally significant effect of context vowel ($F(1, 14)=2.25$, $p=0.156$). The effects of hemisphere and anteriority again reflect that the greatest voltage differences were seen in the front midline region. However, for distance 3 this difference was in the contrary-to-expected direction, with greater positivity in the deviant context.

Next, ANOVAs with vowel context and electrode as factor were performed on a restricted set of electrode sites (FZ, CZ, PZ, AF3, AF4, FC1, FC2, CP1 and CP2) located in the central midline region, where the MMN is typically expected and where the strongest effects were seen here; these sites will henceforth be referred to as "MMN sites." Results were similar to those found in the earlier ANOVAs, with highly significant outcomes for vowel context only seen at distances 1 and 2 and at best a marginal outcome at distance 3 (results at distance 1 for electrode and context, respectively: $F(3.04, 42.6)=12.0$, $p<0.001$, and $F(1, 14)=15.3$, $p<0.01$; for distance 2: $F(1.80, 25.2)=11.3$, $p<0.001$, and $F(1, 14)=13.1$, $p<0.01$; for distance 3: $F(1.91, 26.7)=3.97$, $p<0.05$, and $F(1, 14)=2.32$, $p=0.15$). Figure 4 below shows the topographic distribution of these effects in each distance condition.



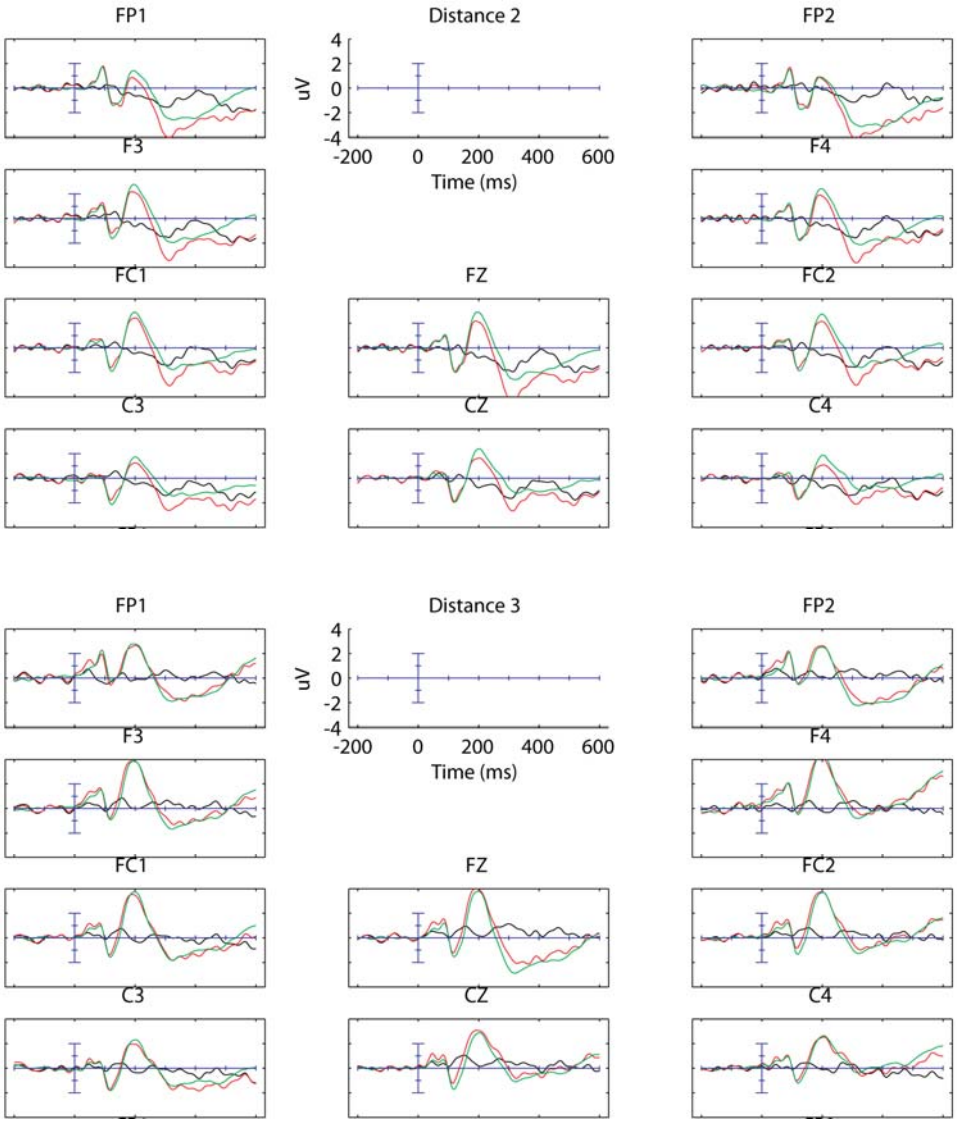


Figure 3. Grand-average waveforms at selected electrode sites in the time range [-200 ms, 600 ms], for each of distance conditions 1, 2 and 3, in that order from top to bottom. In these graphs, green = standard ([a]), red = deviant ([i]), and black = difference (deviant minus standard); negative is plotted downward.

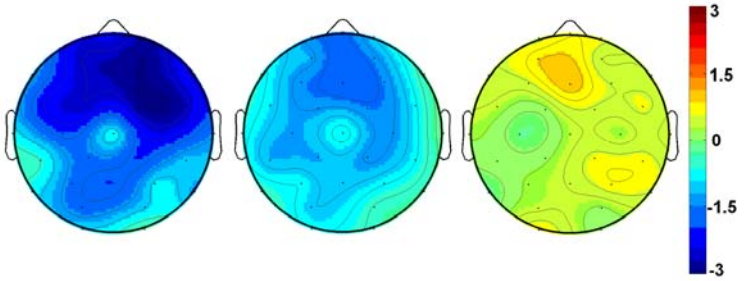


Figure 4. Topographic distribution of the MMN-like effects at 300 ms after stimulus onset at distances 1 and 2, and the marginally significant positivity found at that timepoint for the distance-3 condition, shown from left to right respectively. Units on the scale are microvolts.

3.1 Latency

Because the timing of these effects is later than would generally be expected for an MMN effect, a further analysis of their temporal properties was performed. To this end, ANOVAs like those carried out earlier for the 275-to-325-ms interval were performed over a series of 100-ms intervals, in 50-ms steps from stimulus onset up to 500 ms later. Table 1 below shows the outcomes of these tests. Also shown for comparison in the two rightmost columns are (1) the results for the interval from 275 to 325 ms after stimulus onset, where as noted before, effects were strongest in this study, and (2) results for the interval from 100 to 300 ms, where the MMN is typically expected. For distance 1, significant results do seem to start early, around 100 ms or perhaps a bit earlier. This may indicate that some but not all subjects begin exhibiting a differential response by this time to the differently-colored vowels. For distance 2, the results indicate that the effect is concentrated in the later timeframe. At distance 3, effects tended to be in the contrary-to-expected direction but were not significant.

For distance 1 and to some degree at distance 2, the effects seem rather prolonged and together with the waveforms shown earlier in Figure 3, this raises the question of whether more than one component may be involved. Perhaps just as likely, these effects may reflect contributions from different subgroups of subjects; perhaps some subjects have a more-delayed response to these sub-phonemic contrasts than others do, leading to smearing of the effects when examined at the whole-group level. To examine this possibility further, subjects were next separated into two groups based on their behavioral results. The results of this investigation are presented in the following section.

Interval (ms)	0-100	50-150	100-200	150-250	200-300	250-350	300-400	350-450	400-500	275-325	100-300
All sites											
Dist 1	ns	ns	*	***	**	**	**	*	ns	**	**
Dist 2	ns	ns	ns	ns	*	*	+	ns	ns	**	ns
Dist 3	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
MMN sites											
Dist 1	ns	ns	*	**	**	**	**	*	+	**	**
Dist 2	ns	ns	ns	ns	*	*	*	ns	ns	**	+
Dist 3	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

Table 1. Latency results for the entire subject group (n=15), showing the outcome of significance testing of mean amplitude difference between vowel contexts in the indicated time windows. Significant results are noted, with * = $p<0.05$, ** = $p<0.01$ and *** = $p<0.001$. Also noted are marginal results, where + = $p<0.10$.

3.2 Relationship to behavioral results

For the purposes of this analysis, the group of 15 ERP subjects was broken down into two subgroups, based on their performance in the follow-up behavioral task mentioned earlier. The results of that task can be quickly summarized for brevity as follows: for all subjects, distinguishing the differently-colored distance-1 target vowels was very easy, with all subjects performing near ceiling levels, while the distance-3 task was so difficult that only two subjects performed at significantly better-than-chance levels. In contrast, on the distance-2 task, about half of the subjects performed at better-than-chance levels while the rest did not, which provides a convenient means for breaking the subject group into two nearly-equal-size subgroups, with seven in what will be called the "insensitive" group and the other eight falling into the "sensitive" group.

Table 2 below presents the results of a latency analysis like that whose outcome was shown for the entire subject group in Table 1, but with separate analyses performed for the "insensitive" and "sensitive" subject subgroups. Topological maps of the responses of the two groups as of 300 ms after stimulus onset are also given below, in Figure 5. The results are much different for the two groups, with no significant negative effects seen for the "insensitive" group, even at distance 1. This is in spite of the fact that all subjects performed at well-above-chance levels in the distance-1 behavioral task and in fact, the

"insensitive" and "sensitive" groups did not differ significantly in their performance of the distance-1 task (respective mean d-prime scores = 3.82 and 3.94; t(8.81)=0.36, p=0.73). For distances 1 and 2, the "insensitive" subjects do show a negative trend in the deviant condition, but it is clearly much weaker than that of the "sensitive" group.

One other noteworthy difference between the two subject sub-groups is the weak but significant positivity shown by "insensitive" subjects prior to 300 ms after stimulus onset in the distance-3 condition and much earlier in the distance-1 condition. The very early onset of these positive effects is cause for suspicion that they may be spurious, although Jääskeläinen et al's (2004) "adaptation hypothesis" may hint at an alternative explanation. According to Jääskeläinen et al, the MMN is illusory, being the result of a progressively reduced N1 during the train of standard stimuli, this reduced N1 itself being due to neuronal adaptation to the mutually-similar standard stimuli. Following a similar line of thought, the MMN-like components in the present experiment could be a combination of a number of subcomponents, some positive and some negative, occurring during the same general timeframe. If so, perhaps the "insensitive" subjects have a greater tendency toward a reduced negative subcomponent in some circumstances, resulting in a net positivity. Of course, this must remain a very tentative hypothesis for now. In any case, it is interesting that the "insensitive" subjects' ERP response is so different from the others', even where their behavioral results were very similar, as in the distance-1 condition.

Interval (ms)	0-100	50-150	100-200	150-250	200-300	250-350	300-400	350-450	400-500	275-325	100-300
Sens. (n=8)											
Dist 1	ns	+	**	**	**	**	**	**	*	**	**
Dist 2	ns	ns	ns	ns	+	+	ns	ns	ns	*	ns
Dist 3	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Insens. (n=7)											
Dist 1	(*)	ns	ns	+	ns	ns	ns	ns	ns	ns	ns
Dist 2	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Dist 3	(*)	(*)	(*)	(*)	(+)	ns	ns	ns	ns	(+)	(*)

Table 2. Latency results by subject subgroup, with sensitivity being determined by each subjects' performance on the behavioral task at distance 2. Outcomes are given for significance testing of mean amplitude difference between vowel contexts in the indicated time windows. Significant results are noted, with * =

$p<0.05$, ** = $p<0.01$ and *** = $p<0.001$. Also noted are marginal results, where + = $p<0.10$.

Another issue relevant to this study is whether the magnitude of listeners' ERP response to deviant stimuli might be correlated with their sensitivity as measured in the behavioral task. Analysis of the data obtained in this study does not find evidence of such a relationship. The correlation of ERP response (measured as difference in mean amplitude at the designated "MMN" electrode sites between the deviant and standard contexts) and d-prime scores obtained in the behavioral study was not found to be significant. This was so for all combinations of distance-2 d-prime scores as well as d-prime scores averaged over the three distance conditions, and ERP measures as seen in either the [275 ms, 325 ms] time interval or the interval more typically associated with the MMN, from 100 to 300 ms. Finally, the behavioral and ERP data enable the investigation of two other questions relevant to the relationship between subjects' behavioral sensitivity measures and strength of ERP response.

3.2.1 Can ERP results predict behavioral outcomes?

For this analysis, subjects' mean amplitude of MMN response over the interval [275 ms, 325 ms] for the distance-1 condition was examined, together with their behavioral scores in the distance-2 condition. A negative correlation was found, as might be expected (the MMN is by definition negative), but this was not statistically significant ($r= -0.25$, $p=0.37$).

3.2.2 Are ERP and behavioral responses correlated in general?

Among the 15 ERP study participants, mean amplitude of MMN response was not significantly correlated with behavioral scores, in any of the three distance conditions. This may be due to (1) the noise associated with individual EEG data, (2) natural variation among subjects in strength of MMN response to particular stimuli, (3) the possibility that the MMN is an incomplete index of perception in this context. (A few individuals appeared not to generate an MMN-type response even in the easier listening conditions, but since correlation results were similar with or without their data, their data was included.)

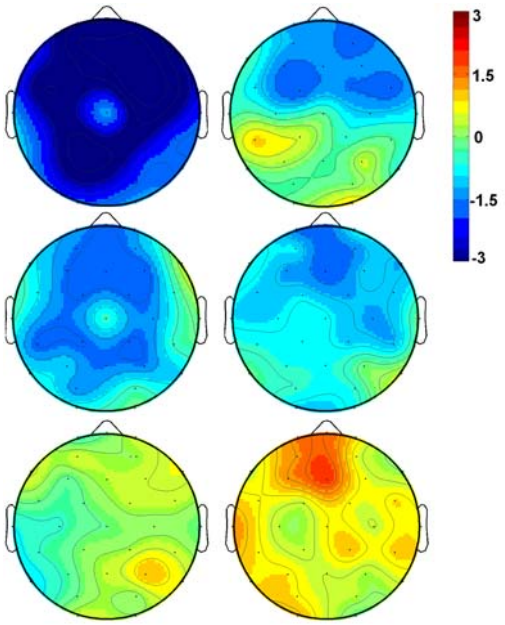


Figure 5. Topographic distribution of the effects seen at 300 ms after stimulus onset, broken down by subject group. The column at left shows results for the subjects deemed "sensitive" according to their behavioral scores, while the right column gives corresponding results for "insensitive" subjects. The top, middle and bottom rows correspond to distance conditions 1, 2 and 3, respectively. Units on the scale are microvolts.

4. Conclusion

This is the first ERP study to investigate the sub-phonemic processing associated with the perception of VV coarticulation. Distance-1 VV coarticulatory effects (i.e., a vowel influencing another vowel across an intervening consonant) were associated with strong MMN-like patterns. Distance-2 effects (a vowel influencing another vowel across three intervening segments) were also associated with a highly significant MMN-like response, though not in the sub-group of subjects considered "insensitive" when tested behaviorally. In aggregate, those subjects had performed behaviorally at somewhat better-than-chance levels. At distance 3 (VV effects across five intervening segments), the situation was quite different, with at best weakly significant ERP effects that were positive instead of negative, in contrast with the behavioral (d-prime) results which provided more straightforward evidence

of some subjects' perceptual sensitivity. These results do not provide evidence that ERP methodology can provide a better measure of listeners' sensitivity to coarticulatory effects than behavior methods offer. However, this study does offer new information about the topography and timing of the processing of such effects, which can inform theories seeking to explain how listeners perceive them.

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A Cartographic Approach to Multiple-Modal Constructions in Mandarin Chinese *

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1. Introduction

Mandarin Chinese (henceforth MC) allows multiple-modal construals, as in (1a); however, some ordering restrictions are at work. If we reverse the order of the two modals, as in (1b), the sentence turns out ungrammatical.

(1) a. ta keneng hui chuxi.
he likely will present
'It is likely that he will be present.'

b. *ta hui keneng chuxi.
he will likely present

The paper then tries to find out the nature of modals in MC and of the sequencing constraints on modals. In Section 2 I briefly examine the interpretations and the classification of modals. In section 3 I review the "modals as verbs" approach and address several problems. In section 4 I provide arguments to contend that modals are not verbs but functional heads that occupy distinct positions in a syntactic structure, and advocate the cartographic approach. In Section 5 I compare the relative order among modals to establish a rigid hierarchy. Section 6 concludes the paper.

2. An Overview of Modal Auxiliaries in Mandarin Chinese

In this paper, I will focus only on 11 major modals with their typical modal usages. Besides, I will adopt a simple two-way distinction—epistemic and root, and subdivide the former into necessity, possibility, and prediction, and the latter into obligation, permission, ability, and volition, and attribute each modal to a proper class according to its semantics. The examples and the classification are given below:

(2) ta yinggai dai zai jiali.
ta should stay at home
a. ‘It should be the case that he is at home.’ (epistemic necessity)
b. ‘He is required to stay at home.’ (obligation)

(3) ta keneng dai zai jiali. (epistemic possibility)
he likely stay at home
‘It is likely that he is at home.’

(4) ta bixu chuxi.[1] (obligation)
he must present
‘He is required to be present.’

(5) ni dei chuxi. (obligation)
you must present
‘You are required to be present.’

(6) pinkunzhe de linchu buzhujin. (permission)
poor people may get subsidy
‘The poor are permitted to get subsidy.’

(7) ta keyi kaiche.
he can drive
a. ‘He is able to drive.’ (ability)
b. ‘He is permitted to drive.’ (permission)

(8) ta neng/nenggou kaiche.
he can drive
a. ‘He is able to drive.’ (ability)
b. ‘He is permitted to drive.’ (permission)

(9) ta ken chuxi. (volition)
he willling present
‘He is willing to be present.’

(10) ta gan maoxian. (volition)
he dare venture
‘He dares venture.’

(11) a. ta hui shuo yingwen. (ability)
he able speak English
‘He is able to speak English.’
b. ta hui chuxi.[2] (future)

hw will present

'It will be the case that he will be present.'

(12) ta yao chuxi.[3]

he must/be going to/want present

a. 'He is required to be present.' (obligation)

b. 'He is going to be present.' (future/irrealis)

c. 'He wants to be present.' (volition/control)

Table 1

Epi.	Necessity: *yinggai*	Root	Obligation: *yinggai, bixu, dei, yao*
	Possibility: *keneng*		Permission: *de, keyi, neng*/*nenggo*
	Prediction: *hui*		Volition: *ken, gan*
			Ability: *neng*/*nenggou, hui, keyi*

3. "Modals as Verbs" Approach

Lin and Tang (1995) claim that modals take a CP as complement and MC can thus allow multiple-modal constructions, i.e., a multi-clause structure. Furthermore, epistemic modals, obligation *yingga*i, and permission *keyi* are raising verbs, while other root modals are control verbs. I shall call the analysis "modals as verbs" (MAV) approach.

3.1 Modals as verbs

To begin with, Lin and Tang find that modals can appear sentence-finally:

(13) ta zheyang zuo bu yinggai./ying-bu-yinggai?

he this-way do not should should-not-should

'He should not do it this way./ Should he do it this way?'

They argue that modals in (13) serve as a matrix predicate and the rest of the clause constitute a sentential subject. In addition, either the whole clausal complement, as in (13), or simply the embedded subject can raise to the matrix subject position, as in (2). The only evidence that modals serve exactly as verbs that they provide is the fact that modals can be negated by *bu* 'not' and form A-not-A questions. Nonetheless, PP, AP, and AdvP can all achieve the same thing as well. For instance, see the case of AdvP in (14):

(14) a. Zhangsan pao bu kuai.

Zhangsan run not fast

‘Zhangsan doesn’t run fast.’

b. Zhangsan pao de kuai-bu-kuai
Zhangsan run DE fast-not-fast
‘Does Zhangsan run fast or not?’

Besides, they observe that epistemic modals can occur sentence-initially:

(15) yinggai/keneng Zhangsan yijing likai le.
should/likely Zhangsan already leave SFP
‘It should be the case/It is likely that Zhangsan has already left.’

They then assume that raising is optional and an empty expletive appears in (15). However, it is controversial whether MC has empty expletives.

Moreover, *hui* ‘will’, also as an epistemic modal, can never appear sentence-initially as in (16a), or sentence-finally as in (16b):

(16) a. *hui Zhangsan yijing likai le.
will Zhangsan already leave SFP

b. *ni zheyang zuo (bu) hui/hui-bu-hui.
you this-way do not will/will-not-will

Nevertheless, Lin and Tang have no explanation for (16a) and attribute the ungrammaticality of (16b) to the idiosyncratic property of *hui*.

3.2 Ordering restrictions and finiteness properties of the complements

According to Lin (2006b), epistemic and obligation modals take a finite TP and can only appear in finite context, whereas future and other root modals take a nonfinite TP and can occur in both finite and nonfinite clauses. Therefore, the former must always precede the latter.

Lin proposes that epistemic modals scope over the perfect aspect *le*2 since *le*2 may occur within the finite TP, as in (17). In contrast, root modals fall within the scope of *le*2 because *le*2 cannot be licensed within the nonfinite TP. If *le*2 is to appear, it must be in the matrix Asp^0, as in (18).

(17) Zhangsan$_i$ T_F [Asp_P[VP keneng [TP **t**$_i$ T_F [Asp_P[VP qu Taipei] le]]] Ø]
Zhangsan likely go Taipei Prf Stc
‘It is likely that Zhangsan has gone to Taipei.’

(18) Zhangsan$_i$ T_F [Asp_P[VP neng [TP PRO T_{NF} [Asp_P[VP qu Taipei] Ø]] le]
Zhangsan able go Taipei Stc Prf
‘Zhangsan has (become) able to go to Taipei.’ (Lin 2006b: 14)

However, if *neng* 'can' can agree with *le*2, a dynamic aspect, with the help of a null static light verb, *keneng* 'likely' should also be able to agree with *le*2 and fall within the scope of *le*2, contrary to the prediction.[4]

4. Cartographic Approach and its Empirical Consequences

In this section I discuss the cartographic approach (Rizzi 1997; Cinque 1999) and offer four arguments to advocate it. I claim that modals are not verbs, but functional heads interspersed in syntactic structure, thus accounting for the ordering restrictions on multiple-modal occurrences.

4.1 Sentence-initial and sentence-final occurrences of modals

At first, we have seen that *yinggai* 'should' and *keneng* 'likely' can occur sentence-initially as in (15), whereas *hui* 'will' cannot as in (16a). Since epistemic modals stand in the CP periphery, it is natural for them to precede the subject. Besides, because *hui* has a bearing on tense, we may tentatively place it under I/T^0. Suppose further that T in MC also has an EPP-feature, then subjects must raise at least to Spec-I/TP to satisfy the EPP-feature. This being so, it follows directly that *hui* can never occur sentence-initially.

On the other hand, we have also seen that *yinggai* can appear sentence-finally as in (13), while *hui* cannot as in (16b). For (13), I follow Lin and Tang (1995)'s analysis to treat the modals as the main predicates. Moreover, since topic is recursive in the left periphery (Rizzi 1997), the sentential topic may naturally stand higher than modals. Concerning (16b), I tentatively attribute it to a phonological rule in MC, preferring a predicate to be "heavy" enough. The speculation makes sense since the sentences will be unacceptable if *yinggai* occurs sentence-finally in the simple form:

(19) *ni zheyang zuo yinggai.
you this-way do should

Then, it follows that *hui*, as a monosyllabic word, can never occur sentence-finally, even in the negative or A-not-A form.

4.2 Normal subject-modal sequences and *henshaoren*

I argue that subjects in MC tend to move to a topic position. Tsai (2007) argues that the subject in high applicative construals in MC actually lie in a topic position. If we generalize the idea, not only the typical subject-modal sequence, but also the relatively free order between epistemic modals and subjects can be accounted for.

Furthermore, we find that high epistemic modals must precede *henshoaren*, which is idiosyncratic in that it cannot undergo topicalization according to Ko (2005), while *hui* must follow it, as in (20):

(20) a. yinggai/keneng henshaoren hui chuxi.
should/likely few people will present
It should be the case/is likely that few people will come.
b. *yinggai/keneng hui henshaoren chuxi.
should/likely will few people present
c. *henshaoren yinggai/keneng hui chuxi.
few people should/likely will present

The MAV approach cannot explain why an empty expletive is obligatory in (20a) and rasisng of only subject is impossible in (20c). On the other hand, the contrasts are exactly as predicted by the cartographic approach.

4.3 Scope interaction between aspect markers and modals

Tsai and Portner (2008) argument precisely predict the scope interaction between modals and aspect that outer aspect like *le*2 undergoes LF movement to T for tense anchoring. Since high epistemic modals reside in the left periphery and low root modals between TP and AspP, the former always scope over aspect, which in turn over the latter, as in (21).

(21) a. Akiu yinggai/keneng qu Taipei le.
Akiu should/likely go Taipei Prf
'It should be the case/is likely that Akiu has gone to Taipei.'
b. Akiu neng(gou)/keyi/ken qu Taipei le.
Akiu can/can/willing go Taipei Prf
"Akiu has (become) able/permitted/willing to go to Taipei."

4.4 Restriction on modal-aspect adjacency

We observe a restriction that prohibits a modal from adjoining an aspect. Typical state verbs that take a clausal complement can immediately precede aspect markers as in (22). If the MAV approach were right, we would anticipate that modals could also do so, contrary to the fact, as in (23):

(22) ta zheng xiang zhe shifou yao jieshou zhe liwu.
he right think Dur whether going-to accept the gift
'He is right thinking whether to accept the gift.'
(23) *ta yinggai/bixu/ken/keyi le/guo/zhe kaiche.
he should/must/willing/can Prf/Exp/Dur drive

Nonetheless, if modals are functional heads, (23) follows directly. Lin

(2006a) contends that vP must undergo a comp-to-spec movement and raise to Spec-AspP due to the agreement relation. (23) crashes since the aspects agree with the true verb *kaiche* 'drive', but not modals, which fails to move.

5. Modal Hierarchy in MC

In this section, we exploit a cartographic approach to establish a rigid modal hierarchy in MC. To begin with, we observe that epistemic necessity modal occurs before epistemic possibility modal, as commonly assumed:

(24) a. ta yinggai keneng chuxi.
he should likely present
'It should be the case that he is likely to be present.'
b. * ta keneng yinggai chuxi.
he be-likely should present

Then, we find that the epistemic possibility modal always precedes the prediction modal and root modals as in (25):

(25) a. ta keneng hui/bixu/yao/dei/neng/keyi/ken chuxi.
he likely will/ must/must/must/can/can/willing present
'It is likely that he will be present.'
b. * ta hui/bixu/yao/dei/neng/keyi/ken keneng chuxi.
he will/ must/must/must/can/can/willing likely present

In addition, we notice that the prediction modal and the obligation modal pattern alike in that they both precede other subtypes of root modals as in (26), but they are mutually exclusive in either order as in (27):

(26) a. ta hui/bixu keyi/neng/ken chuxi.
he will/must can/can/willing present.
'He will/must be able/permitted/willing to be present.'
b. * ta keyi/neng/ken hui/bixu chuxi.
he can/can/willing will/must present
(27) a. *ta hui bixu/dei/yao/yinggai chuxi.
he will must present
b. *ta bixu/dei/yao/yinggai hui chuxi.
he must will present

In the view of the cartographic approach, the prediction modal and the obligation modal must compete for the same position, namely I/T^0.

Permission modals can to some extent precede ability and volition modals as in (28) and (29), respectively:

(28) a. ?ta keyi neng(gou) chuxi.
he permitted able present
'He is permitted to be able to be present.'

b. *ta keyi neng(gou) chuxi.
he able permitted present

(29) a. ta ?keyi/??neng(gou) ken/gan wei ni maoxian.
he permitted willing/dare for you risk
'He is permitted to be willing to/dare to take a risk for you.'

b. *ta ken/gan keyi/neng(gou) wei ni maoxian.
he willing/dare permitted for you risk

Besides, the ability modal and the volition modal mutually exclude each other in either order as in (30):

(30) a. *ta keyi/neng(gou) ken/gan wei ni maoxian.
he able willing/dare for you risk

b. *ta ken/gan keyi/neng(gou) wei ni maoxian.
he willing/dare able for you risk

All in all, we can now establish an articulated modal hierarchy as in (31):

(31) subj > epistemic necessity > epistemic possibility > subj > prediction/obligation > permission > volition/ability

6. Conclusion

In this paper I argue that modals are functional heads interspersed in syntactic structure and hence account for the ordering restrictions on multiple-modal construals. I adopt a two-way distinction of modals and classify them. I also examine the MAV approach and point out some of its problems. Instead, I offer four arguments to claim that modals head distinct functional projections and advocate the cartographic approach. Finally, I map out a fine hierarchy of modals by comparing their relative distributions.

Notes

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1. In fact, obligation modals are ambiguous in their orientation. The obligation could be laid by an unspecified authority or directly by the speaker. The same holds for permission modals. Here I concentrate only on the typical subject-oriented reading for all deontic modals.
2. Enç (1996) argues that English *will* is an epistemic modal whose modality involves prediction, and futurity is its inherent property. Thus, *will* is not a syntactic category of tense. If the argument applies to *hui*, we may tentatively treat *hui* also as an epistemic prediction modal.
3. For (12b), *yao* expresses an immediacy reading. However, it is dubious to relate the reading to the function of modals. Thus, I ascribe it to *yao*'s aspectual use as Lin (2006b). For (12c), it is unclear whether *yao* is a control verb or a volition modal and I will wait for future study.
4. Lin's argument is based on Shen's (2004) idea of aspect agreement, which states that aspect markers must agree with predicates in dynamicity features. Besides, a phonetically null light verb, either dynamic or static, may enter the phrase structure to mediate the agreement between the aspect and the predicate when they do not agree in aspectuality.

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Easily in the Middle

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I assume some familiarity with the intransitive/transitive alternations illustrated in (1) and (2), for which I adopt the commonly used terms *middle* for (1a), (2a), and *ergative* for (2b), from Keyser & Roeper 1984.

(1) a. Mr. Smith bribed easily
b. ? Mr. Smith bribed.
c. Bill bribed Mr. Smith.

(2) a. The glass broke easily.
b. The glass broke.
c. Bill broke the glass.

The role that *easily* plays in the intransitive middle construction (1a) is open to several kinds of account. Often it is simply some kind of modifier, of various kinds of (often unexpressed) elements associated with the construction. Here I assume that something like *easily* is, in a certain sense, necessary for the middle, and give it a central role in both semantic and syntactic function. In section 1 I show how the syntax of the intransitive ergative and middle constructions work. In section 2 I discuss the properties of *easily* that qualify it as the kind of element that can make the middle work. The picture of the intransitives that will emerge is essentially VP-centered, pointedly without access to the full clausal syntax. I discuss this picture in section 3.

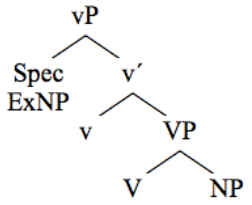
1. Deriving the intransitives

In this section I outline a syntactic working model of the ergative and middle constructions. In section 1.1 I locate this account within the general outlines of current theories of minimalist syntax (Chomsky 1995, 2001) and argument structure. In section 1.2 I review a well-known theory of ergatives, developed through Hale & Keyser 1987, 1993, 2002. This theory has the attractive property that the ergative is not derived by rule, but rather follows as a lexical property of the central verb. In section 1.3 I turn to the middle, and show how it works.

1.1 Argument projection and syntax

A syntactic derivation begins with a lexical array LA. In the course of a syntactic derivation, the NPs constructed from LA are merged into the structure, and assigned θ-roles. In the case of an external argument of V, the typical place of Merge is the Specifier of the light verb *v*, [Spec,vP], as in (3).

(3)



The semantic connotations associated with vP are along lines of "causative;" the thematic content of ExNP is typically along lines of "agent," subject to the composition of the elements in VP. Given the structural origin of ExNP, the θ-assigning role of V with respect to it is minimized. The strongest conclusion is that the external θ-role is not a property of V (Kratzer 1996).

Suppose that the strict lexical θ-assigning properties of middle and ergative verbs like *break* and *cut* are limited to their internal arguments. This amounts to supposing that the Lexical Conceptual Structures associated with them, at least in their minimal use, is not the familiar full-blown causative structure, as in, for example, (4a) (Rappaport Hovav & Levin 1998), but rather as in (4b), which I will call the *core event.* (I return to further discussion of (4) in Section 2.3).

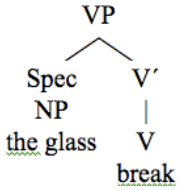
(4) a. [[*x* ACT] CAUSE [BECOME [*y* <*STATE*>]]] (= RH&L:(12))
b. [*y* <*STATE*>]

Within the VPs of middles and ergatives, the single internal arguments exhaust the verbs' θ-assigning requirements. Call such VPs *θ-complete*. As θ-complete structures, these VPs should be able to independently support their expression in a clause. This is the characteristic of ergatives (2b), while middles evidently need some assistance, which I take for the time being to be an adverb like *easily* (1a). I suppose that ergatives and middles differ in their lexical structure, specifically in the way they determine their (single) θ-roles. The manner in which they manifest this difference will be made explicit in what follows.

1.2 Ergative

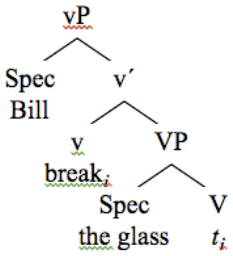
In the Hale & Keyser theory, the ergative verb is a verb with a single argument, which is projected to VP-internal subject position.

(5)



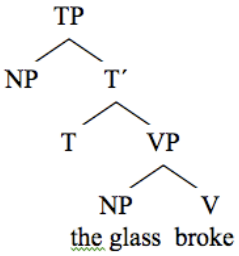
As it stands, this *break* VP can enter the transitivizing syntax of the vP structure in (3). *Break* raises to v, Case will be assigned to *the glass*, and, with Merge of another NP at [Spec,vP] (and subsequent raising to [Spec,TP] for Case), the transitive (2c) will follow. The structure of the transitive vP of (2c) as in (6).

(6)



Suppose now that the LA of a *break* V derivation generates only one NP. That is, suppose that structure (5) exhausts the lexical items in LA. In the Hale & Keyser theory, (5) can enter, as is, into the clausal syntax, abbreviated to TP, bypassing vP, as in (7). In this case, vP has no work to do—there is no Accusative Case to mark, and there is no need for it to supply a position for an external argument.

(7)



In (7), the EPP feature of T requires an NP in [Spec,TP]. In the intransitive ergative structure (7), Move of the VP-internal subject will supply the NP, and effect its Case marking.

1.3 Middle

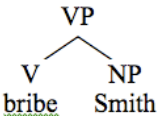
Hale & Keyser assume that the middle VP is identical to the ergative VP—both have their single argument in VP-internal subject position. However, consideration of their likely conceptual structures in (8), (9) indicates that, instead, the argument in the core event denoted by a middle is an object.

(8) a. Bill broke the glass.
b. i. Bill caused the glass to break.
ii. [[*b* ACT] CAUSE [*g* <*BREAK*>]]

(9) a. Bill bribed Smith.
b. i. * Bill caused [Smith to bribe]
ii. * [[*b* ACT] CAUSE [*s* <*BRIBE*>]]
c. i. Bill caused [Smith to be bribed *e*]
ii. [[*b* ACT] CAUSE [BECOME[*s* <*BRIBED*>]]]

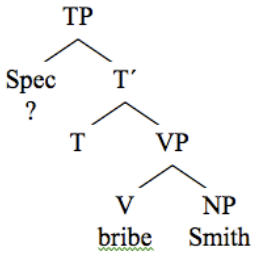
While *break* allows a direct predication in its *BREAK* subevent (8bii), *bribe* does not, in (9bii). Rather, the appropriate conceptual structure of (9a) in (9cii) must be of a passive nature, preserving an essential object origin of the single argument. Hence, I assume that the middle verb projects a VP with its single argument assigned to object position, as in (10).[1]

(10)



Suppose the lexical structure in (10) is embedded, as with the ergative, in a clausal structure, under a TP in need of an NP in Spec, as in (11).

(11)

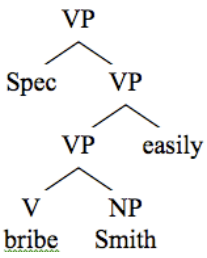


Suppose now that [Spec,TP] has no access to the *Smith* NP, for the following reason. The *bribe* VP, being θ-complete, has the "propositional" character of a phase (Chomsky 2001). All of the lexically specified arguments are discharged within the *bribe* VP. Access to the elements of a phase is only via the edge, i.e. the Spec and head of that phase. Now, in the *bribe* VP, there is no θ-role "left

over" to drive the projection of a [Spec,VP] position. Hence, unless [Spec,TP] can get another NP from somewhere, a derivation along the lines of the ergative in (12), of an intransitive directly from a middle, will fail. This is why (1b) is as bad as it is. Enter *easily*.

Suppose that *easily* is a "deep", VP-level adverb. Crucially, suppose it adjoins directly to a projection of V, before any embedding within a transitivizing vP, as in (12).

(12)



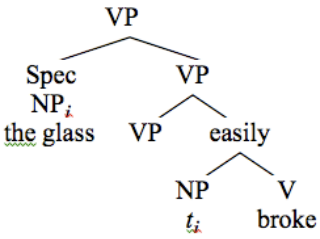
In (12), *easily* adjoins to the *bribe* VP. The branching structure of the new [*bribe…easily*] VP allows the projection of a [Spec,VP] position. This projection is motivated by the external argument required by the *easy* predicate to which *easily* is transparently related. As an adverb, unlike *v*, *easily* has no Case-assigning properties, so the *Smith* NP is free to move. In fact, it can be considered to be forced to move, to satisfy Full Interpretation, along lines considered in Hale and Keyser 1993, 2002.

The [*bribe easily*] VP now has an edge element in [Spec,VP]. The *Smith* NP is in a position to move into the clausal syntax, and the intransitive middle structure in (1a) is the result.

It is commonly acknowledged that any ergative can be "middlized" by taking an *easily*-type adverbial. An adjunction structure like (12) accounts for any case in which an ergative is modified by *easily*, as in (13b), the VP of (13a (= (2a)).

(13) a. The glass broke easily.

b.



In this account, the adverbial *easily* is not a predicate or modifier of any argument. Rather, it is an operator deriving a predicate from a predicate, much

in the way that auxiliaries do.[2] Further, there are no empty elements in the clausal syntax to license, or be licensed by, *easily.* Finally, there is no "rule" of middle, or ergative, formation—the structures arise, or are derived, simply from the properties of the lexical items and, in the case of the middle, exploitation of the possibilities of adverbial adjunction.

We turn now to consider how, and why, *easily* is the kind of element that can rescue the middle the way it does.

2. *Easily*

Easily is often referred to as an adverb of manner in the literature, and its function, especially in the middle construction, is often taken to be a matter of licensing a component of manner in the verb of the construction.[3] This usage tends to obscure the difference between the basic semantics of *easy* and other adverbs that express manner, like *carefully.* In section 2.1 I distinguish *easily* from *carefully* as VP operator from predicate, and in section 2.2 I discuss the nature of the syntactic attachment of *easily.* In section 2.3 I discuss the nature of the association between *easily* and the types of verbs that participate in the transitive/intransitive alternation.

2.1 Operator *easily*

The examples in (14ai,bi), with their (ii) paraphrases, illustrate how the adverbs *easily* and true manner adverbs like *carefully* might be mistaken to be of the same type.

(14) a. i. Bill cut the bread carefully.
ii. Bill cut the bread with care.
b. i. Bill cut the bread easily
ii. Bill cut the bread with ease.

If we take more care in our paraphrases, the difference between the two adverbs becomes clearer. The most natural reading of (15ai) is that Bill exercises some care in the cutting (15aii), independently of the properties of the bread, whereas in (15bi), Bill is not exercising some lack of effort (15bii). Instead, as the related adjectival predicate indicates in (16a), *easy* characterizes the nature of the *cutting the bread* event in which Bill is a participant. Note that adjectival *careful,* which is truly about Bill in his manner of action, cannot have that kind of association with the event (16b).

(15) a. i. Bill cut the bread carefully.
ii. Bill used/exercised care in cutting the bread.
b. i. Bill cut the bread easily
ii. ? Bill used/exercised ease in cutting the bread.

(16) a. Cutting the bread was easy for Bill.
b. ? Cutting the bread was careful for Bill.

As these examples indicate, *easy/easily* is more a predicate of events than of the individuals that participate in them. Now, *easy* is a member of the family of *tough*-movement predicates, and, informally speaking, the signature constructions of these elements relate object-oriented event predicates to subjects. Why "object-oriented?" Because the object is the primary candidate for predicate variable in the core VP (see Jones 1991).

(17) [The bread]$_i$ is *easy* [to cut *e*]$_i$.

In this light, *easily* performs the same type of function as its related adjective.

2.2 Inner *easily*

To get the syntax of the middle to work in the above account, the *easily* associated with the intransitive middle must be attached directly to VP, before embedding within transitivizing vP. Note that the middle reading of *easily* is not available in the trantisitive structure (18).

(18) a. Bill broke the glass easily.
b. Bill [caused the glass (to) break] easily.
c. * Bill caused [the glass (to) break easily].

That is, (18a) only has a reading in which causing the glass to break was easy for Bill (18b). It cannot have the reading in which Bill causes the glass to be easy to break (18c). Yet it is the "easy to break" reading which is the unadorned core reading of the intransitive *The glass broke easily.*

It is not impossible to suppose, following Roberts 1987 or Massam 1992, that the middle construction, i.e., the adverbially modified intransitive, is associated with a special (unexpressed) modal element in the clausal syntax, which enters into a special licensing relation with the adverb, hence setting up its particular semantics.[4] However, the inability of the transitivized middle V structure in (18) to locate the requisite *easily* "deep" enough to get the "easy to break" reading indicates that the clausal syntax has no access to the interior of the core VP. VP-level *easily* is itself at the appropriate level to independently set up the middle. It *is* the modal element.

2.3 The transitive/intransitive alternation

It is well-known that not all transitive verbs have intransitive counterparts of the type we are considering here, as the couple of example pairs in (19) (non-exhaustively) illustrate.

(19) a. i. Bill ignored Smith.
ii. * Smith ignored (easily).
b. i. Bill assassinated Smith.
ii. * Smith assassinated (easily).

The verbs that most successfully participate in the transitive/intransitive alternation are commonly known as "change of state" verbs. These verbs are often associated with the familiar Lexical Conceptual Structure along the lines of (20) (= (4a)).

(20) [[*x* ACT] CAUSE [BECOME [*y* <*STATE*>]]]

A related conception of the nature of the intransitivizing verbs is that their internal arguments must be understood to be "affected" in some way—the Affectedness Constraint of Anderson 1979. The correspondence of the Affectedness Constraint with the …CAUSE [BECOME… substructure of (20) indicates the considerable overlap of the two conceptions.

In the VP account of the intransitives outlined in Section 1, we had supposed that the strict lexical θ-assigning properties of V were restricted to its internal argument. This leads us to a conception of the Lexical Conceptual Structure of the change of state verbs of interest here more along the lines of (21)(= (4b)).

(21) [*y* <*STATE*>]

In the present account, the business of the ACT and …CAUSE [BECOME… subevents is determined independently, compositionally, by the syntax.

Suppose now that middle formation is restricted to verbs of type (21). Why would middle *easily* be restricted in this way? It is so restricted by its relation to *easy*, which essentially operates as a predicate of events, as in (22a), or as a predicate operator between object-oriented events and individual subjects, as in the *tough*-movement structure in (22b).[5]

(22) a. i. [To cut the bread] was easy.
ii. [Cutting the bread] was easy.
b. [The bread] was [easy [to cut *e*]].

As (23) illustrates, the kinds of adverbials that set up the middle are in no way dependent on the existence of *tough*-predicate counterparts.

(23) a. The bread cut quickly. (≠ ?It was quick to cut the bread.)
b. The bread cut like wood. (≠ *It was (like) wood to cut the bread)
c. The bread cut in a jiffy. (≠ *It was/took a jiffy to cut the bread.)

The property that middle adverbials share with *tough*-elements is that they can

act as predicate operators, selecting the core property of a VP, e.g. *cut*(x), and setting up its relation to a subject, *the bread*. Circumstantial adverbials, of manner, location, or time, are peripheral to the core VP relation.

The verbs that do not participate in the transitive/intransitive alternation, then, are those verbs that do not denote an "inner state" event for their internal arguments. This characterization is largely consonant with familiar conceptions of the factors that set up that alternation.

3. VP

The work done by *easily* in the present account is restricted to VP. Hence, the middle and ergative structures have no access to an external argument. From a certain point of view, this lack of access is a desirable result. It is well-known that these intransitive structures differ from passives, in which the characteristic external argument can find expression in a dedicated *by*-phrase (24a). In the middle and ergative, it cannot (24b).

(24) a. The glass was broken by John
b. * The glass broke (easily) by John.

Another phenomenon often taken to indicate that the external argument is absent in the intransitives is their inhospitality to rationale (*in order to*) clauses.

(25) a. The glass was broken [(in order) to prove a point].
b. * The glass broke [(in order) to prove a point].
c. * The bread cut easily [(in order) to prove a point].

Despite these advantages, various kinds of arguments have accrued which aim to establish a necessary role for the external argument in the middle. Here I review and briefly remark on three kinds of argument that are representative of the appeal to an external θ-role in middles.[6] I make reference here to Stroik's (1992-2006) work on middles, where these arguments recur.

3.1 Anaphora

Stroik argues that subject-contained anaphors, like the *oneself* in (26), require licensing by some element.

(26) Books about oneself never read poorly. (= Stroik 1992: (6a))

In Stroik's analysis, the necessary binding for the anaphor occurs in a fully clausal transitive D-structure, with the anaphor in the c-command domain of an external argument. However, whatever the licensing required for the anaphor in (26), the same kind must be available to that in (27), where the *are* predication

offers little evidence of having an underlying agentive external argument.

(27) Books about oneself are always silly.

Hence the subject-contained anaphor phenomenon is larger than the middle, and it is to be expected that the general account of it need not involve properties specific to the middle.

3.2 Genericity

Stroik 2006 adopts "a common assumption shared by most linguists. (:303)," that middles are generic statements. In order to set up the genericity of the middle, there is often an appeal to a clausal event variable, to be bound, along with other free variables, by a GEN(eric) operator. On this assumption, the target paraphrase for a middle like (28a) would be along the lines of (28b) .

(28) a. This book reads easily.
b. "It is a generic property of events of reading this book by any arbitrary person that they are events easily performed by that person. (S:303)"

Since securing genericity for middles involves clausal structure, outside of the VP domain within which the present account is confined, the underlying assumption of this kind of genericity for middles invites skepticism. The target interpretation of the generic reading in (28b) is the "manner" reading for *easily*. In light of the discussion above in section 2 about the problems with the "manner" reading of the middle (as opposed to the *easy to read* reading), it cannot count as a virtue of a clausal analysis that achieves it.

3.3 *For*-PP

For Stroik, the [*for me*] PP in (29) must be a syntactic realization of the external θ-role of *translate*

(29) No Latin text translates easily (for me). (= Stroik 2006: (2a))

There exists, however, a *for*-PP, with roughly appropriate semantics ("for X to do Y with"), which appears as an independent predicate. The *is* predication in (30) offers little hint of any covert external argument of some other predicate.

(30) This book is for you.

Hence, there is an independent source for the middle *for*-PP.

4. Independence, freedom, opportunity

The present VP account of the middle features no clausal empty elements—there are no implicit agents, and there are no clausal operators to license, or be licensed by, the VP-level *easily* that makes the middle possible. There is only VP, independent of the clause, with the θ-marking properties of the head verb, *easily*'s *tough* properties, and the free opportunity to bring them together through adjunction.

Notes

[1] The essential object-nature of the argument of the middle core predicate is noted, and put to somewhat different use, in Massam 1992, Villafaña 2000.

[2] As is often noted, explicit modal auxiliaries, and negation, are able to project the middle argument.

i. This bread will/can cut.
ii. This bread doesn't cut.

On the assumption that these elements are VP-level operators, this should follow from the basic syntactic machinery proposed for *easily*.

[3] Thus, for Rappaport Hovav & Levin 1988:116, "the externally caused change of state verb *break* has the event structure (28) [= (i)]," in which ACT is characteristically associated with *MANNER*.

i. [*x* ACT$_{<MANNER>}$] CAUSE [BECOME [*y* <*BROKEN*>]]]

For Hale & Keyser 1993:90, there is a "*manner component*…in the lexical representation of verbs," along with "principles according to which the manner component is 'licensed.'"

[4] Massam 1992 outlines the general idea thus: "We define middle as a sentence which contains a certain modality…which lends a generic meaning to the sentence. (:121)…The use of an overt modal or adverbial can be seen as serving to modify this basic modality which is generated in all middle constructions. (:124)"

[5] Lekakou 2006, following Hoekstra & Roberts 1993, proposes that the adverbial establishes a licensing relation between its own Benefactive/Experiencer argument and the implicit (external) argument of the middle verb. I note here that this relation, to be established by *easily*, grafts a middle-specific functionality onto the event-individual relation characteristic of its relative, *easy*. In the present account, there is no implicit external argument for *easily* to relate to.

[6] For languages in which the middle is morphologically marked, e.g., French, Russian, the accompanying morpheme often has a reflexive use. The possible role of external θ-role inevitably enters into considerations of reflexive binding in these constructions. I will not go into the matter here, but see Jones & Levine (in progress) for discussion from the present perspective.

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Information Structure of Case on Adjuncts in Korean

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1. Introduction

Although it is commonly thought that Case is assigned only to arguments[i], there are many languages where Case shows up on adjuncts, including Korean.

(1) a. Chelswu-nun i chayk-ul sey pen-ul ilk-ess-ta
Chelswu-TOP this book-ACC three time-ACC read-PST-DECL
'Chelswu read this book three times.'
b. John-i han.sikan tongan-ul talli-ess-ta
John-NOM 1. hour for-ACC run-PST-DECL
'John ran for an hour.'

Previous studies on case-marked adjuncts in Korean focus on finding out the conditions which determine when Acc vs. Nom would appear on the adverbial NPs. However, this study investigates the function of the addition of the particle on adverbial NPs in Korean contemplating why the case particle should be attached to the adverbial NPs. I will argue that as Vallduvi (1992) suggests that each language adopts different strategies for information packaging, Korean uses a strategy of 'Case Morphology' for Information Packaging. My claim is that the case particle on adverbial NPs in Korean can represent 'Information Structure'.

2. Optionality and Focus

Many researchers suggest that only duration and frequency adverbials—that is, acting as 'situation delimiters' in W&L's (1996) term, can be case-marked in Korean. Case on adverbial NPs in Korean is optional unlike Icelandic or Finnish. Furthermore, Duration/Frequency adverbials are often more natural without overt case-markers, while other adverbials with no case-marker result in ungrammaticality.

(2) a. Yumi-ka manhwachayk-ul twu sikan-tongan-ϕ po-ass-ta.
Y-NOM comic.book-ACC two hours-for read-PST-DECL
'Yumi read comic books for two hours.'
b. Yumi-ka kathun yenghwa-lul sey pen-ϕ po-ass-ta.
Y-NOM same movie-ACC three times see-PST-DECL
'Yumi saw the same movie three times.'

(3) a. Yumi-ka kongwen-eyse/* ϕ sanpo-lul ha-yess-ta.
Y-NOM park-LOC/* ϕ walk-ACC take- PST-DECL
'Yumi took a walk in the park.'
b. Yumi-ka Cheli-lul twu si-ey/* ϕ manna-ss-ta.
Y-NOM C-ACC two o'clock-DAT/* ϕ meet-PST-DECL
'Yumi met Cheli at 2 o'clock.'

Y-J Kim (1990) argues that the norm for D/F adverbials is to have a zero case marker in formal speech, whereas in colloquial speech, however, overt case markers are allowed.

We can make two hypotheses from the optionality of adverbial Case in Korean. First, D/F adverbials can occur without Case and make the same semantic contribution to interpretation (i.e., as a Situation Delimiter, in the sense of W&L). That is, adverbial nominals without case-marking also work as "situation delimiters". We can deduce that the case-marker on adverbial NPs is not relevant to situation delimiting function. Second, D/F adverbials can occur with no case-marker and often they are more natural without overt case-marker. It means that there should be some effects on adverbial NPs in Korean. If there is any grammatical consequence, it should not be considered as 'optional'. Then, the optionality of adverbial case should not be treated as the same with the optionality of argument case, although Case Particle Ellipsis happens to both arguments and adjuncts.

3. Case Particle as a Focus Operator

Example (4) let us know that the use of overt case-marker provides the adverbial phrase with a kind of focus reading.

(4) a. Inho-ka sey sikan tongan-/ul.*i TV-lul po-ass-ta
I-NOM 3 hours for-/ACC/*NOM TV-ACC watch-PST-DECL
'Inho watched TV for three hours.'
b.?Inho-ka TV-lul palo sey sikan tongan- po-ass-ta
I-NOM TV-ACC just 3 hours for- watch-PST-DECL
'It was for three hours that Inho watched TV.'

c. Inho-ka TV-lul palo sey sikan tongan-ul/*i po-ass-ta
I-NOM TV-ACC just 3 hours for-ACC/*NOM watch-PST-DECL
'It was for three hours that Inho watched TV.' (J-S. Jun 2000)

In (4b), *palo* 'just' which focuses duration adverbial, *sey sikan tongan* 'for three hours' allows no particle attached, whereas in (4c) it fits the case-marked adverbial. The use of *palo 'just'* has an effect similar to the 'it-cleft construction' in English. J-S Jun (2000) interprets that the co-occurrence in the same sentence of *palo* 'just' and the case-marking on adverbial NPs means the focus effect of case particles on adverbial NPs.

I propose that the function of Case Particle on adverbial NPs is similar to the typical "delimiters" such as *man* 'only', *nun* 'topic' or *tul* 'plural' in Korean. It could be an 'operator' which is associated with Focus[ii]. The function of Case Particles surpasses to represent abstract Case, and it can have scope over a category that dominates it as a domain marker to represent other grammatical information of the entire sentence. I suggest 'Misplaced Marker Hypothesis (MMH) '. Although the case particle is attached to the adverbial, its scope is not limited to the adverbial NP itself, but could be over the entire VP or the TP.

My claim is that Case on adverbial NPs represents identificational focus[iii]. I suggest that case particles on adverbial NPs in Korean is a contrastive focus with [+contrast] and [+rhematicity]. It is doubly-focal in that identificational focus could convey new information as well. The purpose of this paper is to present syntactic evidences to prove that case particles on adverbial NPs in Korean can represent the identificational focus.

4. Syntactic Evidences

Identificational focus associated with Case on adverbial NPs in Korean has distinct syntactic realizations in two respects. First, it does take scope. Second, it is created by the movement to the specifier of FP.

4.1 Scope

The first syntactic evidence is that the identificational focus associated to the case particle on adverbial NPs in Korean does take scope. I hypothesize that identificational focus associated with Case on adverbials occupies a scope position and it marks the sentence part as the scope of exhaustive identification.

4.1.1 Scope ambiguity (NP-Focus, VP-Focus, TP-Focus)

It is significant that focus which case-marking on adverbial NPs induces does take scope. First, the existence of 'Scope Ambiguity' should be a natural corollary. I claim that the scope of the particle is not restricted to a surface position where it is located. The scope which is associated to focus effect is over

the adverbial NP, and it can be extended to the entire VP, and even to the entire sentence, TP, in adverbial case construction in Korean. There exist three possible different scopes with respect to an operator depending on the distance that is caused by the movement of the operator between the operator and the variable. Narrow scope can be taken to the adverbial itself, while broad scope can be taken to the VP; furthermore, another broad scope can be taken to the entire TP (or CP) depending on the context.

The surface position of case-marked adverbial NPs may not correlate with semantic scope. However, if we assume the covert operator raising to spec position of some functional projection (FP), the operator can take scope. Consequently, the scope of operator is not limited to the adverbial itself to which it is attached, but can have a scope over a category that dominates it. This scope ambiguity is similar to 'Focus Projection' of information focus that the optional extension of the domain of focus interpretation to the projections dominating a constituent bearing a pitch accent.

Scope is automatically generated depending on the pragmatic circumstances.

In (5), the scope of case particle is not limited to the adverbial NP, which it is attached, but it can be over the VP or over the TP:

(5) [$_{TP}$ na-nun [$_{VP}$ nonmwun-ul [$_{NP}$ yelsikan-(tongan)]-ul sse-ss-e]]
I-TOP paper-ACC 10.hours-(for)-ACC write-PST-DECL
'(I did not take a rest but) I wrote a paper even for ten hours.'

The following represents the possible alternative sets to distinguish Narrow Focus vs. Broad Focus:

(6) a. M = {three hours, thirty minutes, one hour, etc…}.
b. M = {did not read a book for ten hours, did not write a paper at all, played all day long, etc…}.
c. M = {You wrote a paper for ten hours, He wrote a paper for ten hours, She wrote a paper for ten hours, etc…}

The following examples in (7) represent the '*wh*-Question test' for Narrow-Focus. The focus test is done using *wh*-words. So, in (7), for narrow-focus, the question meaning '*How many hours (or how long) did you write a paper*?', can be used with the expected answer, '*I wrote a paper for* [$_{NP}$ *ten hours*]'.

(7) a. ne-nun nonmwun-ul myet-sikan-(tongan) sse-ss-ni?
you-TOP paper-ACC how many-hour-(for) write-PST-Q
'How many hours did you write a paper?'
b. ne-nun nonmwun-ul elma-tongan sse-ss-e?
you-TOP paper-ACC how long write-PST-DECL?
'How long did you write a paper?"

The following represents the *wh*-question test for Broad Focus, VP. The focus test is done using *wh*-words. So, in (8), for VP-focus, the question is '*What did you do*?', with the expected answer '*I* [$_{VP}$ *wrote a paper for ten hours*]'.

(8) a. ne-nun mwuess-ul hay-ss-ni?
you-TOP what-ACC do-PST-Q?
'What did you do?'
b. ne-nun totaycey mwuess-ul hay-ss-ni?
you-TOP on earth what-ACC do-PST-Q?
'What on earth did you do?'

Implied cognate object can indicate the fact that the Acc case is operated over the whole VP. In (9), ACC is assigned to the adverbial *halwu-tongan*. I suggest that ACC on the adverbial in (9) is caused by the fact that the verb *sal-ta* 'live' can take a cognate object:

(9) halwusali-nun halwu(-tongan)-ul sa-n-ta
dayflies-TOP 1.day (-for) –ACC live-PRES-DECL
'Dayflies live for one day.'

It is also possible that the context or the situation can take the entire TP (or CP) as scope of the semantic operator. Scope Ambiguity is automatically generated depending on the pragmatic circumstances and it can be erased by discourse contexts or by pragmatic elements.

4.1.2 Scope relations

Other than the 'Scope Ambiguity' between narrow focus and broad focus, there should be 'scope relations' with other scope-bearing elements. Exhaustive identification enters into scope relation with other clause-mate scope-bearing operator.

(10) Chelswu-nun Yenghi-man ttalatany-ess-ta
C-TOP Y-only follow-PST-DECL
'Chelswu followed only Yenghi.'
'Chelswu only followed Yenghi.'

In (10), the focus particle *man* 'only' in Korean exhibits the 'Scope Ambiguity'. That is, two different interpretations are all possible. (10) means that '*Chelswu followed only Yenghi*' or it can also mean that '*Chelswu only followed Yenghi.*' That is, the focus particle *man* 'only' exhibits a similar effect of 'Scope Ambiguity'. It can take scope as VP (broad focus) as well NP (narrow focus). J-W Choe (1996) suggests that Korean particle *–man* 'only' can have a scope over

a category that dominates *-man*, so there is a systematic ambiguity with respect to the scope of *-man*, and indeed a set of 'sister members' can equally be set up for the cases of so-called 'emphatic use' of *-man*. He also argues that the scope can be taken over the entire sentence depending on the context. His argument is similar to my claim about the focus ambiguity that the case particle on adverbial NPs induces.

(11) a. Chelswu-nun Yenghi-lul sipnyen-ul ttalatany-ess-ta
C-TOP Y-ACC 10.years-ACC follow.after-PST-DECL
'Chelswu followed after Yenghi for ten years.'
b. Chelswu-nun Yenghi-man sipnyen-ul ttalatany-ess-ta
C-TOP Y-only 10.years-ACC follow.after-PST-DECL
'Chelswu followed after only Yenghi for ten years.'

Now, consider the case where two scope-bearing focus particles are in the same sentence. In (11a), I claim that the operator *lul* has the scope ambiguity between NP, VP and TP. However, in (11b), there are two scope-bearing focus operators: the focus particle *man* 'only' and the case particle *lul* on the adverbial NP. Both of focus operators could have the focus ambiguity by themselves. That is, the focus particle, *man* 'only' could take the wide scope VP as well as the narrow scope NP, and the case particle, *lul*, on adverbial NP also could take the wide scope VP as well as the narrow scope NP. These two operators associated with the emphatic meanings enter into the scope relation. That is, besides the 'Focus Ambiguity' that the case particle on adverbial NP induces, there should be 'scope relations' with other scope-bearing focus particle, *man* 'only'. Consequently, the expectation that the impact of 'scope ambiguity' which is observed in (10) can disappear is born out. I claim that in (11b) the reconstruction, which leads to 'scope reduction', takes place, since there is a scope relation of two scope-bearing elements. There are two possibilities. The first possibility is that, only a narrow scope interpretation of *man* 'only' is possible in (11b), when the case particle *lul* takes a wide scope. In that case, since the case particle *lul* takes a wide scope over the other focus particle *man* 'only', the NP-Focus reading disappears but only the wide focus reading (VP-Focus and TP-Focus) is available for the identificational focus effect of case on the adverbial NP. The second possibility is that, on the contrary, only a narrow scope interpretation of *lul* is possible in (11b), when the delimiter *man* takes a wide scope. When the delimiter *man* takes a wide scope over the case particle *lul*, the focus ambiguity which the case particle *lul* induces disappears.

4.2 The position of focus

4.2.1 Focus movement

The second syntactic evidence is the position of focus. As for the position of focus, there are two theoretical possibilities. First, the focus could be base-generated *in situ*. Or, it could be created by syntactic focus movement.

I believe that the properties between the scope relation and the position of focus are closely inter-related, and argue that semantic/syntactic properties such as scope ambiguity and scope relations are created by focus movement. Identificational focus which Case on adverbial NPs in Korean induces is created by the syntactic movement of the operator to the specifier position of a functional projection, called focus phrase (FP) for the focus effect. The complement of F is the sentence part over which the identificational focus takes scope. Consequently, three possible scopes (NP, VP, TP) can become focus phrases (FP) and can have the focus effects as the result of the movement. The position of identification focus which case on adverbial NPs in Korean induces is not constant, because the focus phrase (FP) varies depending on the context. It relates to the landing site of the operator of focus. Its semantic effects are interpreted only at its landing site.

I suggest the following properties associated with the focus movement in adverbial case construction.

(12) a. It is a covert movement to [Spec, FP] which is similar to operator raising.
b. It is a traditional a-bar movement without feature-checking.
c. It is a 'phase by phase' movement.
d. It is an 'obligatory movement' for an 'optional operation'.
e. It has INT effects as a 'configurational focus.'

The identificational focus associated with the case particle on adverbial NPs is created by a covert movement of the semantic operators into their scope position, that is, the specifier position of a functional projection called (FP), which is similar to quantifier raising (QR).

As for the narrow focus which the scope is over the adverbial NP itself, the movement is one-step. However, as for the wide focus in which the scope is over the entire VP, or over the entire TP, the movement is realized step-by-step. That is, it is a successive-cyclic A'-movement. I argue that it is 'Phase by Phase' movement.

In addition, I suggest that identificational focus in adverbial case construction in Korean goes through an 'obligatory' movement, which is optionally operated, although 'focus movement' is usually considered as 'optional' unlike other A-movements which show the obligatory appearance. This movement is obligatory, in that it takes obligatorily only when it has semantic effects (INT). I argue that this focus movement creates INT effects. INT does not trigger focus movement, but it is the result of focus movement. Thus, my claim is that focus interpretation is due to the configuration where the operator lands, but not to the Case particle

itself. In a word, the case-marking on adverbial NPs in Korean is not 'optional' in real sense, since it results in the obligatory focus interpretation through the structural focus movement, and 'Focus Movement' is involved in the configuration that results in INT effects.

4.2.2 Reconstruction in focus movement

I suggest that focus movement which is related to case on adverbial NPs in Korean induces reconstruction effects, which lead to scope reduction, when it is associated with other focus phenomenon. If focus movement induces reconstruction effects, it proves that the case-particle on adverbial NPs in Korean really can work as a scope-bearing operator which is associated with focus. Furthermore, it can also tell us that the focus associated with the case particle on adverbial NPs is created by focus movement.

I suggest that reconstruction effects of focus are caused by intervention effects of other scope-bearing elements. Hagstrom (1998) suggests that the Quantifier induces a barrier to LF WH-Movement into a scope position. I hypothesize that the focus movement which creates identificational focus in adverbial case construction in Korean essentially shows reconstruction effects caused by the 'Intervention Effects', which are caused by movement of the other scope-bearing operators as in the case of *wh-in-situ* phrases.

(13) na-nun kongpwu-lul halwucongil-lul hay-ss-ta
I-TOP study-ACC all.day.long-ACC do-PST-DECL
'I studied all day long.'

(14) Focus-induced Reconstruction
a. kongpwu-lul$_i$ na-nun t_i halwucongil-ul hayss-ta
study-ACC I-TOP all.day.long-ACC do-PST-DECL
'I studied all day long'
b. halwucongil-lul$_i$ na-nun kongpwu-lul t_i hay-ss-ta
all.day.long-ACC I-TOP study-ACC do-PST-DECL
'All day long, I studied.'

There are two kinds of focus effects related in (14a): one is formed by the scrambling of the object NP into the spec CP position, and the other is formed by a covert focus movement of the operator, case particle, *lul*, on the adverbial NP. In case of the two identificational foci, only the focus which is created by the scrambling can have scope over the focus which is created by a covert movement. I claim that reconstruction effects which lead to scope-reduction take place because of the scrambling of the object in the same clause. In (14a), since the scrambled NP *kongpwu* 'study' is located in the specifier position of CP, the possibility that the TP-Focus could be created is intervened. An intervention effect of the scrambled NP results in the scope reduction. The operator cannot

move to the specifier position of CP, since it is already filled with the scrambled NP. Furthermore, since the scrambled NP *kongpwu* 'study' has a wide scope over the case-marked adverbial NP, the VP-focus interpretation is preferred. In a word, because of the intervention effect of the focus of the scrambled NP, the reconstruction which leads to focus reduction takes place. Consequently, the possibility of the TP-Focus interpretation is relatively low, and the availability of the narrow Focus interpretation (NP-Focus) disappears.

(14b) also shows the reconstruction effects which lead to scope reduction, when the case-marked adverbial itself is scrambled. The hypothesis is that case-marked adverbial NP appears to obligatorily reconstruct when it is scrambled, since there are two different phenomena, which are associated with focus, take place. I claim that adverbial scope interpretation in scrambling shows reconstruction effects. In (13), there is a scope ambiguity, that is, the broad focus interpretation (VP-Focus and TP-Focus) is available as well as a narrow focus interpretation (NP-Focus), since the case particle *lul* on adverbial NP could work as a scope-taking operator. However, in (14b), I suggest that the availability of a scope ambiguity disappears, and only the NP-focus interpretation is available. That is, when the case-marked adverbial nominal is scrambled, reconstruction which leads to scope reduction) takes place. I claim that the scrambling of the case-marked adverbial NP decreases the probability of the 'Scope Ambiguity'. The disappearance of the focus ambiguity can prove that the identificational focus which is associated with the case-marked adverbial is created by the structural focus movement. Focus ambiguity does not arise because of focus-induced reconstruction.

In case of two identificational foci, only the preposed focus can have scope over the *in situ* focus. In conclusion, the focus movement which takes place in the adverbial case construction induces the reconstruction effects, which lead to scope reduction phenomena due to focusing.

5. Adverbial Focus is a Constructional Focus

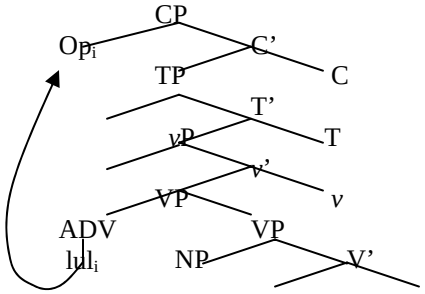
I claim that the focus effect which the case-marking on adverbial NPs in Korean induces is not coming from the case particle itself, but it is the result of the construction, which can be said as a 'Constructional Focus' (Chomsky 2001). The important assumption is that adverbial NPs to which structural Case is assigned occur in the positions where focus interpretation is assigned configurationally (Chomsky 2001).

I claim that the case-marked adverbial NPs form a non-trivial Chain which induces a head and a tail of the moved nominals. Adopting Chomsky's (2001) suggestion, I presume that the tail (base) position of the nominals gets INT', which involves inherent properties of the lexical items and the theta role, whereas the head (surface) position of the nominals gets INT, which involves surface semantic interpretation such as focus as well as definiteness/specificity.

I adopt Chomsky's (2001a) assumptions in terms of Focus Movement which is of INT effects. INT, which is induced by movement, means interpretive complex which is composed of Focus, Topic, old/new information, specificity, definiteness, D-linking, etc. INT effects should be interpreted in Spec/Edge position of some functional category depending on the properties which comprise it. I claim that the INT effect of identificational focus related to adverbial Case-marking is interpreted at [Spec, FP], which is one of strong phases. In Chomsky (2001), "Strong Phases" are phases whose heads must have an EPP feature, and are ones whose Head allows (successive) movement to the Spec/Edge including Head Movement. I posit three strong phases, the adverbial NP, *v*P or CP to claim that identificational focus moves to the edge of a strong phase. The focus only moves to the edge of a strong phase along with the syntactic and the phonological reconstruction effects. As I took the (adverbial) NP as the parametric options as a strong phase, I have to parameterize the position of the INT, that is, the specifier position of FP ([spec, NP], [spec, *v*P] or [spec, CP]. We have to assume that the adverbial NP should be another strong phase for focus movement for a narrow scope of focus for the parametric options.

(15) represents the formation of Focus Movement that raises the operator Op of the case-marked adverbial NPs to [Spec, FP] : [Spec, CP] through [Spec, NP] and [Spec, *v*P], [Spec, *v*P] through [Spec, NP], or [Spec, NP]:

(15)



The raising of the operator of the case-marked adverbial NPs, to [Spec, CP] through [spec, NP] and [Spec, *v*P], would yield the structure (15) and the relevant semantic interpretation is provided under the INT of Chomsky (2001a). I adopt Chomsky's (2001) suggestion that the actual interpretation does not arise from the inherent properties of the moved XP, but rather from the *configuration* created by the movement being interpreted in one way or the other. He assumes that semantic properties, INT, cannot drive the movement, and these properties are those read off the configurations/constructions that result from movement which involves dumb formal feature. I claim that focus movement in adverbial

Case construction in Korean forms a non-trivial A-chain, where the head position is assigned INT, while the base position is assigned INT':

(16) C = < DP, …, DP >
INT INT'

In a word, this analysis treats that the Focus interpretation is due to the configuration where the case-marked adverbial nominals occur, but not to the Case particle itself. It means the constructional Focus of adverbial NPs with Case Particles allows INT interpretation. The focused adverbial particle undergoes focus movement to the edge of the strong phase CP through the edge of the strong phase NP and *v**P for the TP-Focus. It could undergo focus movement to the edge of the strong phase v*P for the VP-Focus, or it could undergo focus movement to the edge of the strong phase NP for the NP-Focus.

My claim is that the scope property of the case particle on adverbial NPs as an operator can prove that Focus Interpretation is not due to the properties of the moved constituent, but is due to the configuration which INT is effective. The operator of the adverbial NPs undergoes focus movement to the edge of the strong phases (CP, *v**P and the adverbial NP) depending on the context. The scope ambiguity that identificational focus shows can prove that the focus effect which the case-marking on adverbial NPs in Korean induces is not coming from the case particle itself (moved constituent), but it is the result of the configuration, which can be said as 'Constructional Focus'.

In conclusion, information structural properties which are related to the case-marking on adverbial NPs, can facilitate the semantic parsing of the adverbial case construction in Korean. I support Hirose and Chun's (1998) claim that the parser abides by not only a structural preference but also some non-syntactic information provided prior to structural disambiguation. In a word, I argue that non-syntactic information as a configurational focus decides the semantic parsing of the adverbial case construction. That is the way how the grammatical case and the information structure are related. Since the parser chooses a suitable position based on based informational structural properties as well as thematic and other pragmatic considerations, focus information can be related to the grammatical case particle in Korean which is independent of interpretive factors.

6. Conclusion and Remaining Issues

In conclusion, Case on adverbial NPs is not the monopoly of the narrow syntax, but a joint asset of other grammatical representations of the entire sentence. I claim that the case morphology on adverbial NPs in Korean has information structural properties. It could be an 'operator' which is associated with Focus.

The focus which case particles on adverbial NPs induces is a contrastive focus with [+contrast] and [+rhematicity].

It could be a significant future research to investigate whether we can extend this approach to other non-delimiting non-arguments as well as to argument NPs. In addition, whether Japanese, which shows the similar case morphology, also can use the case particle for information packaging is a remaining issue.

Notes

[i] Chomsky's (1981) Case Filter

[ii] I assume Rooth's (1985) Alternative Semantics. The focus semantic value is the set of propositions obtained by making substitutions in the position of the focused phrase, and the contribution of focus is to evoke a set of alternatives, which can be contrasted with the ordinary semantic value. The exact membership of M is determined both ontologically and contextually.

[iii] I adopt Kiss' (1998) claim that identificational focus (Contrastive Focus), which expresses exhaustive identification and occupies the specifier of a functional projection (FP), must be distinguished in language description from information focus (Presentational Focus), which conveys new information and involves no syntactic reordering.

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Temporal Adverbials Restricted in Indirect Speech

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1. Introduction

The way of dealing with temporal adverbials in indirect speech within the theories of tense remains unexplored even though it has been touched by several researchers such as Dowty (1979) and Klein (1994). It seems nearly impossible to embrace within a theoretical account the lexical variety and syntactic flexibility of temporal adverbials. Even a lot of insightful accounts of embedded tenses, proposed by Abusch (1997), Krazter (1998), Ogihara (1996), von Stechow (1995), Schlenker (2000), Higginbotham (2002a), and Stowell (1997, 2007), could not go beyond enough to provide an account of how temporal indexical adverbials interact with embedded tenses, and how they are constrained in indirect speech across languages. Thus, in this paper, limiting ourselves to indexical temporal adverbials such as *yesterday* or *tomorrow*, it will be investigated under which syntactic or semantic conditions temporal adverbials are restricted in the course of the interpretation of embedded tenses. The aim of this paper is three fold: 1) to show in what contexts non-anaphoric temporal adverbials are restricted across languages, 2) to argue that in order to explain such restriction, the notion of a reference time is to be taken into consideration, and 3) to propose that when temporal adverbials affect a bound reference time of indirect speech, a restriction appears.

More specifically, inspired by the idea of an emphasis on a reference time in a temporal interpretation brought by Higginbotham (2002a) and Stowell (2007), the proposed analysis relies on the role of a reference time of a clause and its interaction with temporal adverbials in indirect speech. It is argued that a bound reference time of an embedded clause cannot be changed or modified. Given that, temporal adverbials are restricted in indirect speech when they come to change the reference time of a given clause by their adverbial modification. Such a restriction is universal across languages, holding for non-Sequence of Tense(SOT) languages such as Korean or Japanese as well as SOT language like English.

2. Identifying the Restriction across Languages

Like other Sequence of Tense (SOT) languages, English exhibits such characteristics that an embedded past tense is ambiguous between a back-shifted reading and a simultaneous one, as below:

(1) John said that Mary was in LA.
Past$_1$ Past$_2$
a. Back-shifted Reading: 'John said, "Mary was in LA." '
b. Simultaneous Reading: 'John said, "Mary is in LA." '

The past tense on *was* in the embedded clause of indirect speech can be interpreted as prior to the matrix past tense on *said* as indicated by the back shifted reading in (1a), or as simultaneous to it as shown in the reading (1b).

Let us consider what happens when we add an indexical temporal adverbial *yesterday* to the embedded clause of (1). Note that it makes a difference because it removes the second reading of (1b)[2], as we can see in (2)

(2) John said [that Mary was in LA ***yesterday***.][1]
a. Back-shifted Reading: 'John said, "Mary was in LA yesterday." '
b. ~~**Simultaneous Reading**~~: 'John said, "*Mary is in LA **yesterday**." '

When *yesterday* is inserted, the simultaneous reading such as (2b) disappears or becomes very hard to get. The intuition on the English data is supported by Dickey's (2001) questionnaire study conducted on 52 English native speaker participants (pp. 196~199). Participants were given the following four sentences[3] and were asked whether they could get a simultaneous reading for them or not.

(3) a. **At the party**, John admitted that he was drunk.
b. John admitted that **at the party**, he was drunk.
c. John admitted that he was drunk **at the party**.
d. John admitted that he was drunk.

Adverb position	Ambiguous items	Eventive controls[4]
(3a) Preposed	0.580	0.113
(3b) Post-COMP	0.163	0.036
(3c) Sentence-final	0.120	0.031
(3d) No adverb	0.635	0.059

Table 1. Adverb Position and Temporal interpretation (from Dickey 2001)

As we can see in Table 1, for no-adverb or matrix adverb environments such as (3a) and (3d), a simultaneous reading is slightly preferred: 0.580 for (3a) and 0.635 for (3d). However, when the adverbs appear in the embedded clauses, the preference drops significantly, as in (3b: 0.163) and (3c: 0.120), indicating that a simultaneous reading is hard to get with embedded temporal adverbs. It is concluded in other words that temporal adverbials are restricted in the simultaneous reading of an embedded clause of indirect speech.

The same restriction is found in non Sequence of Tense (non-SOT) languages such as Korean and Japanese. In Korean and Japanese, the simultaneous reading under consideration is obtained in a different way, as follows:

(4) **Korean**:
John-un [Mary-ka LA-ey iss-∅-ta]-ko malha-**ess**-ta.
John-Top Mary-Nom LA-in be-**Present**-Dcl-that say-**Past**-Dcl.
Simultaneous Reading: 'John said, "Mary is in LA." '

(5) **Japanese**:
John-wa [Mary-ga LA-ni iru-∅]-to yu-tta.
John-Top Mary-Nom LA-in be-**Present**-that say-**Past.**Dcl.
Simultaneous Reading: 'John said, "Mary is in LA." '

The null tenses embedded in indirect speech in (4) and (5) are to be interpreted as simultaneous to the matrix past tense. Unlike the English past tense in (1), embedded past tenses in Korean/Japanese do not show an ambiguity so that they are responsible only for a back shifted reading while the null tenses in (4) and (5) only for a simultaneous reading. In spite of the difference in their tense morphology, however, the same restriction found in the English case in (2) also applies to Korean and Japanese.

(6) **Korean**:
*****John-un [Mary-ka **ecey** LA-ey iss-∅-ta]-ko malha-**ess**-ta.
J-Top M-Nom **yesterday** LA-in be-**Prs**-Dcl-that say-**Pst**-Dcl.
Simultaneous Reading: 'John said, " *****Mary is in LA **yesterday**." '

(7) **Japanese**:
*****John-wa [Mary-ga **kinoo** LA-ni iru-∅]-to yu-tta.
J-Top M-Nom **yesterday** LA-in be-**Prs**-that say-**Pst.**Dcl.
Simultaneous Reading: 'John said, "*****Mary is in LA **yesterday**."

The sentences (4) and (5) with a simultaneous reading only become ungrammatical / unacceptable when a past time denoting adverbial such as *ecey* (Kor. 'yesterday') or *kinoo* (Jap. 'yesterday') is added as in (6) and (7). One might be attempted to say that the embedded tense in (6) takes the same

morphological form with a present tense so that it cannot go with the past time denoting adverb, *ecey* (yesterday), thereby resulting in the ungrammaticality of (6); the same thing applies to (7). But, the embedded tenses in (6) and (7) are not a deictic present tense which mismatches with past time denoting adverbs, but an anaphoric tense with a null form. With deictic tenses, there is no way to get the simultaneous readings of (4) and (5) because the matrix past tense and embedded present tense do not agree, that is, the two tenses cannot be interpreted as simultaneous. Therefore, the embedded tenses of indirect speech in (6) and (7) are an anaphoric tense which is responsible for the simultaneous reading under consideration.

The cross-linguistic restriction discussed so far can be illustrated as follows:

(8) [[…***yesterday/ *ecey/ *kinoo***…***Tense*$_i$**…**] …***Past*$_i$ …]: **Eng., Kor., Jap.**

(8) says that in the three languages certain temporal adverbials are restricted in the simultaneous reading between a matrix tense and embedded one of indirect speech, indicated by the same index on the tenses. The question to arise is what restricts them. More specifically, the past time denoting temporal adverbials are not allowed to appear with the embedded tense simultaneous to the matrix past tense. If the embedded anaphoric tense ends up with being interpreted as past through the anaphoricity, why are past time denoting temporal adverbials in (8) not able to occur with them? To answer this question, an analysis of tense, based on Higginbotham (2002a) and Stowell (2007), which employs the crucial role of a reference time will be proposed and discussed in the following section.

3. Background Assumptions

3.1. A non-Reichenbachian approach to Tense

The Reichenbach (1947)'s traditional analysis of tense views tense as a relation of three time points, Speech time, Event time and Reference Time. In Reichenbach (1947), tense is a relation between Speech Time (ST) and Event Time (ET), mediated by Reference Time (RT). Noticeably, Reichenbach 's (1947) theory brought an attention to a role of a reference time in temporal interpretation.

Keeping the same emphasis on the importance of a reference time in temporal interpretation, however, the analysis of tense adopted in this paper departs from Reichenbach's (1947) tripartite analysis of tense. Following Giorgi & Pianesi (1997), Higginbotham (2002a, 2006) and Stowell (2007), we view tense as a binary relation between two temporal elements, Reference Time and Event time; Speech Time is treated as a default case of Reference Time. According to this line of approach, tense is a function expressing a relation between the two

temporal elements, and it cannot directly refer to a specific time point/interval without any specification provided by temporal adverbials or given contexts, going against the referential view of tense proposed by Partee (1973) Kratzer (1998) and many others.

The advantage of this approach is that it enables us to analyze root and embedded tenses in a unified way: both of root and embedded tenses are evaluated with respect to a reference time, as schematized below:

(9) **A unified analysis of Tense**:
a. Tense in root sentences: E1 Θ R1
b. Tenses in embedded sentences: E1 Θ R1 [s E2 Θ R2]

While a RT is structurally provided by an upstairs clause in (9b), it is contextually given as in (9a); the speech time is regarded as a default RT. Thus, in this account, the meaning of tense remains constant whether in embedded or root clauses: tense relates an Event time to a reference time. The move to reduce the speech time to a reference time is reasonable, considering that the speech time is a deicitc temporal reference point.

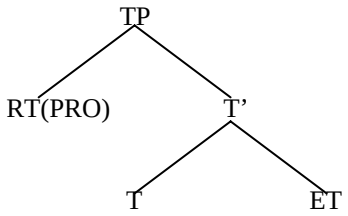
3.2. A Reference time & temporal anaphoricity

In spite of the significant differences between Higginbotham (2002a) and Stowell (2007), they share the view that a reference time is an argument of Tense and it is the one that goes into the anaphoric relation to another temporal element in a structurally higher clause. But, they differ from each other in the nature of the argument, that is, a reference time: while Stowell (2007) analyzes it as a syntactic argument of tense, Higginbotham (2006) views it as an implicit argument of tense, as shown below:

(10) Higginbotham's anaphoric theory of tense (2002a, 2006):
a. John said that Mary *was* happy
b. $[\exists e_1: \tau(e_1)<\tau(u)]$ *say* $'(j, \wedge[\exists e_2:\tau(e_2) \approx \tau(e_1)]$ & *happy*$'(m,e_2)], e_1)$ [5]

Since a reference time is an implicit argument of tense, it does not need to be syntactically realized in Higginbotham (2006). So, the two reference times, $\tau(u)$ of the matrix clause and $\tau(e_1)$ of the embedded one in (10b) do not need to take a syntactic position. In contrast, in Stowell (2007), a reference time is a syntactic argument occupying an external argument potion of tense, as follows:

(11) Stowell's temporal control theory(2007):



It is proposed in Stowell (2007) that a reference time is a syntactic argument of a null form 'PRO' appearing in the Spec of a Tense Phrase(TP), and the temporal PRO has to be controlled by c-commanding temporal elements, which is another a reference time(that is, the speech time) or an event time of an upstairs clause.

The proposed analysis in this paper adopts Higginbotham (2006)'s view that a reference time is an implicit argument of tense and it does not need to hold a syntactic position in order to be interpreted. It seems more flexible and suitable enough to deal with the temporal interpretation of a noun phrase or gerund which lacks a TP structure. The important thing to note, borrowed from Higginbotham (2002a, 2006) and Stowell(2007), is the insight that a tense appears anaphoric because an argument of tense, a reference time, goes into an anaphoric relation to a higher temporal element. Even though the meaning of tense itself remains constant, temporal interpretation can vary depending on the antecedent selection of a reference time that is a temporal anaphora, which can be summarized as follows:

(12) a. A reference time is an implicit argument of tense.
b. A reference time is a temporal anaphora that takes an antecedent structurally or contextually.

4. Proposed Analysis

4.1. A RT as a temporal pronoun

It is posited that a RT is a temporal pronoun so that it can be interpreted anaphorically (*bound*) or deictically (*free*) as other pronouns. Kratzer (1998), along the same line of Partee (1973), argues for the parallelism between tenses and pronouns. Taking a slight different position, it is assumed in this paper that there is no direct parallelism between them but the parallelism is to be established between a RT and a pronoun. With this added to the previous assumptions, embedded tenses can be given as follows:

(13) $\mathbf{RT_a \ldots ET_b \ldots}$ …[$_S$… $\mathbf{RT_{a/b} \ldots ET_c}$ …]

The embedded reference time $\mathbf{RT_{a/b}}$ can be interpreted bound or free, depending which temporal antecedent it takes. As a temporal pronoun, it builds an anaphoric relation to its possible antecedents, namely $\mathbf{RT_a}$ or $\mathbf{RT_b}$. But, the embedded event time $\mathbf{ET_c}$ is just referential that it does not connect itself to preceding temporal elements. So, even though the embedded event time $\mathbf{ET_c}$ happens to overlap with the matrix event time $\mathbf{ET_b}$, tenses in natural languages do not express a direct relation between the two event times. Then, the LFs of two readings of the sentence in (14) will be represented as below:

(14) John said that Mary *was* in LA
  a. **Back Shifted Reading**:
    $[\exists e_1: \tau(e_1) \mathbf{< RT_0]}$ *say′* $(j, \wedge[\exists e_2: \tau(e_2) < \mathbf{RT_1}]$ *be-in-LA′*$(m, e_2), e_1)$
  b. **Simultaneous Reading**:
    $[\exists e_1: \tau(e_1) \mathbf{< RT_0]}$ *say′* $(j, \wedge[\exists e_1: \tau(e_2) \approx \mathbf{RT_1}]$ *be-in-LA′*$(m, e_2), e_1)$

As we can see above, the back shifted reading in (14a) differs from the simultaneous reading in (14b) with respect to the way the embedded event time is related to the bound reference time.

4.2. Temporal adverbials and an altered reference time

Following Dowty (1979), non-anaphoric temporal adverbials are regarded to serve as a restriction to an event time, as represented below:

(15) John said [that Mary *was* in LA yesterday.]
  a. **Back shifted Reading**: $\mathbf{RT_a < ET_b \ldots}$ [$_S$… $\mathbf{RT_b < ET_c}$ …*yesterday*]
    $[\exists e_1: \tau(e_1) \mathbf{< RT_0]}$ *say ′*
      $(j, \wedge[\exists e_2: \tau(e_2) < \mathbf{RT_0} \ \& \ \tau(e_2) \subseteq \mathbf{yesterday]}$ *be-in-LA′*$(m, e_2), e_1)$
  b. ~~**Simultaneous Reading**~~: $\mathbf{*RT_a < ET_b \ldots}$ [$_S$… $\mathbf{RT_b \approx ET_c}$ …*yesterday*]
    $[\exists e_1: \tau(e_1) \mathbf{< RT_0]}$ *say′*
      $(j, \wedge[\exists e_1: \tau(e_2) \approx \mathbf{RT_1} \ \& \ \boldsymbol{\tau(e_2) \subseteq yesterday}]$ *be-in-LA′*$(m, e_2), e_1)$

It means that most of temporal adverbials except for an anaphoric adverbial such as "*at that time*" are an event time modifier, and does not affect a reference time at all. Thus, as we can see in the back shifted reading of (15a), the bound reference time remains intact. Along with this, let us take the following principle on a reference time.

(16) **A principle of a reference time (Hyuna Kim, 2008)**
  A bound reference time $\mathbf{RT_i}$ cannot be altered or modified.

The principle above says that a reference time, when bound, is fixed so that it cannot be altered or assigned a new value for it. Given that temporal adverbials such as “yesterday” do not affect a bound reference time, it is expected that temporal adverbials do not bring any trouble by violating the principle given in (16), which turns out to be attested in (15a). Then, the initial question arises again: where does the restriction in question, given in (15b), come from?

4.3. The restriction explained

In short, the answer to the question above is due to the characteristics of an overlapping relation expressed by the embedded anaphoric tense. In (17a), the temporal adverbial *yesterday* modifies the embedded event time and does not affect a reference time so that there is nothing wrong with the interpretation of the adverbial and tense in the LF. However, as (17b) reveals, because through the overlapping relation of the embedded anaphoric tense, the second event time and the bound reference time fall into the same time interval, the temporal modification of the former by *yesterday* ends up with applying to the latter.

(17) John said [that Mary *was* in LA yesterday.]: **Simultaneous Reading**

a. $[\exists e_1: \tau(e_1) \prec \mathbf{RT}_0 \mathbf{]}\ \textit{say}'$
(j, ^[$\exists e_1$:$\tau(e_2) \approx \mathbf{RT}_1$ & $\boldsymbol{\tau(e_2)} \subseteq$ yesterday] *be-in-LA*′(m, e_2), e_1)
Event Time Modification

b. $\#[\exists e_1: \tau(e_1) \prec \mathbf{RT}_1 \mathbf{]}\ \textit{say}'$
(j, ^[$\exists e_2$:$\tau(e_2) \approx \mathbf{RT}_1$ & $\mathbf{RT}_1 \subseteq$ yesterday **]** *be-in-LA*′(m, e_2),e_1)
Reference Time Modification

In other words, even though the temporal modification by ‘*yesterday*’ only targets the event time $\tau(e_2)$ in (17b), the adverb eventually comes to modify the bound reference time RT_1 as well, as the substitution of $\tau(e_2)$ by RT_1 indicates, because the event and reference time occupy the same time interval. Therefore, the bound reference time is altered by the adverbial modification in (17b), violating the principle of a reference time in (16), which causes the restriction in question. This account goes for the cross-linguistic restriction illustrated in Section 2.

5. Conclusion and remaining questions

It is argued in this paper that:

a) A Reference Time, a temporal pronoun, has to be considered as a main factor in order to solve the present puzzle of the restriction of temporal adverbials.

b) When temporal adverbials result in altering a bound reference time, their modification is not allowed across languages.
c) A simultaneous reading, but not a back shifted reading, provides a semantic environment to cause such alteration through its overlapping relation.

However, there are further questions to arise:

a) The principle of a reference time seems to be a stipulation to explain the given data. Is there any independent evidence or motivation for it? No discussion of what the behind mechanism for the prohibition principle is.
b) Does it also hold for the tense & adverb interaction in non-indirect speech contexts such as relative clauses?

Notes

[1] The sentence in (2), with no bracket, is ambiguous depending on which level of clause it belongs to. Thus, a bracket is inserted to indicate that the reading we are dealing with is the one where the sentence-final adverb *yesterday* modifies the embedded clause. To achieve the same effect, one can prepose the adverb to the position right after a complementizer *that*, by which the ambiguity disappear, leaving only the targeted reading.

i) John said that **yesterday** Mary was in LA.

We regard (2) as semantically equivalent to (i) above, but take (2) in order to keep the consistent form of a sentence with (1).
[2] The second simultaneous reading is well known as a Sequence of Tense phenomenon, or Tense agreement.
[3] *At the party* provides not only spatial but also temporal information.
[4] The control cases in this experiment are English eventive sentences where a simultaneous reading cannot be obtained in any way; e.g. John admitted that he got drunk. The results in Table 1 show that a simultaneous reading is not obtainable regardless of an adverb position.
[5] Following Higginbotham (2002a, 2006)'s terminology, in the formula above 'e' is an event variable; 'τ' stands for a function from an event to a time associated with it; τ(u) stands for the utterance time, that is, the speech time. And RT_0 is a free/deictic reference time, the speech time, and RT_1 is a reference time bound by the previous event time $\tau(e_1)$.

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Semantic Contrast

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1. Introduction

In this paper, I will discuss semantic Contrast. The term 'contrast' is one of the terms that have been used in vague ways in the linguistic literature. To make a more concrete point, I will compare specifically two famous constructions, Focus and Contrastive Topic. The examples of these constructions are provided below

(1) Focus
a. A: Who witnessed the murder?
B: [BEN] did.
b. A: John witnessed the murder.
B: No, [BEN] did.

(2) Contrastive Topic
A: Who ate what? What about Fred? What did he eat?
B: [**[**FRED]]IntP [ate the [BEANS]]IntP
L*+H L- H% H* L - L% Jackendoff 1972

These constructions are well known to be correlated with specific prosodic contours, a focused phrase with a so-called A-accent (marked as H* in the To-BI system, also called a falling accent) and a Contrastive Topic phrase with a so-called B-accent (L*+H, also called a rising accent). I will argue that a B-accented phrase, stipulating it as a semantic Contrast operator, presupposes the existence of (an)other contrasting alternative(s) and that, differently from an A-accented phrase, the speaker refers to these alternative contrasters implicitly. That is, in (2), the speaker does not make a statement only about 'Fred'. The range of objects that his statement concerns is not only 'Fred' but also other alternatives that are possibly induced from context. The speaker is comparing Fred with these people and states that when Fred and these other people are compared on the grounds of 'eating something', 'Fred' holds the property of 'eating Beans' but other people hold the property of 'eating other things but Beans'. I argue that there is no implicit structure in a proposition that contains a

focused phrase (an A-accented phrase) while there is one in in a proposition that contains a B-accented phrase.

To support this argument, I provide the following examples. These examples can be puzzles in the existing paradigms of Contrastive Topics or B-A contours. Even though the propositional content of (3a) and (3b) is exactly the same, (3b) cannot be a felicitous answer to the question in (3) while (3a) can. Interestingly, in (4) and (5), the answers with both types of accents are allowed but still their meanings have slightly different tastes. I will explain these data by examining the Contrast structure within a sentence and the entailment relation of the question and the answer sentences.

(3) A: Unfortunately, someone witnessed the murder.
a. B: I know. [$_{\text{A-accent}}$ BEN] did.
b. B: I know. # [$_{\text{B-accent}}$ BEN] did.

(4) A: Unfortunately, no one witnessed the murder.
B: Well…[$_{\text{B-accent}}$ BEN] did.

(5) A: Unfortunately, no one witnessed the murder.
B: No, [$_{\text{A-accent}}$ BEN] [$_{\text{A-accent}}$ DID]

I will apply this Contrast structure to the Contrastive Topic cases and argue that it is a derived meaning from an interaction of a Contrast operator with a following Focus. This will explain how the underlined part of the following sentence, which seems to acquire its meaning from different sources (Conventional Implicature (Hara 2003), Discourse Structure (Buring 2003), Focus scope (Wagner 2007)), actually obtains its meanings in a unified way.

2. Contrast

2.1 Contrast structure

Since Contrast is too general a term, I restrict the following definition of 'Contrast' to be applicable to the constructions that we have been discussing. I will call them 'marked Contrast' in order to distinguish them from numerous usages of 'contrast', especially in focus. Even though I use the term Contrast, I refer specifically to Marked Contrast defined below.

(6) Marked Contrast
When ***a*** is marked to be Contrasted, it means that ***a*** is a member of a limited set M, M= {a, b, c, …} and predicate **P** holds ***a*** and the predicate **P'** holds ***b***, an alternative of ***a*** in the same set in M. **P'** and **P** are the predicates only minimally

different in ***x*,** and ***x*** corresponds to the occurrence of a following focus that appears in any item in the same proposition with ***a***.

The concept of 'Marked Contrast' here is illustrated based on the contrast within a proposition. However, the concept of 'contrast' can be found not only within a proposition but between propositions. For something to be contrastive to something else, there must be some property that decides that they are not identical. Being in 'contrast' does not simply mean that things are different. 'Being in contrast' presupposes that the subjects are evaluated on the same ground and turn out to have some distinctive property that contributes to the result, contrast. Since this property is the main trigger of the contrast, I will call it the 'contrast trigger'. Then the evaluated subjects turn out to be contrastive to each other. These are the ones that obtain the contrasting properties.

When the concept of 'Contrast' is realized within a sentence, the described elements in the above are realized as a structure in a sentence. The Contrasted item which is called the 'Contraster' is realized in a sentence by accompanying an accent. The Contrast trigger is also indicated by an accent. For instance, at the sentence level, what distinguishes 'contraster' and 'contrast trigger' is the type of accent. When a constituent is realized having a rising accent (B-accent), it indicates that the constituent is a contraster in the sentence and the proposition contains a contrast structure within it. If a contraster explicitly appears in a sentence, it means other structures of contrast, contrast trigger and common ground[i] are realized at the sentence level. A contrast trigger at the sentence level is realized by a falling accent (A-accent). The contrast structure realized at the sentence level is summarized as follows.

(7) Contrast Structure
I. Contraster (B-accent): the objects that are evaluated to have the contrasting property
II. Contrasting Property
i. Contrast Trigger (A-accent): the part that endows a distinguishing property to each contraster alternative
ii. Common Background: the shared common base properties that make the contraster alternatives eligible to be compared

However, if the A- and B-accent realization is all explained at a sentence level, how is it related to other utterances in a context? I adopt the claim that prosodic marking is related to pragmatic function and it should be explained in a flow of information, not by itself (Roberts 1996).

What kind of relation does Contrast theory have with the puzzling conversation pairs in (3)-(5)? How can we use this to account for the relation between the Contrastive Topic and Rise-Fall-Rise construction? I suggest that the B-accent is an indication of a Contrast operator, not a marker for Contrastive Topic. The meaning that we thought to be derived from Contrastive Topic is actually the

result of interaction of contrast operator with the following focus. That is, it is a meaning that the contraster makes with its contrast trigger. Here is the sentence from (4), '[$_{\text{B-accent}}$ BEN] witnessed [$_{\text{A-accent}}$ the MURDER]', which is followed by the components of its contrast structure.

(8) Contrast Structure within a sentence [ii]

[$_{\text{B-accent}}$ BEN] witnessed [$_{\text{A-accent}}$ the MURDER]

L*+H H* -L%

{BEN {MURDER

JOHN} SUICIDE}

Contraster: Ben, John

Contrast Trigger: Murder, Suicide

Common Background: x witnessed y.

Having a contrast structure like this naturally leads the sentence that contains B-accent have two properties as follows: first, it presupposes the existence of an implicit proposition, and second, it illustrates the relation between B-accented and A-accented phrases as a dependent relation by being a Contraster and a Contrast Trigger.

2.2 Even when we cannot perceive it, the second Focus exists.

The analysis of contrast explains the appearance of a partial pair list reading by presupposing the implicit propositions of contrasters. However, this analysis also seems to face the same problem that previous analyses have had. When B-accent appears alone and has implicatures, not pair-list readings, it seems that we come back to the original problem of having the two independent structure that are associated with a rising accent (B-accent). There is an independent construction called Rise-Fall-Rise that has a pragmatic implicature of uncertainty (Ward and Hirschberg 1985) as follows.

(9) A: Did Victor get tickets for the Fellini Triple Feature?

(a) B: He's CON\SIDER/ING it.

(b) B: VE\RONI/CA did.

Ward and Hirschberg 1985

(10) The meaning of (9b)

i. Adversary: Veronica did but Victor did not.

ii. Uncertainty: I know that Veronica did but I am not able make any assertion about Victor. (This is the best information that I can provide.)

Even though, Ward and Hirschberg did not present the exact components of prosodic contours in the above example, it seems to be certain that one rising

pitch accent is on the capitalized constituent followed by a falling boundary tone. This is a representative example in English where a rising accent alone appears. However, previous analyses hesitated to provide a unified treatment of these two constructions. Some of them agreed that these two distinctive constructions, so called, Contrastive Topic and Rise-Fall-Rise (henceforth, RFR) construction, merely co-exist sharing some similar features.

However, I will argue that B-accent is not related to two distinctive constructions of CT and RFR respectively. I will claim that the function of 'B-accent' is a Contrast operator and 'A-accent' signals Contrast trigger. How can the uncertainty implicature of RFR be explained with the contrast structure analysis?

Let me account for these so-called Rise-Fall-Rise construction examples using the contrast structure analysis. For instance, the example (9b) can be interpreted in two ways: either an adversary reading possibly being calculated from scalar implicature or an uncertainty reading as in (10). This example apparently not only contradicts the analysis of a rising accent as a Contrast operator but also seems to demonstrate that this should be distinguished from the previous case of pair-list reading of Contrastive Topic. However, above I suggested that the contrast trigger actually exists. The reason why we cannot see or hear the existence of a contrast trigger or, in other words, a following focus, is because they are assigned on linguistically unrealized items such as polarity or assertion operators. When the contrast trigger is on the polarity operator, it makes an adversary reading and when it is on the assertion operator, it makes an uncertainty reading, which has made people believe that Rise-Fall-Rise construction is associated with an implicature.

(11) [$_{\text{B-accent}}$ VERONICA] did [$_{\text{A-accent}}$ POLARITY]
{Veronica, { positive.
Victor, negative}

(12) [$_{\text{B-accent}}$ VERONICA[did [$_{\text{A-accent}}$ ASSERTION]
{Veronica, {assertable,
Victor, non-assertable}

3. Demonstration of the Contrast Structure

3.1 Discourse Contrast

In this section, I will confirm the function of B-accent to form a contrast structure through analyzing the puzzling conversation pairs that were introduced in the beginning of the paper. Before discussion of the puzzles, let me briefly illustrate of the concept 'discourse contrast'. Discourse Contrast is used when Contrast appears between sentences. I am basically following Schwarzschild

(1994, 1999) here. Discourse Contrast applies to the focus examples. The components that form a discourse structure at the discourse level are the same as what has been suggested for discourse structure at the sentence level. What is different between these two is the unit that Contrast applies to. This proposal for discourse contrast is not original. However, it needs to be explained here to understand the following puzzles and figure out the whole picture of contrast. When a contraster is a whole proposition, the existence of accent indicates the contrast. So, I distinguish the meaning of existence of accent from the meaning of the type of accent. The former is an exponent of discourse contrast (usually thought to be plain focus) and the latter is that of contrast within a sentence.

3.2 Analyzing the puzzles

Here are interesting minimal pairs of conversation. The first of each pair, which corresponds to a question in the question answer pair, contains different quantifiers, some and no, respectively. It seems that the type of quantifier in the first utterance affects the prosodic contour of the following utterance. In (13), when 'someone' is used, the argument 'Ben' with a rising accent (B-accent) is not allowed while A-accent is allowed. In (14) and (15), even though both of the accents are allowed, they make a different meaning which is too subtle to be expressed only by its compositional reading. How can these comparisons be explained? I am not going to have elaborated accounts of why previous analyses cannot deal with this problem. Let me move directly to solving this using a contrast structure.

(13) A: Unfortunately, someone witnessed the murder.
a. B: I know. [$_{\text{A-accent}}$ BEN] did.
b. B: I know. # [$_{\text{B-accent}}$ BEN] did.

(14) A: Unfortunately, no one witnessed the murder.
B: Well…[$_{\text{B-accent}}$ BEN] did.

(15) A: Unfortunately, no one witnessed the murder.
B: No, [$_{\text{A-accent}}$ BEN] [$_{\text{A-accent}}$ DID]

Let us start from the example (13). In contrast to a B-accent, an A-accent does not introduce contrast structure within a sentence. Therefore, there is no sentence internal contrast structure in (13a). Now the existence of an accent (A-accent here) will be explained in a context. If we interpret the meaning of sentences in (13), it will be logically illustrated as in (16).

(16) a. A: [someone] witnessed the murder
$\exists$x(witness(murder)(x))

b. B: [BEN $_{\text{A-accent}}$] did (= witnessed the murder)
∃x,x∈M, (witness(murder)(x) & **x=Ben**) &M= the set of people formed from a Context

The contrasters here are the whole propositions. What makes these two propositions contrastive to each other is the contrast trigger, 'Ben' in the following utterance. So, 'Ben' appears with a plain default accent, the falling accent. As shown in (17), 'x(witness(murder)(x))' are common in (17a) and (17b), which can be the common background. The components of discourse contrast structure are described in (17).

(17) Discourse Contrast Structure of (16)
Contrasters
a. ∃x(witness(murder)(x))
b. ∃x,x∈M,(witness(murder)(x) & **x=Ben**) &M= the set of people formed from a Context
Contrast Trigger
x=Ben
Common Background
x(witness(murder)(x))

In (13b), the B-accent introduces a Contrast Structure within a sentence. The contraster is 'Ben', which we can tell from the B-accent there. The contrast trigger that we cannot perceive must be either on the polarity or on the assertion operator. In this sentence, considering the given previous utterance, it seems to be on the polarity[iii]. The description of the sentence internal contrast structure is in (18).

(18) Sentence Internal Contrast Structure (14B)
[BEN $_{\text{B-accent}}$] did [POLARITY] (= witnessed the murder)
{BEN {pos
JOHN} neg}
Contrasters
Ben, John
Contrast Trigger
positive, negative polarity
Common Background
x did y.

This does not complete the examination of this pair. The discourse contrast structure needs to be examined. Here is the meaning of each sentence.

(19) a. A: [Someone] witnessed the murder
∃x(witness(murder)(x))
b. B: [BEN $_{\text{B-accent}}$] did
∃x,x∈M,(witness(murder)(x) & <u>x=Ben</u>)& ∀y, y∈M, y≠B → y(¬witness(murder)(y))
& M=the set that is formed from the context

Due to the sentence internal contrast structure, the sentence with a B-accent has more complex meaning by having more than one propositions including the implicit ones. The examination of the first proposition in (19b) is illustrated in (20) and the second one is illustrated in (21).

(20) Discourse Contrast Structure I.
<u>Contrasters</u>
a. ∃x, x(witness(murder)(x))
b. ∃x,x∈M, x(witness(murder)(x) & **<u>x=Ben</u>**)
<u>Contrast Trigger</u>
Ben
<u>Common Ground</u>
x(witness(murder)(x))

The discourse contrast structure between the first proposition of (19b) and (19a) is exactly the same as the previous A-accent case in (13). Here we need to concentrate the contrast between the second proposition of (19b) and (19a), which is (21).

(21) Discourse Contrast Structure II.
a. x, x(witness(murder)(x))
b. ∀y, y∈M, y≠B → y(¬witness(murder)(y))
Not eligible for the Contrast Structure Formation

As we can see in (21), the previous utterance and the implicit proposition of the following utterance are neither in a contrast relation nor in an entailment relation. The problem is that even though they are not in an entailment relation, the second proposition exists implicitly. In order for some linguistic expression to be implicit, null or even prosodically weak, it needs an antecedent to make it possible, which is usually an antecedent that can entail a null constituent. The relation between the explicit previous utterance and the implicit second proposition of the following utterance is the cause of the infelicity of this conversation pair. This argument is further supported by studying the example with ‘no one’ in the first utterance, which corresponds to the example (14) above. Here is the meaning of each sentence in (14).

(22) a. A: [no one] witnessed the murder:
∀x, x∈M, x(¬witness(murder)(x))
b. B: [BEN $_{\text{B-accent}}$] did:
∃x,x∈M, x(witness(murder)(x) & x=Ben) & ∀y, y∈M, y≠B → y(¬witness(murder)(y)) &
M=the set that is formed from the context

As in the previous case, when the two propositions in the answerer's utterance are respectively examined the contrast structure with the preceding utterance, we can easily see that contrast exists in the first proposition on two constituents, the polarity operator and the argument 'Ben'. Actually both of these are accented (in case of the polarity, the unseen focus is assumed to be there according to the contrast structure theory of B-accent). How about the second proposition? Here is the description of (22a) and the second proposition of (22b).

(23) Discourse Contrast Structure II
a. ∀x, x∈M, x(¬witness(murder)(x))
b. ∀y, y∈M, y≠B → y(¬witness(murder)(y))
(23a) entails (23b)

As we can see in the above, they are in the entailment relation. The preceding utterance (21a) entails the implicit proposition of the following utterance (21b) and the felicity of this conversation is successfully accounted for by this. This makes a good comparison with the 'someone' case.

3.3 Summary

In this section, we confirmed the analysis of contrast structure through conversation pairs. At first sight, the type of accent used in the answering sentence depends on the type of quantifier, whether it is a strong quantifier, 'no one', or a weak quantifier, 'someone', and it looked puzzling. However, this could be explained through the contrast and entailment relation between sentences. Without the contrast structure within a sentence, however, the distinctive felicity between the answer with an A-accent and a B-accent could not be accounted for.

4. Conclusion

In this paper, I made a distinction between a plain focus represented by an A-accent and a focus with a contrast operator represented by a B-accent. I began by suggesting that the Contrast structure that B-accent is associated with a following A-accent. This accounted for the dependency relation between the

focalized items in a sentence by not treating them as just a random relation. In the latter part of the paper, we extended the contrast structure to a discourse level and examined some examples by combining these contrast analyses. The good consequence of this analysis is that Contrast structure can provide a unified account for Contrastive Topic and RFR reading.

Notes

[i] For the sake of distinction with the terminology of Stalnaker's Common Ground, I will use 'common background' for the conditions that makes the evaluation possible.

[ii] In contrast to this, when 'Ben' has an A-accent, it is same in that the accented items have alternatives but the implicit propositions about the alternatives are not presupposed and the relation between these two accents is random unlike the B- and A- accent.

(1) [$_{\text{a-accent}}$ BEN] witnessed [$_{\text{A-accent}}$ the MURDER]
H* H* -L%
{BEN {MURDER
JOHN} SUICIDE}

[iii] The possibility of 'assertion operator' as a contrast trigger can be excluded by question answer congruence in Roberts (1996).

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Syntax and Semantics: Argument Mapping and Maturation in Child Passives

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1 Background

The passive has been extensively studied in first language acquisition. This construction is a marked one in many adult languages (Keenan, 85), and correspondingly, much research has indicated that the passive is late to be acquired. Naturalistic data from English (Horgan, 1978), French (Sinclair, Sinclair, and Marcellue, 1971; cited in Suzman, 1985), German (Mills, 1985), and Hebrew (Berman, 1985), among other languages, have shown that spontaneous full passives (that is, those with an agent *by*-phrase; e.g., (1)) are quite rare in child language until age 4;0 at the very earliest (English, German), if not much later (e.g., 8;0 in Hebrew).

(1) Neil was kissed by Louise

This relatively late acquisition prompted Borer and Wexler (1987, 1992) to propose the *linguistic maturation hypothesis*, according to which certain linguistic constructions in UG (including those involving A-chains, such as the passive) are not immediately available to the child, but rather mature over time, just as do secondary sex characteristics. Structures relevant to the passive are assumed to mature around the age of 4;0; before this age, the *A-Chain Deficit Hypothesis* (ACDH; e.g., Babyonyshev et al., 2001) suggests that A-chains – specifically "non-trivial," or subject-object, A-chains – are ungrammatical for the child, and predicts that passives will therefore not appear in spontaneous speech. Data from a number of other studies on the passive, both naturalistic and experimental, have been interpreted by various researchers as support for the maturation hypothesis (e.g., Horgan, 1978; Mills, 1985; Pierce, 1992).

However, other accounts of the passive in child speech take a different tack, assuming that children initially depend heavily on semantics to support their syntactic interpretations. Proponents of the *semantic bootstrapping hypothesis* (e.g., Bowerman, 1973; Grimshaw, 1981; Pinker, 1984) have suggested that

children come to the language learning task with inborn knowledge and/or biases about semantics which allow them to "bootstrap" into the syntax of their language. The details of the account vary from researcher to researcher, but the two major components hypothesized to be part of this task – namely, the categorization of words into syntactic classes, and the identification of syntactic functions within an utterance – are both connected inextricably to the (linguistic and cognitive) semantics of an utterance.

Important to the current discussion is the hypothesis that children rely on canonical notions of subject and object in their interpretation of all sentences. Specifically, children are biased to associate particular syntactic positions (e.g., "subject" and "object") with particular thematic roles (e.g., "agent" and "patient/theme," respectively) in a consistent way. This default assumption should aid children when they are presented with a linguistic description of an observable event. For instance, upon hearing *The boy is kissing the girl* in the context of a kissing event, the child will be able to determine the word order of the ambient language (in the case of English, SVO, since the agent, mentioned first, should map onto the subject, and the patient, mentioned second, should map onto the object). As with syntactic categorization, the learner must initially depend on utterances that display the canonical semantics (e.g., active-voice clauses with agentive-transitive verbs) as she builds up a basic level of knowledge; only after building this foundation can she go on to identify subjects and objects that do not conform to this general scheme.

Such a strategy generally works well, considering that syntactic roles and semantic/thematic roles often line up in adult language, resulting in prototypical agent subjects and patient/theme objects, crosslinguistically (Fillmore, 1968; Keenan, 1976; Dowty, 1991; Baker, 1997).

However, the passive construction results in a syntactic-semantic "mismatch," in which themes – and not agents – surface as subjects. As would be predicted by the semantic bootstrapping approach, children who have not yet acquired the relevant syntax interpret "reversible" passives (that is, those with two animate arguments; (2)) as if they were active sentences, taking the first NP to be the agent (3) (Bever, 1970; Maratsos, 1974; Mills, 1985).

(2) *Utterance*: Neil was kissed by Louise
(3) *Child's interpretation*: Neil kissed Louise

Taking such evidence into account, Hyams et al. (2006) have suggested that children's trouble with the passive stems from a noncanonical arrangement of theta-roles. They propose the *Canonical Alignment Hypothesis* (CAH), which states that in the earliest grammar, any external argument (for instance, typically an agent) must map onto subject position (Spec, IP). Thus, it is not A-chains *per se* that give children trouble, but rather, only A-chains that result in a violation of the CAH.

If children's failure on passive comprehension is due to problems overcoming a syntax-semantics mismatch, rather than trouble with A-chains, children should perform better on passives when prototypical theta-role mapping is not violated. Passives embedded under raising-to-object verbs (RO-EPs; shown in (4)) circumvent violations of canonical roles in argument mapping, thereby providing an utterance type with which we can test this prediction. Here, semantic objects surface as syntactic objects – for instance, in (4), *Neil* is both the patient of *kiss* and object of *want/need.*

(4) Suki wanted/needed Neil$_i$ [t_i to be kissed t_i by Louise]

On the other hand, if trouble with the passive indeed results from a deficiency regarding non-trivial A-chains, children should perform equally poorly on RO-EPs, which involve movement from the object to the subject of the embedded clause, and secondarily to the object of the matrix clause.

2 Method

The research described below tested the hypothesis that children's difficulty with the passive construction is a result not of a pre-mature grammar which is unable to construct or interpret nontrivial A-chains, but rather of the syntax-semantics mismatch posed by this construction. I tested this hypothesis with English-speaking children (ages 4-5) using two truth-value judgment tasks.

2.1 Experiment 1: Matrix passives

In Experiment 1, children ages 4-5 were tested on their ability to interpret matrix (non-embedded) passives. 32 monolingual English-speaking children (ages 4;1.15-5;11.15) were recruited from the Chapel Hill, NC, area to take part in the study. The 4-year-old group contained 8 boys and 8 girls and had a mean age of 4;6 (range: 4;1.15-4;11.12); the 5-year-old group contained 7 boys and 9 girls, and had a mean age of 5;5 (range: 5;0.18-5;11.15). Participants had no known linguistic (speech or hearing) impairment or other cognitive or developmental delays. Children received a small token gift for their participation.

Experiment 1 comprised a truth-value judgment task (TVJ; Crain and McKee, 1985; Gordon, 1996), in which each child heard stories and saw them acted out with small figurines. After each story, the child listened to a puppet make a comment about the story. The child was asked to reward the puppet for his correct comments by "feeding" him a plastic orange, and to punish him (i.e., provide him with a less attractive reward) for his incorrect comments by "feeding" him a plastic piece of lettuce. In the latter case, children were also asked to explain why the puppet was wrong. Children received test items

separated by filler items, which were included to check for answer biases and/or inattention to the task.

All test items in Experiment 1 involved full reversible passives – that is, they included an agent *by*-phrase, and both subjects and objects were animate. All arguments were full lexical NPs. An example story appears in (5), and test items appear in (6). Target answers for stimuli appear after each item.

(5) *Example story: Passive*
This woman wanted to draw a picture of someone. The nurse was busy, and she had already drawn a picture of farmer, so she decided to draw the policeman.
Experimenter: *What happened?*
Puppet: *The woman was drawn by the policeman* (F)

(6) *Passive test items*
The pig was sent by the farmer (T)
The woman was drawn by the policeman (F)
The farmer was picked by the sheep (F)

The outcome of Experiment 1 was that only 5-year-olds behaved in an adultlike manner in their interpretations of matrix passive utterances. That is, the 5-year-olds, but not the 4-year-olds, had mastered matrix passives. The results of Experiment 1 are given in Table 1.

Table 1: Performance on Matrix Passives

Age	% Correct
4	64.6
5	79.2*

*p<0.01

The data was analyzed by age group (4, 5). A series of logistic regressions (with the standard error adjusted for multiple observations within subjects) were performed to compare the number of correct (adultlike) responses per age group to a chance level of performance (namely, 50%). The test of the hypothesis that children performed at a chance level on matrix passive constructions was rejected for 5-year-olds ($z=3.08$, $p=0.0020$), but not for 4-year-olds, who did not perform above chance ($z=1.83$, $p=0.0667$).

These results are unsurprising, when we consider the existing literature on acquisition of the passive. In short, the children in Experiment 1 performed exactly as the extant literature predicted they would, given their age and native language.

However, given the predictions of the semantic bootstrapping hypothesis, it is possible that children who failed on the task in Experiment 1 may still succeed on interpreting embedded passives (RO-EPs), in which syntactic and semantic roles align. Evaluating children who fail to comprehend matrix passives on their comprehension of RO-EPs will serve as a test for Wexler's hypothesis that it is specifically the non-trivial (subject-object) A-chain in the passive construction that causes children trouble. The A-chains in RO-EPs (e.g., *Suki wanted/needed Neil$_i$ [t_i to be kissed t_i by Louise]*) are exceedingly non-trivial, in that they constitute object-subject-object A-chains. As a result, if Wexler is right, RO-EPs should prove as problematic for pre-mature children as do matrix passives. On the other hand, if children have less trouble with embedded than with matrix passives, the mismatch account would be supported.

2.2 Experiment 2: Embedded Passives

In Experiment 2, children were tested on their ability to interpret passives embedded under raising-to-object verbs. The participants and methods in Experiment 2 were identical to those in Experiment 1.

In Experiment 2, all test items had a pronoun matrix subject (to reduce processing load) and a lexical NP embedded subject and object. Each child received either *want* items, or *need* items. An example story appears in (7) and test items (with target answers) appear in (8).

(7) *Example story: Embedded passive*
Winnie the Pooh said to Tigger, "Somebody should call Elmo and invite him over to play with us. Do you have his telephone number? Can you call him up?" Tigger said, "Yes, I can call Elmo," and he went to call him and invite him over.
Experimenter: *What did Winnie the Pooh do?*
Puppet: *He needed Tigger to be called by Elmo* (F)

(8) *Embedded passive test items*
She wanted the tiger to be tickled by the bear (T)
She wanted Clifford to be drawn by Patrick (T)
He wanted the horse to be seen by the farmer (F)
He needed Clifford to be fed by Shrek (T)
He needed Tigger to be called by Elmo (F)
She needed Cookie Monster to be photographed by Elmo (T)

It should be explicitly noted that if children were to interpret the embedded passives as if they were actives, they would fail on the task (9).

(9) He needed [Tigger to be called by Elmo] ≠ He needed [Tigger to call Elmo]

The outcome of Experiment 2 was that both 4- and 5-year-olds performed significantly above chance in their interpretations of passives embedded under RO verbs. The results of Experiment 2 are given in Table 2.

Table 2: Performance on Embedded Passives

Age	% Correct
4	75.0*
5	79.2*

*p<0.01

As in Experiment 1, the data was analyzed by age group, with logistic regressions performed to compare the number of correct responses per age group to a chance level of performance. The test of the hypothesis that children performed at a chance level on RO-EP utterances was rejected for both age groups: both 4- and 5-year-olds' performance was significantly above chance (4: $z=3.30$, $p=0.0010$; 5: $z=4.41$, $p<0.0001$).

Thus, contrary to the maturation account, but as predicted by the mismatch account, both groups – even 4-year-olds, who had failed to comprehend matrix passives – performed above chance in their interpretation of RO-EPs.

Table 3: Comparative Performance on Passives (Percent Correct)

Age	Matrix	Embedded
4	64.6	75*
5	79.2*	79.2*

*p<0.01

Moreover, success on two tasks was not significantly correlated ($r^2=0.076$, $p=0.1273$); thus, it was not the case that those children who succeeded on the RO-EP task were simply those who also succeeded on the matrix passive task.

These data dovetail with independent evidence that children have no trouble with A-chain formation (e.g., in subject raising, Köppe, 1994; *get*-passives, Fox and Grodzinsky, 1998; and unaccusatives, Guasti, 2002), as well as with adult aphasia studies indicating that processing load increases with non-canonical theta-role ordering (Caplan and Hildebrandt, 1988).

3 Conclusion

In the experiments presented here, English-speaking 4- and 5-year-olds were tested on their comprehension of matrix and embedded passives. Although 4-year-olds failed to comprehend matrix passives in an adultlike way, instead interpreting them as active-voice utterances, both age groups performed significantly above chance in interpreting passives embedded under raising-to-object verbs. These results are especially striking considering the greater syntactic complexity and length (both traditionally considered to be correlated with processing load) of RO-EPs, in comparison to matrix passives.

I propose that children's pattern of performance in these two experiments are part of a larger cluster of strategies that I will refer to as *semantic scaffolding* (for more detail, see Kirby, in prep). Specifically, I submit that children rely strongly on the semantics of the utterances – including, but not limited to, canonical syntax-semantics matches, as claimed by the CAH – to aid in interpretation, until syntactic representations and processing power reach adult levels.

Taken together, children's performance on matrix passives and on RO-EPs provide strong support for the semantic scaffolding hypothesis, and specifically for the proposal made by the CAH that interpretation of the passive by young children hinges on the match between syntactic and thematic roles, rather than on the ability to form A-chains. In RO-EPs like those tested in Experiment 2, D-structure objects surface as S-structure objects, even though they pass through an external argument position between the two levels of representation. The results of Experiment 2 would then indicate that the CAH acts as a kind of filter, only looking at the head and the tail of the chain, and not at the intermediate traces, which – in the case of RO-EPs – *would* result in a violation of canonical alignment.

However, interpretation of the passive is not the only domain in which the effects of semantic scaffolding can be seen. A number of other researchers (Maratsos, 1974; Chapman and Kohn, 1977; Lempert, 1989; Hyams et al., 2006) have observed the effects of children's initial assumptions about theta-structuring in numerous arenas, and have linked children's non-adultlike behaviors to these default assumptions about the appearance of agents and themes. For instance, Chapman and Kohn (1977) presented evidence that children performed better on interpreting sentences with animate (agent) subjects and inanimate (theme) objects than on sentences with inanimate subjects and animate themes – that is, they performed best with Dowty-style "proto-agent" subjects and "proto-theme" objects. Similarly, Maratsos (1974) found that children appear to use a default "behavioral" strategy when confronted with NVN sequences; this processing shortcut leads them to interpret such sequences (regardless of syntax) as actor-action-object utterances. In related work, Lempert (1989) found that children (ages 2;6-5;3) produced more

novel passive sentences when they had been trained on items with animate (rather than inanimate) patients – which, recall, surface as subjects in a passive utterance. All these results are consistent with the hypothesis that for children, the "concept" of *subject* is a category that includes animacy as a component.

The semantic scaffolding analysis of children's performance here, which relates to the prototypicality of agent-subjects, is moreover attractive in that it may bear on the distinction seen in children's patterns of competence on *get*-passives versus *be*-passives: namely, that children who fail on tests of full matrix *be*-passives still sometimes perform in an adultlike way on *get*-passives (Crain et al., 1987; Crain and Fodor, 1989; Crain, 1991; Fox and Grodzinsky, 1998). Although Fox and Grodzinsky (1998) present a cogent argument that the syntax of *get*- and *be*-passives is identical, it could be contended that the comparison is not an entirely fair one, since there is a subtle semantic difference between the two. Specifically, the patient-subjects in *get*-passives are more "active" in terms of the semantic role they play.

For instance, compare *Louise was kissed* with *Louise got kissed*. In the *be*-version, it is possible that all that the patient-subject *Louise* did was to hold still for the kissing event. However, in the *get*-version, *Louise* may have played a much more active role in bringing the kiss about: namely, she may have flirted, tried to look cute, or even asked someone to kiss her (cf. *Louise got herself kissed*). This divergence between the two passives may relate to the fact that *be* is stative and *get* is eventive; thus, a *get*-passive will more closely match children's default expectations that the verb in a NVN sequence represents an action (see Bowerman, 1973; Maratsos, 1974; Grimshaw, 1981; Pinker, 1984). In short, there is something much less "passive-y" about the *get*-passives, and it may be exactly this semantic distinction that allows children to master them before they master their *be*-passive counterparts.

A second benefit to the semantic scaffolding analysis is that it provides a better, more refined definition for the concept of "processing load" than has previously existed – and furthermore, that it makes use of the concept of cognitive load without giving up on a grammatical account of acquisition. As seen in the results on matrix and embedded passives detailed above, processing load does not appear to be monotonically correlated with sentence length or transformational complexity, considering that some children who succeeded on interpretation of the longer RO-EPs (with their longer A-chains) failed to interpret the shorter matrix passives. Instead, the semantic scaffolding approach equates processing load with "novelty of construction," including the noncanonical assignment or appearance of theta-roles, and predicts that utterances which violate children's default assumptions about the syntax-semantics interface will result in a greater cognitive load than utterances which match those assumptions. Such a mismatch results in the pattern observed above: children deal with various types of syntactic "strangeness" in ways that are non-adultlike, but still governed by the grammar. In short, the semantic

scaffolding hypothesis explains how UG may still constrain and guide non-adultlike performance, even in the face of processing limitations.

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Frequency-based Expectations and Context Influence Bridge Quality

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1. Introduction

Grammatical principles such as Chomsky's (1973) Subjacency Condition sought to provide a general explanation for a number of island constraints by claiming that *wh*-movement was forbidden across more than one bounding node. Given this condition, the rather long, non-local dependencies in (1) are surprisingly easy, apparently suggesting that *wh*-movement is in fact unbounded:

(1) a. What$_i$ does she believe that he said that he was reading t_i?
b. What$_i$ are they claiming that she believes that he said that he was reading t_i?
c. What$_i$ do you think that they are claiming that she believes that he said that he was reading t_i?

In contrast, rather simple extractions like those in (2) are found quite difficult or unacceptable, although some may seem more degraded than the others:

(2) a. What$_i$ did he lisp that he had seen t_i?
b. What$_i$ did he whisper that he had stolen t_i?
c. What$_i$ did she mumble that he had eaten t_i?

To address this discrepancy, Erteschik-Shir (1973) suggested that some verbs tolerate relations of unbounded dependence into their sentential complements and serve as "bridges" over which a *wh*-phrase can move. Non-bridge verbs, on the other hand, disallow extraction from their complements and include factives and manner-of-speaking verbs like *mumble* and *lisp*.

However, why is there a division in extraction possibilities – why should some verbs allow extraction from their complements while others behave the opposite way? Are there strictly two classes of verbs with regards to bridge phenomena? Furthermore, what underlies the variable acceptance of the questions in (2)?

As Erteschik-Shir (2006b) explains, many scholars have attempted to analyze bridge phenomena in structural terms. Dean (1967) and Chomsky (1973) proposed that bridge verbs allow deletion of the complementizer *that* in

declaratives whereas non-bridge verbs require an overt complementizer, although Erteschik-Shir (1973) found this correlation spurious. Stowell (1981) suggested that complements to non-bridge verbs are adjuncts, so bridging effects can be reduced to the more general ban on extraction out of adjuncts. Some were worried about the grammatical gradience and so appealed to lexical factors. For instance, Chomsky (1980) proposed that bridge conditions have to do with whether S' counts as a bounding node for Subjacency and must be stipulated for particular verbs. On the whole, however, none of the structural approaches explain the gradience or *why* the verb-classes function the way they do.

An alternative conception of bridge phenomena appeals to semantic complexity and information-structural factors. Erteschik-Shir (1973, 2006a, 2007) proposes that all island effects including bridge phenomena are conditioned by focussability – extraction is permissible only out of potential focus domains, i.e. foregrounded or salient constituents to which the attention of the hearer is drawn. Semantically complex lexical items such as non-bridge verbs are necessarily focussed and dominant, making their complements unavailable for extraction. Squishy data are predicted since semantic complexity is itself a graded notion and informants come up with contexts of their own for interpreting sentences. A similar line of reasoning is adopted by many other researchers, including Kluender (1992), Goldberg (2006), and Hawkins (1999). Most of the non-structural approaches assume that appropriate contexts should defocus the matrix verb which then releases the complement clause and makes it available for extraction, *but no empirical work to date has confirmed that this actually happens*. By investigating the influence of context on bridge phenomena, the experiments described here test the basic claim that non-structural factors can influence bridge quality.

Interestingly, although the non-structural approaches predict squishy data, they all implicitly assume that bridging phenomena fall out from a categorical distinction that places verbs into two classes. Gradience is expected only in the case of non-bridge extractions. However, Featherston (2004) has shown that in German at least bridge-ness is a continuum which interacts with a range of other factors. So in addition to the structural vs. non-structural debate, another major question is whether gradience might not be found in bridge verbs as well, making a categorical island constraint dubious.

There is one more important dimension worth exploring, namely whether people's usage preferences in fact are to blame. Language users are sensitive to usage preferences in terms of the frequency with which a verb is used with a sentential complement (Garnsey et al., 1997). In particular, verb-bias (the likelihood of a particular subcategorization) could influence the acceptability of and serve as another type of continuous measure of bridge quality; it is therefore another feature of the current investigations.

The main research questions to be addressed here, therefore, are as follows:

- Does context influence the acceptability or processing of dependencies into

non-bridge complements? If so bridge phenomena are likely to arise from non-structural factors.
- Do we see evidence for gradience? If there is gradience, is it meaningfully related to some other factor such as semantic complexity or verb-bias?
- Does a categorical division into two verb-classes make sense?

2. Overview of the Experiments

A total of three experiments were conducted to investigate whether a categorical or a gradient verbal property drives bridge phenomena and to understand the effects of context and semantic complexity. The first experiment collected acceptability ratings for basic question sentences involving extraction of the object from the sentential complements of bridge and non-bridge verbs. The second experiment tested these same sentences but this time they were preceded by a context sentence which either did or did not mention the verb in question. A self-paced reading paradigm was used here to detect the locus of processing difficulty and the effects of context. The contextual manipulation in the second experiment was rather simple, however, and could be viewed as just the presence or absence of lexical priming. So the third experiment, another self-paced reading study, was designed to investigate the effects of a richer range of context types, including contexts that prime semantically but not lexically. All experiments were run using the Linger 2.88 software by Doug Rohde.

2.1. Verbs studied

To limit the types of verbs studied and reduce noise, the critical materials in each of the experiments used only verbs of saying and ignored the factive/non-factive distinction. There were 16 verbs from each of two verb-classes:
- Manner-of-speaking (***mos***) verbs: *groan*, *growl*, *grumble*, *grunt*, *holler*, *howl*, *lisp*, *mumble*, *mutter*, *scream*, *shout*, *shriek*, *wail*, *whine*, *whisper*, *yell*
- Non-manner-speaking (***nmos***) verbs: *affirm*, *announce*, *argue*, *assert*, *claim*, *declare*, *emphasize*, *explain*, *proclaim*, *relate*, *remark*, *report*, *say*, *state*, *swear*, *warn*

The verbs were chosen so as to be as semantically diverse as possible and to span a range of frequencies. They were classified as either ***mos*** or ***nmos*** using the class-membership properties discussed by Zwicky (1971).

2.2. Frequency data

Raw lemma frequencies were collected to serve as a measure of semantic complexity. Sentential-complement (SC) subcategorization frequencies were extracted as well, allowing for the calculation of each verb's bias for SC

subcategorization (by dividing SC frequency by lemma frequency). Three large corpora were consulted, namely the British National Corpus (Burnard, 1995), Web 1T 5-gram (Brants & Franz, 2006), and COBUILD from CELEX2 (Baayen et al., 1996). Eight frequency-based metrics were derived in all:

- Lemma frequency, SC subcategorization frequency, and verb-bias from the first two corpora (**bnc**, **bnc.sc**, **bnc.scbias**, **web1t**, **web1t.sc**, **web1t.scbias**)
- Lemma and log frequencies from the third corpus (**cob**, **coblog**)

A robust pattern found in the frequency data is that ***mos*** verbs are less frequent than ***nmos*** ones, as seen with raw lemma frequencies for instance:

	mos	***nmos***
BNC	1,147	27,941
Web 1T 5-gram	2,979,485	156,233,161
CELEX2	97	6,147

3. Experiment 1

How do non-linguists judge extraction from complements of bridge and non-bridge verbs? An acceptability ratings study addressed this basic question.

3.1. Method

Twenty-six native English speakers from Stanford University took part in the experiment. There were 16 items, each with two conditions, namely whether the matrix verb was ***mos*** or ***nmos***. Each item consisted of a question sentence with extraction of the object from the complement. A sample item is as follows:

(3) ***mos***: What did the freshman mumble that he had drunk?
nmos: What did the freshman say that he had drunk?

In choosing how to pair up ***mos*** and ***nmos*** verbs, the decision was made to match according to plausibility based on commonly occurring uses of the verbs on the web and elsewhere. By turning to actual usage to decide verb pairings the stimuli were made more suitable for the following experiments in which they would be embedded in the same discourse contexts.

The target sentences were combined with 56 fillers (various types of question sentences) in two balanced lists such that each participant would see equal numbers of each condition. The stimuli were pseudo-randomized separately for each participant such that at least one filler item intervened between two targets.

Each trial began with a question sentence to be rated. Participants would then press the spacebar to proceed to the following screen which asked them “How natural did you find that question?”. Participants were required to pick a rating

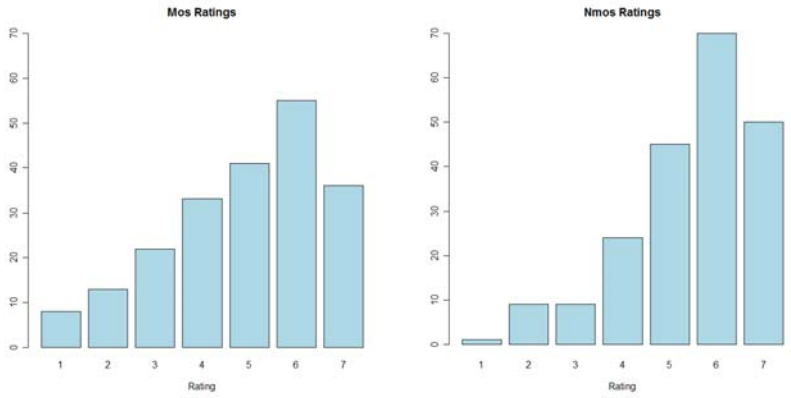
on a scale from 1-7 to proceed to the next trial, where '1' marked the "very unnatural" end of the scale and '7' the "very natural" end. Participants were told that their ratings should reflect what would sound natural or acceptable to them in a conversation or in reading a text and that this was not a test of their intelligence or of their knowledge of what grammar books have to say. Crucially, they were asked to provide their first impressions.

3.2. Results and discussion

A total of 208 ratings were obtained for each of the two verb-classes, ***mos*** and ***nmos***. These responses were distributed as follows:

	1	**2**	**3**	**4**	**5**	**6**	**7**
mos	8	13	22	33	41	55	36
nmos	1	9	9	24	45	70	50

As the following graphical views of these same data show, ***m***ost of the responses are concentrated in the "very natural" portion of the rating scale for ***nmos*** verbs, whereas ***mos*** verbs ratings are more spread out.



Each subject's raw scores were standardized so that different subjects' ratings became more comparable. Looking at both raw and standardized ratings, the means and standard deviations for each verb-class were as follows:

	Raw ratings		**Standardized ratings**	
	Mean	**SD**	**Mean**	**SD**
mos	4.899	1.649	-0.182	1.011
nmos	5.466	1.358	0.182	0.891

The differences in means were highly significant for both raw and standardized ratings (all $p < .001$) using both *t*-tests and Wilcoxon rank sum tests (the latter used because the data did not have within-group normality). But the standard deviations are rather large, indicating there is significant overlap in the ratings of the two verb-classes and casting serious doubt on the validity of a strict binary classification. The plots above echo this point since the ratings for the two verb-classes do not cluster around opposite ends of the scale. Thus, the results so far *do not support* a categorical constraint involving two distinct verb-classes.

Instead, the ratings correlate significantly with a number of continuous frequency-based measures:

	Raw ratings	Standardized ratings
bnc	0.0925	0.0939
bnc.sc	0.1423 **	0.1505 **
bnc.scbias	0.2117 ***	0.2421 ***
web1t	0.0843	0.0689
web1t.sc	0.1502 **	0.1556 **
web1t.scbias	0.1909 ***	0.2195 ***
cob	0.0886	0.0903
coblog	0.2359 ***	0.2480 ***

Although the correlation coefficients are not very large, the higher the frequency the more acceptable the corresponding question seemed. Of particular interest is the fact that the correlation coefficients corresponding to the SC subcategorization and verb-bias measures were larger and more significant than those corresponding to lemma frequencies. One possible interpretation is that the presence of the complement headed by *that* affects acceptability, and that subjects' experience with the SC structure and their expectations about how these verbs are typically used informs their acceptance of the full sentence (regardless of ***mos*** or ***nmos***, or how semantically complex the verb is).

Crucially, the strong relationship between frequency and acceptability supports a gradient basis for bridge phenomena. To further compare the predictive powers of verb-class and frequency, a series of mixed-effects models were constructed using the lme4 package in R. Each of these models had standardized ratings as the response variable, an item random effects factor, and verb-class and a frequency measure as predictor variables (one model for each frequency measure). In almost all cases, verb-class turned out to be significant ($p < .05$) while frequency did not. However, all the models suffered from collinearity as verb-class and frequency fixed effects were correlated; this is not surprising because ***mos*** verbs are generally less frequent than ***nmos*** ones. What is needed instead is a comparison of non-nested models, one with just verb-class as the predictor and one with any one of the frequencies as the predictor. Then we could compare models to determine which factor best predicts the variation in

ratings. An appropriate model quality measure to use for comparison is the Akaike Information Criterion (AIC) value, which can be used for non-nested models (Burnham, 2002). Several competing models may be ranked by their AIC, with the best one having the lowest AIC. Thus another series of mixed-effects models were constructed, each one modeling the variation in standardized ratings but each having a different predictor; the AIC values from the models corresponding to each of these independent variables are as follows:

Independent variable	AIC value of model
verb-class	1104
bnc	1143
bnc.sc	1136
bnc.scbias	1105
web1t	1130
web1t.sc	1121
web1t.scbias	1104
cob	1140
coblog	1102

The main observation to make about these AIC values is that some of the frequency predictors (the verb-bias and **coblog** metrics in particular) are just as good as or better than verb-class in explaining the variation in ratings. Thus, continuous predictors are on a par with a categorical predictor.

On the whole, Experiment 1 provides evidence for gradience in the perceived grammaticality of both bridge and non-bridge extraction constructions. The gradience in turn corresponds to frequencies, particularly SC subcategorization frequencies and verb-bias for SC subcategorization.

4. Experiment 2

Are bridge and non-bridge extractions processed similarly when the context does not defocus the verb? How about when the context does mention the verb to be read, thereby lexically priming it or making it given?

4.1. Method

A total of 40 undergraduates from Stanford University, all native speakers of American English, participated. The same stimuli were used as in Experiment 1, with 16 sets of sentences. Each set had four conditions crossing context-type (prior-mention, no-prior-mention) with verb-class (***mos***, ***nmos***). Prior-mention contexts mentioned the upcoming verb, while no-prior-mention contexts were plausible precursor contexts which *did not* mention the verb. A sample item:

(4) prior-mention, ***mos***:
The freshman mumbled that he had drunk seven shots of vodka that night.
What did the freshman mumble that he had drunk?
no-prior-mention, ***mos***:
The freshman spoke unintelligibly, managing to convey that he had drunk seven shots of vodka that night.
What did the freshman mumble that he had drunk?
prior-mention, ***nmos***:
The freshman said that he had drunk seven shots of vodka that night.
What did the freshman say that he had drunk?
no-prior-mention, ***nmos***:
The freshman spoke unintelligibly, managing to convey that he had drunk seven shots of vodka that night.
What did the freshman say that he had drunk?

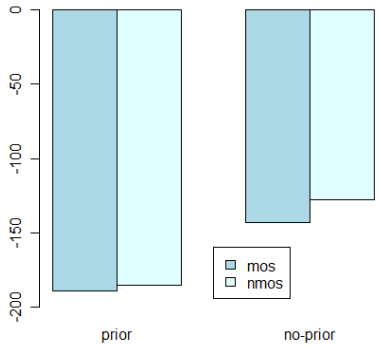
The target sentences were combined with 56 fillers in four lists balancing all factors in a Latin Square design. The stimuli were pseudo-randomized for each participant such that at least one filler item intervened between two targets.

The task was self-paced word-by-word reading with a moving window display (Just et al., 1982). Each trial began with two lines of dashes covering all characters in the two sentences to be read. Participants pressed the spacebar to reveal each word, and as each new word appeared, the preceding word disappeared. The amount of time the participant spent reading each word was recorded as the time between key-presses. The second sentence (the actual portion we are interested in) also served as a comprehension question. Participants were asked to read and comprehend sentences at a natural rate. They were told to answer the questions as quickly and accurately as they could and to take wrong answers as an indication to read more carefully. Before the experiment, a short list of practice items was presented.

4.2. Results and discussion

The critical region to analyze was the part consisting of the matrix verb and the portion of its complement that was shared across all conditions – for example, this region would be *mumble that he had* or *say that he had* in (4). Not only is this region the greatest section of overlap across conditions it is where the possibility of a direct object gap is eliminated in favor of a gap somewhere in the complement. To adjust for differences in word length across conditions as well as overall differences in participants' reading rates, residual reading times were calculated for each participant using all filler and experimental items. A negative residual reading time means that the subject was reading faster than his own average rate. The following summarize the mean residual reading time of this critical region in the four conditions (along with standard errors):

	prior	no-prior
mos	-189.284 (13.68)	-143.403 (15.49)
nmos	-185.468 (13.00)	-127.753 (17.64)



Reading a verb in the context sentence greatly facilitates the reading of the same verb and following words in the target sentence, *regardless of the type of verb*. The differences in the means of ***mos*** and ***nmos*** times are not significant, for either type of context. However, the mean in the prior-mention case is significantly smaller than that of the no-prior-mention case for both verb-classes (both $p < .05$). Thus, prior mention of the verb improves the reading of the critical region and reduces extraction-induced difficulty. So strong are the effects of context that in mixed-effects models predicting residual reading time, context-type is always highly significant (all $p < .01$) while verb-class and/or frequency are never significant.

These results seem to support Erteschik-Shir's theory that when context defocuses a verb its complement becomes available for extraction. However, this happens for both ***mos*** and ***nmos*** verbs, i.e. for verbs of all kinds regardless of semantic complexity differences, counter to her predictions. The fact that even simple lexically-priming contexts can make *all* extractions much easier to process casts doubt on the strictness of a categorical island constraint and supports an information-structural approach.

5. Experiment 3

This experiment used the same task as in Experiment 2 but with three different kinds of contexts – lexical/syntactic priming, semantic priming, and neutral (which serves as a baseline).

5.1. Method

Thirty-six native English speakers from Stanford University took part in the

experiment. The ***mos-nmos*** verb pairs were the same as before, leading to 16 items again. Each item had six conditions crossing context-type (prior-mention, semprime, neutral) with verb-class (***mos***, ***nmos***). As before, prior-mention contexts mentioned the upcoming verb and used the same SC subcategorization that would be found in the upcoming extraction scenario. Semprime contexts were designed to be plausible precursor contexts which *did not* mention the verb but which included a paraphrase of or words related to the upcoming verb. And neutral contexts meant the target sentence simply lacked a context sentence. The target sentences were declaratives this time, but they still involved a wh-dependency into the sentential complement. A sample item:

(5) prior-mention, ***mos***:
The students mumbled that the party was a lot of fun.
The residential fellow overheard what the freshman mumbled that he had drunk at the party.
semprime, ***mos***:
The students spoke unintelligibly, managing to convey that the party was a lot of fun.
The residential fellow overheard what the freshman mumbled that he had drunk at the party.
neutral, ***mos***:
The residential fellow overheard what the freshman mumbled that he had drunk at the party.
prior-mention, ***nmos***:
The students said that the party was a lot of fun.
The residential fellow overheard what the freshman said that he had drunk at the party.
semprime, ***nmos***:
The students talked about the party they had just returned from.
The residential fellow overheard what the freshman said that he had drunk at the party.
neutral, ***nmos***:
The residential fellow overheard what the freshman said that he had drunk at the party.

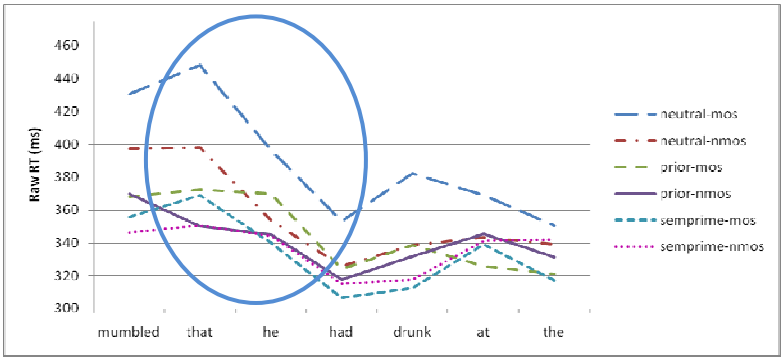
The target sentences were combined with 56 fillers in four lists balancing all factors in a Latin Square design. The stimuli were pseudo-randomized for each participant such that at least one filler item intervened between two targets.

The same one-word-at-a-time self-paced moving window paradigm was used as in Experiment 2, except with yes/no comprehension questions.

5.2. Results and discussion

The graph below depicts the word by word average reading times for each of the six conditions, starting at the matrix verb and ending past the syntactic location of the gap (between *drunk* and *at*). What is important is the relative distance between the different lines corresponding to different conditions at any given word in the sentence. *T*-tests found a significant difference in mean reading times between some of the conditions at *that, he,* and *had* (all $p < .05$) but not

anywhere else, i.e. significant differences emerged only in the circled portion:



Reading times differed between conditions in the region immediately after the verb, not at or after the structural location of the gap, and the main difference was between the neutral-mos condition and the other conditions. Thus the processing difficulty stemmed from the presence of the subordinate clause after ***mos*** verbs. We can therefore focus on the phrase *that he had*, which is in fact shared across conditions. The raw reading times of this region were log-transformed in order to get more normal data and normality within each condition. The mean log-RTs (and std. errors) for this region were as follows:

	prior	semprime	neutral
mos	6.917 (0.034)	6.876 (0.031)	7.032 (0.034)
nmos	6.869 (0.032)	6.873 (0.030)	6.932 (0.0322)

Using *t*-tests to evaluate whether the differences in means between the conditions in the first column below were significant, we get these *p*-values:

Conditions being compared		***p*-value**
neutral-mos	neutral-nmos	0.0386 *
semprime-mos	semprime-nmos	0.9377
prior-mos	prior-nmos	0.3084
neutral-mos	semprime-mos	0.0009 ***
neutral-mos	prior-mos	0.0174 *
semprime-mos	prior-mos	0.3805
neutral-nmos	semprime-nmos	0.1841
neutral-nmos	prior-nmos	0.1718
semprime-nmos	prior-nmos	0.9319

These data and patterns lead to the following results:

a) Extraction from ***mos*** complements is generally more difficult than that from ***nmos*** complements, significantly so in neutral or null contexts.
b) The neutral context cases are read more slowly; processing the critical region is easier with contexts that prime, significantly so for ***mos*** verbs.
c) Contrary to the results in Experiment 2 (in which the nature of the stimuli precluded clear conclusions), we see that although ***nmos*** verbs are helped by context they are not significantly helped by it, and on average are read in the same way in all three contexts. ***Mos*** verb extractions, on the other hand, are hard in neutral contexts and do benefit from semantic or lexical priming.
d) Both semantic and lexical priming helped about the same, and differences between conditions and verb-classes disappeared in all but the neutral context case, so it is not possible to arrive at any conclusions about the nature of influence these contexts may have.
e) As in Experiment 2, this makes a categorical island constraint defined in terms of the two classes somewhat doubtful while lending credence to information-structural or semantic-complexity factors.

Looking now at continuous frequency measures, a number of mixed-effects models were constructed as before. Again, including both verb-class and any given frequency in the same model as predictors was futile since these two factors were highly correlated and either one or none would emerge as significant in the presence of a 'context-type' factor. So I compared AIC values of various models including any one of these factors along with context-type as the other factor (lower AIC is better):

Independent variable	AIC value of model
verb-class	21.96
bnc	51.02
bnc.sc	47.30
bnc.scbias	17.50
web1t	40.33
web1t.sc	33.89
web1t.scbias	21.38
cob	48.08
coblog	28.50

Both verb-bias measures lead to the lowest AIC values, beating verb-class as well. This is exciting because it mirrors the patterns found in the acceptability ratings study which strongly suggests the validity of verb-bias in determining the goodness of extraction from both ***mos*** and ***nmos*** verbs. The implications are that subjects call on their experience with a given verb and on their expectations about how that verb's usage in both rating and reading. These results call into

question the existence of a categorical or structural island constraint based on two separate verb-classes. They suggest that variable grammaticality in bridge constructions is to be expected rather than surprising, and that the gradience corresponds to verb's bias for a sentential complement.

6. General discussion

Returning to the research questions posed initially, the results described above provide some answers. First of all, contexts do influence bridge quality and can even eliminate differences between bridge and non-bridge constructions. Both semantic and lexical priming contexts are beneficial. These effects strongly support a non-structural account. Secondly, a categorical division into two verb-classes is not entirely supported; rather it could be an epiphenomenon of a more continuous frequency-based property. This became evident from not only the comparable or superior AIC values of models with frequentistic predictors but also the strong correlations between acceptability ratings and frequencies. Verb-bias types of frequency measures stood out as having an especially strong relationship with both acceptability ratings and reading times in critical regions.

Overall, the results support a non-structural account of bridge phenomena, and clarify that the associated island effects need not have a basis in a categorical distinction between verb-classes. Rather the effects are related to a continuous parameter having to do with language users' expectations about the typical usage patterns of a verb, and so gradient patterns in grammaticality can occur with both ***mos*** and ***nmos*** verbs. ***Mos*** verbs are infrequent to begin with and even less frequently used with sentential complements; so it is not surprising that a typical language user will find them difficult, especially in a situation involving a *wh*-dependency. And the same is true of infrequent ***nmos*** verbs, or ***nmos*** verbs that have low bias for a sentential complement.

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Compositional Telicity and Heritage Russian Aspect*

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1. Introduction

Despite an increasing interest in and a growing body of linguistic work on the restructuring of aspect in heritage grammars, the issue remains excitingly complex both from the point of view of general theoretical linguistics, for we still haven't quite reached a consensus about aspect, and from the point of view of an emerging field of heritage language studies, for we don't know much about heritage grammars. In striving to contribute to the literature on both battlegrounds, the present study addresses the interaction between lexical and grammatical aspects, with a specific focus on the role of aspectual compositionality in the use of the perfective and imperfective forms by heritage speakers of Russian in controlled experimental environments. The issue of aspectual compositionality has not received systematic attention in previous studies of aspectual restructuring, focused by and large on individual verbs; nevertheless, the implications of this work could be relevant, on the one hand, for the study of the intricate relationships between lexical (or lexico-compositional) and viewpoint aspects cross-linguistically, while on the other hand contributing to our understanding of the systematic processes that ultimately shape a unique linguistic system that we call a heritage grammar.

1.1 Heritage grammars and heritage speakers

Heritage grammars, often described as divergent, reduced, or incomplete, albeit natively acquired linguistic systems, have proven to be a vast resource for current linguistic work, including work on aspect (Polinsky 1996, 2008; Montrul 2002, Pereltsvaig 2004, Jia & Bayley 2008, *inter alia*). Despite some lack of agreement in the literature with respect to the exact underlying cause of the divergence of heritage grammars, ascribed either to arrested development or attrition, the term *heritage speaker* is used rather consistently to refer to an individual whose L1 has at a young age been replaced with a more dominant L2 under particular sociolinguistic circumstances, such as migration to another

country, insufficient contact with other speakers of the L1, lack of formal instruction and literacy skills in the L1, societal pressures that favor the L2 over the L1, and many others. The linguistic outcome of these circumstances is the emergence of systematic constraints or patterns that distinguish heritage speakers from the speakers of the corresponding full-fledged baseline varieties, due to total or partial restructuring of various areas of the grammar. In a language like Russian, where aspect is undoubtedly one of the central categories in the verbal domain, such restructuring is particularly worthy of attention.

1.2 The perfective-imperfective contrast in Russian

Unlike English, which does not formally encode the perfective-imperfective contrast on verbs, Russian makes a morphological distinction between a situation viewed "in its entirety," marked by a perfective aspect, and a situation viewed with regard to its "internal temporal consistency," for which imperfective verb forms are used (Comrie 1976: 12-24). Depending on how the situation is to be viewed, from the outside or from the inside (hence the term *viewpoint aspect*, Smith 1991), Russian verbs may surface in various forms: the perfective forms generally signal "single, completed actions" while the imperfective forms mark processuality and habituality (Dickey 2000:12).

Morphologically, the perfective verbs are most typically formed from the imperfective stems via prefixation (e.g., *pisat'*.IMP – *napisat'*.PF 'write') or suffixation (e.g., *prygat'*.IMP – *prygnut'*.PF 'jump'), although some verb stems are perfective by default (e.g., *kupit'*.PF 'buy'). Most Russian verb stems, however, are by default imperfective (e.g., *chitat'*.IMP 'read'). Additionally, the imperfectives can also be derived from the perfective stems, usually via suffixation (e.g., *lit'*.IMP – *nalit'*.PF – *nalivat'*.IMP 'pour').

1.3 Previous studies of aspect in heritage Russian

Early observational studies have shown that heritage Russian speakers often express aspectual distinctions in ways different from those used by the monolingual speakers (Polinsky 1995, 1996, 1997). Generally speaking, the production 'errors' tend to fall into one of the following three types: (i) use of a form with the opposite aspectual value from the one that would have occurred in its place in baseline Russian (BR); (ii) use of a form with the same aspectual value as in BR but marked differently via the aspectual morphology, such as a missing, superfluous, or 'wrong' prefix or suffix; (iii) use of periphrastic constructions to express aspectual meanings, whereby verbal aspectual marking is often absent altogether.

In accounting for the systematic production errors of the first type, Polinsky (1996, 1997) proposed that the restructuring of aspect in heritage Russian could be related to telicity, or the internal lexical meaning of verbs. This idea was

formally developed in Pereltsvaig (2002, 2004) as the Lexical Aspect Hypothesis. According to this model, verbal aspectual morphology in heritage Russian encodes lexical-semantic properties of individual verbs, rather than viewpoint aspect *per se*: verbs that have an inherent endpoint (telos) occur with the perfective morphology, and verbs without such endpoint surface as morphologically imperfective.

1.4 Aspectual compositionality

Following the work of Verkuyl (1993, 1999), who has argued convincingly for the central position of the VP (rather than the verb alone) in construing temporal structure, a number of other studies have shown that aspectual meanings are not inherent to the verb itself, but are rather determined compositionally (Ramchand, 1997; Kratzer, 2004, *inter alia*). The conventional classification of verbs into four aspectual classes, two atelic (states, activities) and two telic (accomplishments, achievements), has been shown to be problematic for certain predicates, particularly activities and accomplishments, known for their variable telicity effects: in the words of Dowty (1979: 61), "I have not been able to find a single activity verb which cannot have an accomplishment sense in at least some special context." Instead, it has been argued that telicity (or in Verkyul's terms, terminative aspectuality) "crucially concerns the quantificational information expressed by an [object] NP," and this quantificational information "is presented as a whole in the predicate VP" (Verkyul 1999: 80). The contrasts in (1) illustrate this point for the English verbs *drink* and *eat*, both traditionally classified as activity verbs, yet both able to yield atelic (1a) or telic (1b) interpretations, depending on the nature of the internal argument. Indefinite bare plurals and mass nouns in the direct object position contribute to the atelic interpretations of the predicates, whereas predicates containing objects that denote some specified quantity, in English often also associated with definiteness, are interpreted as telic.

(1) a. John drank wine/ate apples.
b. John drank a glass of wine/ate two apples/ate the apples.

The idea that aspect is a property of verb meaning (and that all verbs are inherently marked as telic or atelic) has more recently been called into question in the literature on Slavic aspect as well. For example, Slabakova (2005: 333) points out that "the bulk of Slavic roots are neutral with respect to telicity in the lexicon," or [α]-telic, and argues that the aspectual interpretations for such predicates in Slavic are construed with the help of the verbal prefixes (preverbs), rather than direct objects. This results in a salient parametric difference between English and Slavic in the encoding of (a)telicity within the VP.

If certain classes of verbs are not fully lexically specified for telicity, heritage speakers should receive little or no relevant lexical information from such [α]-telic verbal roots about aspect. What, then, determines aspectual marking for predicates of variable telicity in a heritage grammar? This question is addressed in an experimental study described in the next section.

2. The Study

This study is part of a larger project on aspectual compositionality in heritage Russian. In exploring a possible correlation between verbal aspectual marking and particular properties of verbal internal arguments, I focus here on two related questions: first, whether the interaction between grammatical and lexical aspects in heritage Russian may extend beyond the lexical properties of individual verbal roots and into larger linguistic units (VPs), and second, whether (and in what respects) the patterns of such distribution differ from what we observe in the monolingual Russian data.

The approach undertaken here is different from that of the earlier work on heritage Russian aspect in several ways. In addition to shifting the locus of attention from individual verbs to verbs in context, the study places its main emphasis on controlled experimental tasks rather than spontaneous production. In doing so, it expands the scope of the investigation from errors to the overall patterns of aspectual distribution in the heritage data, as compared to the monolingual data, in an attempt to capture the more general tendencies that could be taken to reflect a particular state of development in a heritage grammar as a linguistic system.

2.1 Participants and methodology

Nine heritage speakers of Russian participated in the study (mean age =24, mean age of arrival to the US =5.5). The control group consisted of nine monolingual speakers of Russian, tested in Russia (mean age =33). All heritage speakers were fully proficient in English, their primary language, and used Russian infrequently and in limited contexts. In contrast, the monolingual speakers used only Russian and no other languages in all everyday communication; their knowledge of English was minimal, although sufficient for the experiment.

Both groups completed two experimental tasks. In the first task, the participants were presented with 20 VPs in English and asked to give their Russian equivalents. Each VP consisted of an [α-telic] verb plus a direct object of either some specified or unspecified quantity (henceforth [+Q] and [-Q], respectively). There were a total of 10 verbs, which were kept constant, 10 [+Q] arguments, which included DPs with definite and indefinite articles and quantifiers (e.g., *a sandwich*, *the house*, *two letters*), and 10 [-Q] arguments,

which included bare plurals and mass nouns (e.g., *books*, *milk*). In the second task, the participants were asked to construct one original Russian sentence for each VP from the first task, for a total of 20 sentences. The items were presented in a random order in each task; other activities were held in between tasks.

2.2 Hypotheses and predictions

Because the heritage speakers of Russian are fully competent in English, their primary language, the contextual factors that are relevant for English, such as the cardinality of the direct object, may trigger a preference for particular aspectual marking on the verb within the VP. For variable telicity predicates, where the verb itself is not lexically marked as unambiguously telic or atelic, heritage speakers may use the perfective morphology predominantly in the presence of internal arguments of some specified quantity and the imperfective aspectual marking, conversely, with mass and indefinite plural DPs in the same position. Such correlation would be consistent with the English value of the telicity parameter, where the direct object is crucial for the aspectual interpretation of a VP, rather than with the Slavic value of the same parameter, where the internal argument is traditionally viewed as having no bearing on the aspectual interpretation of a predicate (e.g., Slabakova 1999). The latter assumption also predicts no similar restrictions on the distribution of the perfective and imperfective forms in the monolingual data, which should be able to co-occur freely with [+Q] and [-Q] arguments.

2.3 Results and Discussion

First, the results for the group of heritage speakers will be discussed. Here, the main hypothesis of the study was borne out fully. Both tasks revealed a strong preference for the perfective morphology in compositionally telic contexts, while the imperfective forms were strongly preferred when the predicates were compositionally atelic. The overall results for the heritage group, averaged over the two tasks, are shown in Fig. 1.

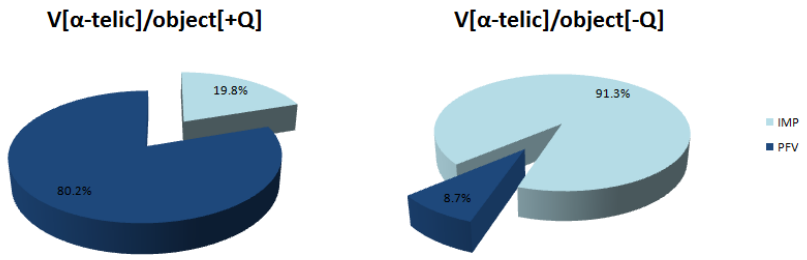

Figure 1. The distribution of perfective and imperfective forms in heritage Russian.

The results for the individual tasks are as follows: on the first task, 73.3% of the predicates with [+Q] objects occurred as perfectives and 26.7% as imperfectives. The reverse pattern was attested when the target verbs were followed by [-Q] arguments: 87.2% of such predicates were imperfective and only 12.8% perfective. On the second task, the pattern was repeated: 87.8% of compositionally telic predicates occurred with the perfective marking and the remaining 12.2% were imperfective. Compositionally atelic VPs were, in contrast, predominantly imperfective: 95.4% versus only 4.6% perfective. These findings support the main hypothesis of the study in suggesting that there exists a correlation between the aspectual morphology and telicity in a compositional sense for [α]-telic verbs in heritage Russian. That is, when no lexical information is available on the verbal root itself, the internal argument does play a role in the choice of verbal aspectual form for heritage speakers. This correlation is initially suggestive of a possible interference from English, the contact language; however, data from the monolingual speakers need to be examined before such a conclusion can be reached.

The overall results for both groups are summarized in Fig. 2.

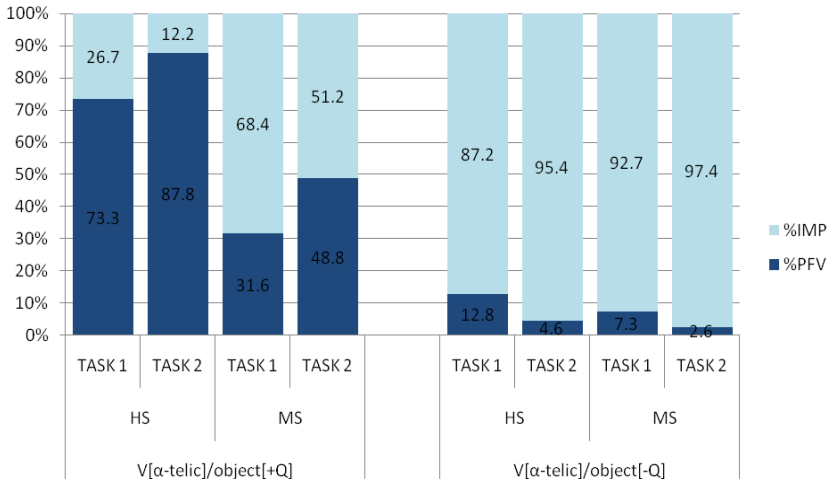

Figure 2. The overall results for heritage speakers (HS) and monolingual speakers (MS) on two experimental tasks.

The distribution of the aspectual forms in Fig. 2 yields some interesting generalizations. First, consider the results from the two groups of speakers side by side. The most striking observation is that the patterns observed in the heritage data do not hold in the monolingual data as far as compositionally telic predicates are concerned. That is, in contrast to the heritage speakers, who prefer

the perfective marking in this condition, the monolinguals do not favor perfectives in the context of [+Q] objects. In the sentence construction task (Task 2), approximately half of all target verbs receive the perfective marking while the other half are imperfective. Also it should be noted that the imperfectives were actually preferred in [+Q] contexts on the first task (bare VP elicitation) for monolinguals, again in sharp contrast with the heritage speakers; however, this difference between the groups can be attributed to an additional independent factor. In Standard Russian, the imperfective aspect is conventionally used as a default citation form for verbs. It is not surprising that the monolingual speakers, familiar with this formal convention through education and access to the standard dialect, generally prefer the imperfective forms for bare VPs, and that the heritage speakers, in the absence of formal schooling and lack of exposure to the standard dialect, do not follow this convention. Nevertheless, when this confounding factor is removed and the verbs no longer surface in citation forms (Task 2), the difference between the two groups in the [+Q] object condition is still remarkable.

The second striking observation is that no such difference exists in the [-Q] object condition. With compositionally atelic predicates, heritage speakers pattern together with the monolinguals in preferring the imperfective forms. Under the hypothesis of the present study, such preference is predicted for the group of heritage speakers: [-Q] object triggers the imperfective aspect on the verb. However, a larger principle seems to be involved in the distribution of the aspectual forms with compositionally atelic predicates, one that prevents the occurrence of perfectives in these contexts in Russian and neutralizes or overrides any possible differences between the two groups.

In her study of the parametric differences in the encoding of telicity in English and Slavic in L2 acquisition, Slabakova (1999) found that Bulgarian learners of English patterned with native speakers in all atelic contexts, but considerably differed from them in judging and matching telic sentences. These findings, coupled with the results presented here, point to an intricate complexity in the relationships between (a)telicity and (im)perfectivity in the Slavic languages – namely, lack of uniformity across telic and atelic contexts. While telic predicates allow for both perfective and imperfective aspectual marking, only imperfectives are compatible with the atelic readings; perfective forms appear to be excluded from the atelic contexts altogether. Verkuyl (1999), among others, notes that the perfective prefixes in Slavic impose certain restrictions on the interpretation of the internal argument NPs: “in spite of the absence of quantificational information, the NP will be interpreted as pertaining to a specified quantity” (p. 129). That is, the prefixes take scope over entire VPs rather than individual verbs. In avoiding the perfective aspectual marking in compositionally atelic contexts (with few exceptions, which will be discussed below), both groups of speakers demonstrated sensitivity to such scopal effects of the Russian perfective prefixes.

After careful examination of the sentential contexts in which the target atelic predicates occurred with perfective morphology in the data, a consistent pattern emerged: every instance pointed to a reinterpretation of the bare plural object from [-Q] to [+Q]. In the absence of definite and indefinite articles in Russian, bare plurals like *books* are formally ambiguous between the generic indefinite and concrete definite readings; it was almost certainly the latter reading that the speakers intended in the few seemingly perfective-atelic instances in the data. All such examples from both groups cannot be listed here due to space restrictions; however, the sentence in (2) below, produced by a heritage speaker in Task 2, is perhaps the most straightforward illustration of an explicit substitution of the target [-Q] VP *read books* with a [+Q] VP *read these books* through the addition of an overt determiner:

(2) Vam nuzhno prochitat' vot **eti** **knigi** do zavtra.
you need read.PFV particle these books till tomorrow
'You need to read these books for tomorrow' (target VP: *read books*)

Before turning to the concluding remarks, one additional finding of the study will be addressed in this section. What initially appears as a slight imperfective bias in the heritage data, 55.6% out of all verb forms used, turns out to be a perfective bias in comparison with the group of monolingual speakers. In order to make the comparison more accurate, I will focus on the data from the sentence construction task, setting the bare VPs in the first task aside (in doing so, I once again exclude the independent factor responsible for the large number of imperfective verbs in citation forms in the monolingual data). In sentences, 55.1% of all verbs were imperfective in the heritage data and 73.0% in the monolingual data. That is, even though the heritage speakers overall used slightly more imperfective forms than perfective forms, they did not use nearly as many imperfective forms as did the monolingual speakers: only 27.0% of the target verb forms in sentential contexts were perfective in the monolingual data, compared to 44.9% in the heritage data. This finding supports a recent observation made in passing in Polinsky (2008): "it seems that heritage speakers use a greater number of perfective forms (at least in spontaneous production)" (p.19) and warrants further investigation.

3. Conclusion

The goals of this study were two-fold: first, to examine the restructuring of the aspectual system of heritage Russian at the phrasal level of VP, and second, to attempt to contribute to the ongoing debate on the complex interactions between the lexical and viewpoint aspects in Russian, an issue far from settled in the literature of Slavic aspect. This section will summarize the overall conclusions

of the study, insofar as they relate to the above two lines of research, and outline some possible directions for future work.

The distribution of the aspectual forms in the heritage Russian data supports the idea that contextual factors, particularly internal arguments, are relevant for the occurrence of aspectual morphology with verbs of variable telicity. When constructing sentences out of VPs with [+Q] objects, heritage speakers strongly preferred the perfective aspectual marking, while speakers of Russian in the control group paid no attention to the direct object on the same task, producing a nearly equal number of perfective and imperfective forms. This mismatch points to an interesting difference between the heritage grammar and the grammar of the corresponding baseline language – one that mirrors the parameterized difference with respect to the encoding of telicity at a phrasal level between English and Russian.

The results of this study further bear on what has for a long time been one of the central problems in the literature on Slavic aspect – the relationship between the viewpoint aspect and the (a)telicity of verbal predicates. In atelic contexts both heritage speakers and monolingual controls strongly preferred imperfective forms. This restriction on the occurrence of perfectives with compositionally atelic predicates questions the idea that grammatical aspect in Russian is fully independent from lexical aspect. The data on the distribution of compositionally atelic predicates supports the opposite view, as perfective aspectual morphology in Russian does not occur with this group of predicates in the monolingual data.

Further, the difference in the distribution of aspectual forms with compositionally telic and atelic predicates provides a convincing argument for the asymmetrical nature of compositional aspectuality. While compositionally telic predicates are compatible with various construals of a situation, compositional atelics only allow for the viewing of a situation "from the inside," the viewing that highlights its internal temporal structure.

These findings have several implications for future studies of aspectuality at a phrasal level, including further research on aspect in heritage grammars. The first, and perhaps most obvious, conclusion is that data from the corresponding baseline varieties can be critical for uncovering the patterns of systematic restructuring in a heritage grammar, for some of these patterns, especially those not manifested in errors, may not be easily detectable otherwise. Second, differences in restrictions on the occurrence of the perfective and imperfective forms with compositionally telic and atelic predicates may help bridge the gap between the literature that conflates the lexical and viewpoint aspects in Slavic into one single notion and the literature that distinguishes them as two independent categories. It is hoped that more work on aspect in heritage languages will soon follow to help bring major insights into the overall makeup of the aspectual system and complex interactions within that system.

Notes

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The Pragmatics of the Choice between Raised and Non-raised Complement Structures in Korean: A Corpus Study

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1. Introduction

This paper is an empirical study on the variation displayed by *believe*-type verbs between the complement clause involving Raising-to-object (RtO) and the complement clause without raising in Korean. Since Kuno (1976), it has been a standard assumption in generative inquiries of Japanese and Korean syntax that the case alternation on the embedded subject shown in (1a) and (1b) is the counterpart in these languages of the English construction in (2a) and (2b), respectively (J.-H. Yoon 1987, 2004, 2007; J.-M. Yoon 1989, 1991; S.-M. Hong 2005; cf. K.-S. Hong 1990; Hoji 1991, 2005).[i]

(1) a. Na-nun Mary-ka yengliha-ta-ko mitnun-ta.
I-TOP Mary-NOM smart-DECL-COMP believe-DECL
'I believe that Mary is smart.'
b. Na-nun Mary-lul yengliha-ta-ko mitnun-ta.
I-TOP Mary-ACC smart-DECL-COMP believe-DECL
'I believe Mary to be smart.'
(2) a. I believe (that) Mary is smart.
b. I believe Mary to be smart.

It has been demonstrated that only embedded subjects construable as a discourse theme or topic predicated by the lower clause are allowed to undergo RtO (K.-S. Hong 1990; J.-H. Yoon 2004, 2007), but they are not required to raise:

(3) Table 1. The felicity condition on the use of RtO in Korean

Embedded Subject	Raised Complement	Unraised Complement
Construable as a topic	√	√
Not Construable as a topic	*	√

This raises the question whether the raising of the embedded subject which functions as the topic is purely optional or whether the choice

between raised and unraised complement structures is motivated by semantic/pragmatic considerations.

We begin in section 2 with a review of properties of RtO in Korean and different syntactic analyses of RtO. In section 3 we discuss the pragmatic properties of the two types of complement clauses of *believe*-type verbs in Korean in more detail and motivate research questions we investigate in this study. Section 4 presents a corpus study on the distribution of the complement clauses of the verb *sayngkakha-* 'think' showing that the choice between the two types of complement clauses is strongly affected by the contrastiveness of the proposition expressed by those clauses. In section 5 we propose that the pattern of complement choice observed in the corpus data reflects the speaker's attempt to balance between processing cost and discourse function. Section 6 concludes the paper.

2. The Status of RtO in Korean

In this section we introduce properties of RtO in Korean that have attracted special attention in the literature and different syntactic analyses of RtO.

In early theoretical approaches to RtO/Exceptional Case Marking (ECM) in English, the postverbal NP was treated as a 'raised' object, positioned in the subject position of the lower clause at Deep Structure, and then subsequently raised to the object position of the higher clause (e.g., Postal 1974; Chomsky 1981, among others).

A similar analysis has been suggested for ECM-like constructions in Japanese and Korean such as (1b). Some recent examples of this view include Hiraiwa (2002), Tanaka (2002) and S.-M. Hong (2005). However, Hoji (1991, 2005) and K.-S. Hong (1990) have challenged the traditional raising analysis. These researchers take the construction in (1b) in Japanese/Korean not to be an Subject-to-object raising (SOR)/ECM construction, but one where the accusative NP is base-generated in the matrix VP.

A crucial argument against the SOR analysis of the Korean quasi-ECM construction comes from the fact that the raised NP is not limited to the embedded subject. As pointed out by J.-H. Yoon (1987) and K.-S. Hong (1990), nonsubjects can be raised as shown below:

(4) Initial scene-setting adverbial NPs (place adverbial):
Na-nun **L.A.-lul** (mikwuk-eyse) hankwuksalam-i kacang manhi
I-TOP L.A.-ACC US-LOC Koreans-NOM most many
santa-ko mit-nun-ta.
live-COMP believe-PRS-DECL
'I believe L.A. has the greatest number of Koreans in the US.'

J.-H. Yoon (2007) points out another problem for the standard SOR analysis of (1b). He notes that the relation between the raised nominal and

the gap/pronoun in the embedded clause in SOR can violate Subjacency, as shown below:

(5) Na-nun **Yenghi-lul**$_i$ [[**e**$_i$/**kunye-ka** e ha-nun] il]-i
I-TOP Yenghi-ACC she-NOM do-ADNOM work-NOM
mobemcek-ila-ko sayngkakha-nta.
exemplary-COP-COMP think-DECL
'I think of Yenghi that the things she does are exemplary.'
(J.-H. Yoon 2007: 74)

For the standard SOR analysis, the lack of locality between the raised nominal and the gap/pronoun in the embedded clause would be problematic as it constitutes evidence against the existence of a movement-like dependency.

A third problem for the standard SOR analysis comes from the fact that non-raised (1a) and raised (1b) constructions differ in terms of a number of interpretive properties. As J.-S. Lee (1992) has pointed out, for example, idiomatic readings are not retained when subject idiom chunks undergo raising.

In his recent study, J.-H. Yoon (2007) examines the status of raising in Korean. Despite much evidence seemingly to the contrary, he argues for a raising analysis, but one in which not a subject but a Major Subject raises. He proposes that raising is involved in the derivation of the sentence in (6).

(6) Na-nun Mary-lul yengliha-ta-ko mitnun-ta. (=(1b))
I-TOP Mary-ACC smart-DECL-COMP believe-DECL
'I believe Mary to be smart.'

In his analysis, *Mary* raises from a position in the complement clause to its position in the matrix clause. But what is raised is not the subject of the embedded clause but the Major Subject, a term that traditionally refers to the first nominative element in a multiple nominative construction shown below.

(7) I hakkyo-ka(MS) kyoswucin-i(GS) coh-ta.
this school-NOM faculty-NOM good-DECL
'The faculty at this school is good.'

In multiple nominative constructions there is more than one subject-like element, the Major Subject(MS) and the grammatical subject(GS). A grammatical subject is the subject of the VP, an unsaturated predicate. A Major Subject is a subject on which the sentence consisting of the grammatical subject and VP are predicated. Following J.-H. Yoon (2007) we will refer to such sentences which function as a predicate as 'Sentential Predicates'.

J.-H. Yoon (2007) proposes that a Major Subject occupies a position higher than the grammatical subject and that all instances of RtO in Korean target the Major Subject position. The position occupied by the raised Major

Subject is assumed to be a derived non-thematic Major Object position in the matrix clause.

In sum, we have discussed properties of RtO in Korean that are problematic for the standard raising analysis and different treatments to RtO in Korean. In this paper, we will follow J.-H. Yoon (2007) in assuming that what undergoes raising is a high subject of the embedded clause—the Major Subject.

3. To Raise or not to Raise: The Problem of Variation

In the previous section, we noted that a dependent of an embedded complement is allowed to raise if and only if it is expressed as the embedded Major Subject. This raises the following question. Why is it the embedded Major Subject that undegoes RtO? J.-H. Yoon (2007) proposes that the answer lies in the fact that RtO in Korean is sensitive to the discourse salience of the raised nominal and targets the topic predicated by the embedded clause.

The topic of a sentence is the thing which the proposition expressed by the sentence is about (Kuno 1972; Gundel 1976; Reinhart 1982; Lambrecht 1994). But what does it mean for a proposition to be *about* something? Strawson's (1964) Principle of Relevance captures the idea well. This principle states that speakers' utterances give or add information to what is currently under discussion—the current central interest or concern. Thus, the topic of an utterance is that part which has information added to it, what that information is about.

As noted by J.-M. Yoon (1989), K.-S. Hong (1990) and J.-H. Yoon (2004), the Major Subject and the Sentential Predicate that is in construction with it must satisfy the interpretive condition called the 'characteristic property' condition or 'Aboutness condition' identified by Kuno (1973). That is, the Sentential Predicate in RtO is constrained to denote a characteristic or distinguishing property of the raised nominal (the Major Subject), as the contrast (8a) between (8b) demonstrates.

(8) a. Na-nun L.A.-lul hankwuksalam-i ceyil manhi santa-ko
I-TOP L.A.-ACC Koreans-NOM most many live-COMP
mit-nun-ta.
believe-PRS-DECL
'I believe that L.A. has the largest Korean population.'
b. *Na-nun L.A.-lul nay tongsayng-i santa-ko mit-nun-ta.
I-TOP L.A.-ACC my brother-NOM live-COMP believe-PRS-DECL
'I believe that my brother lives in L.A.'
(K.-S. Hong 1990: 222)

The property of my brother living in L.A. is not a plausible property that characterizes L.A., compared to the property of having the largest Korean

population. Thus, when an embedded dependent is not construable as a topic predicated by the embedded clause, it is disallowed to raise.

Note that dependent elements of an embedded clause construable as a topic and hence expressible as a Major Subject are only allowed to raise, but they are not required to raise. In fact, in all of the felicitous RtO examples given above, accusative-marking alternates with nominative-marking on the Major Subject:

(9) Na-nun L.A.-ka hankwuksalam-i ceyil manhi santa-ko
I-TOP L.A.-NOM Koreans-NOM most many live-COMP
mit-nun-ta.
believe-PRS-DECL
'I believe that L.A. has the largest Korean population.'

The alternation between accusative-marking and nominative-marking on the Major Subject raises the question whether the raising of the embedded Major Subject is purely optional or whether the choice between raised and unraised complement structures is motivated by semantic/pragmatic considerations. We assumed the following hypotheses and tested them against the corpus data:

(10) Hypothesis 1: Salience of embedded Major Subjects

Raised NPs exhibit greater topicality (measured by givenness) than their unraised counterparts.

(11) Hypothesis 2: Salience of embedded propositions

Complement clauses involving raising exhibit greater contrastive salience than clauses without raising.

Hypothesis #1 is motivated by the fact that there is a strong correlation between the concept of topic and raised NPs (Kuno 1972; Givón 2001). At this point, it is important to make the distinction between aboutness and givenness clear in relation to topichood. We saw above that topics are defined as being what the proposition expressed by the utterance containing them is about. While aboutness is perhaps the most important as the defining features of topichood, it is not the only one.[ii] Being previously mentioned in a discourse, also called being given or discourse-old, has long been associated with topichood. Although this status is not in and of itself a defining feature of topics, the correlation between givenness and topichood is can be a signal to an underlying property of topics, which is that they be accessible to the speaker/hearer. If it is the case that topicality as measured by givenness affects the choice between raised and unraised complement clauses of the verb *sayngkakha-* 'think', then raised Major Subjects should take up previously-mentioned referents more frequently than unraised Major Subjects.

In addition to the effect of the givenness of embedded Major Subjects on the choice between the two types of complement clauses, the current experiment will also examine whether and how the salience of the entire proposition expressed by embedded clauses affects complement choice. The relevance of propositional salience to raising is motivated by the fact that the function of RtO constructions in Korean is to mark the referent of an embedded nominal as a particular kind of topic in the proposition in which it occurs and as a corollary, to *mark a relation (i.e., a topic-predication relation)* between the referent of the embedded Major Subject and the proposition in which it occurs.

A proposition which expresses a topic-predication relation can become more salient when it serves some special discourse function beyond expressing such a relation. We hypothesize that the high salience of the proposition expressed by a raised structure may justify the use of that structure: raising is justified when used for adding contrastiveness or the speaker's attitude toward the proposition expressed by the embedded clause such as affirmation, negation or disagreement. If it is the case that propositional salience in terms of contrastiveness affects complement choice, then raised structures should be used in contrastive context more often than unraised structures.

4. Corpus Analysis

This section presents the methods and analysis of the corpus data on the variation displayed by the verb *sayngkakha-* 'think' between raised vs. unraised complements.

4.1. Methods and materials

In this study we investigated the question whether givenness or propositional contrastiveness affects complement choice through corpus analysis.

The corpus used was the Sejong corpus of Korean collected by the National Institute of the Korean Language. Using Guljabi, a corpus exploration program supplied with the Sejong corpus of Korean, we searched for examples of sentences containing occurrences of the verb *sayngkakha-* 'think' with the two types of complement clauses. We then went through these one by one, throwing out those that did not exemplify the constructions under consideration in this study, e.g., sentences containing an embedded subject that is not construable as a topic as defined in this study, sentences that do not exhibit variation between raised and unraised complements. The remaining sentences included a total of 240 examples of the clausal complements taken by *sayngkakha-* 'think'.

We hand coded these examples for the givenness of embedded Major Subject NPs, assigning values we refer to as discourse-old and discourse-new (Prince 1992). An NP was classified as discourse-old if its

referent has been previously mentioned within the current text. An NP whose referent has not been explicitly mentioned was classified as discourse-new.

We also coded for kontrastiveness. The notion of *kontrast*, originally proposed by Vallduví and Vilkuna (1998), refers to the ability of certain linguistic expressions to generate a set of alternatives, i.e., a subset of the elements of the corresponding type including the focused item and at least one additional element. This notion has been used as a concept which applies to entities. In this study we re-analyzed it so that the kontrast set extends to include a set of propositions and properties as well as entities.

Kontrastiveness was coded as one of two categories: kontrastive and non-kontrastive. These were identified according to whether there is a proposition alternative to the one expressed by clausal complements taken by *sayngkakha-* 'think'. Consider an example from the Sejong corpus of Korean:[iii]

(12) [Two speakers A and B are talking about domestic animals. A says:]
A: talk-ul mwusewun tongmwul-ila-ko sayngkakha-ko,
chickens-ACC frightful animal-COP-COMP thought-and
koyangi-lul kwiyewun tongmwul-ila-ko sayngkakhayss-ciyo.
cat-ACC cute animal-COP-COMP thought-SE
'So people thought that chickens are frightful animals and that cats are cute animals.'

The information structure of the underlined part of the above utterance is shown in (13). Below it in (14), a generalized structure is given.

(13) Cats [+k(ontrast)/Topic] are cute animals [+k/Predication].
(14) A [+k(ontrast)/Topic] has property x [+k/Predication].

In the context of (12) the kontrastive topic *koyangi* 'cats' belongs to a set of entities, specifically the contextually evoked set of domestic animals: M_1 = {chickens, cats, dogs, cows, ...} and the kontrastive predicate *kwiyewun tongmwul* 'cute animals' belongs to a set of properties that hold for domestic animals: M_2 = {frightful animals, cute animals, tame animals, ...}. Thus, the proposition expressed by the underlined part of (12), x(A), makes the hearer generate a set of alternative propositions, M_3 shown in (15):

(15) Propositional kontrastiveness:
x(A) generates M_3 = {{y(A), z(A), ... }; {x(B), x(C), ... }; {y(B), z(C), ... }}

An embedded complement clause was classified as kontrastive if a set of related propositions is generated by introducing alternatives to the referent of its Major Subject and/or to the property denoted by its Sentential Predicate. Otherwise, the clause was classified as non-kontrastive.

Kontrastive clauses are further divided into two sub-categories: contrastive and comparable. Contrastiveness refers to the state in which there is a set of entities that is mutually known (a contrast set) and one

member is chosen from that set to the exclusion of the other members (Chafe 1976; Kiss 1998). In this paper we extend the notion of contrastiveness to the propositional level and define it as the state in which there is a set of kontrastive propositions which express a topic-predication relation, and one of these propositions is affirmed while others are denied. Thus, the relationship among the members of a set of contrastive propositions involves mutual exclusiveness or negation:

(16) Propositional contrastiveness:
M = {X, Y}, where Y = ¬X
(X and Y are mutually exclusive in the speaker's belief.[iv])

An embedded complement clause was classified as contrastive if it belongs to a set of mutually exclusive kontrastive propositions which differ in the value of the Major Subject and/or in the value of the Sentential Predicate. Otherwise, the clause was classified as comparable.

Consider an example of a contrastive proposition from the corpus:

(17) ...7% sengcang-ul ce sengcang-ila-ko sayngkakha-nun
7% growth-ACC low growth-COP-COMP think-MOD
kyenghyang-i kanghan kes kath-ta. Naynyen sengcanglyul 7.3%-nun
tendency-NOM strong seem next year growth rate 7.3%-TOP
kyelkho nacun swucwun-i aniciman, silceylo naynyen
never low level-NOM not-but in fact next year
kyengki twunhwa kanungseng-un maywu nac-ta.
economic slump possibility-TOP very low-DECL
'... There seems to be a strong tendency to consider the 7% rate of economic growth is a low level of growth. The 7.3% rate of economic growth, a rate expected for next year, is not a low level of growth, and moreover, economic slump is highly unlikely next year. ... '

X: The 7% rate of economic growth is a low level of growth.
Y: The 7% rate of economic growth is not a low level of growth.

In (17), the speaker's second utterance negates other people's belief stated in his previous utterance, i.e., that the 7% rate of economic growth is a low level of growth. It adds a tone of correction and disagreement and is perceived as an attack on the generally held belief.

A fine-grained categorization of kontrastiveness is summarized below:

(18) Table 2. Categorization of kontrastiveness

<table>
<tr><td rowspan="2">Kontrastive</td><td colspan="2">Contrastive (example (17))</td></tr>
<tr><td>Comparable(examples (12))</td><td rowspan="2">Non-contrastive</td></tr>
<tr><td colspan="2">Non-kontrastive</td></tr>
</table>

4.2. Results

The breakdown of embedded Major Subject NPs by givenness in both complements is given in Table 3. 84.2% of raised Major Subject NPs are given, or discourse-old, and 75.8% of unraised Major Subject NPs take up previously-mentioned referents. The difference in givenness between Major Subjects in the two complement clauses, however, did not reach statistical significance (χ^2=2.16). The prediction of hypothesis #1 (10) is therefore not borne out by the data.

(19) Table 3. The relative frequency of given/new Major Subjects in both complements (%)

	Major Subjects in raised complements	Major Subjects in unraised complements
Discourse-old	101 (84.2%)	91 (75.8%)
Discourse-new	19 (15.8%)	29 (24.2%)

To test the prediction of hypothesis #2, we first examined the effect of propositional kontrastiveness on complement choice. Statistical analyses of the corpus data showed that propositional kontrastiveness is significantly correlated with complement choice (χ^2=147.62, p<.05). As shown in Table 4, the majority of the raised structures in our data (75%) denote a kontrastive proposition, whereas more than 52% of unraised structures are non-kontrastive.

(20) Table 4. The relative frequency of kontrastive vs. non-kontrastive complements (%)

Kontrastiveness	Raised complements	Unraised complements
Kontrastive	90 (75%)	57 (47.5%)
Non-kontrastive	30 (25%)	63 (52.5%)

We also tested the effect of propositional contrastiveness on complement choice. Table 5 below shows the relative frequency of raised and unraised structures according to propositional contrastiveness. We can see that the majority of the raised structures (67.5%) are contrastive, whereas only 37.5% of unraised structures are contrastive. These results are significant at the 0.05 level (χ^2=21.6).

(21) Table 5. The relative frequency of contrastive vs. non-contrastive complements (%)

Contrastiveness	Raised complements	Unraised complements
Contrastive	81 (67.5%)	45 (37.5%)
Non-contrastive	39 (32.5%)	75 (62.5%)

This distribution is in accordance with the hypothesis #2 of (11), thus providing evidence that use of RtO constructions in Korean is significantly correlated with the salience of the embedded proposition in terms of

contrastiveness rather than by the salience of the embedded Major Subject in terms of givenness.

5. Discussion

The previous section has presented evidence for the effects of propositional salience on complement choice. In this section we propose an analysis which accounts for the pattern of complement choice in terms of the interaction between markedness and discourse function.

5.1. The markedness of raising constructions

Compared to their unraised counterparts, RtO constructions exhibit a larger distance between surface form and semantic representation. In Korean RtO constructions, the raised Major Subject is the grammatical object of the higher clause, as evidenced by linguistic tests for clausality (e.g., adverbial placement and disjoint reference of pronouns) and grammatical objecthood (e.g., passivization) (K.-S. Hong 1990). But the same NP also functions as the dependent of the finite embedded clause (J.-H. Yoon 2007). When compared to their unraised counterparts, RtO constructions are thus functionally and semantically more complex and less transparent, cause more cognitive cost and require more processing time in terms of the analyzability and decoding of the form-function relation (Hawkins 1986; Legenhausen and Rohdenburg 1995).

The markedness of raising constructions and its impact on processing have been much discussed in studies on language acquisition (Eckman 1977, 1996; Kellerman 1979; Kortmann 1998). One of the central observations in this research is that more explicit and semantically transparent structures are acquired earlier in the L2, are preferred options, and have a wider range of application also in the advanced stages of the learning process, whereas less explicit and semantically opaque variants are avoided even when they exist in the L1 (Callies 2008). In a corpus-based study which compared texts produced by German learners of English and native speakers of English, Callies (2008) has shown that raising constructions are problematic even for advanced learners of English. He found that English raising constructions are underrepresented in the writing of advanced German learners of English due to avoidance. Taken together, these findings strongly suggest that the less explicit and semantically opaque nature of RtO constructions is problematic for language users and cause more cognitive cost.

5.2. Balancing between processing cost and discourse functions

We now turn to discuss the question why RtO in Korean is strongly correlated with propositional salience. In the spirit of the pragmatic theory of Relevance (Sperber and Wilson 1995) and the Accessibility theory of referential processing (Ariel 1990), we assume that language processing is

governed by balancing processing cost with cognitive effect or communicative function.

A nice illustration of the balance between processing cost and communicative function can be seen in the correlation between the form of referential expressions and their function in discourse. The general performance pattern that emerges from studies of the selection of different referential forms in English and other languages is that more accessible entities are referred to by shorter and more reduced forms, e.g., by pronouns rather than full NPs (Ariel 1990; Gundel, Hedberg and Zacharski 1993; Arnold 1998). Pronouns are a less marked referential form in that they typically have minimal formal complexity and carry a low amount of descriptive information, whereas full NPs tend to be formally more complex and semantically richer. When the context makes an entity highly accessible, the semantic generality of a minimally complex form suffices to pick out the intended referent for the hearer. Referential expressions that carry a low amount of information, such as pronouns would be easier to process when the referent is salient than when it is not, because they do not pose a processing burden that has to be balanced by serving some special function such as reactivating the referent beyond identifying the referent. In contrast, using full NPs to refer to a highly accessible entity would result in an imbalance between function and cost during the integration of the referential expression into the representation of the discourse. Referential expressions that carry more information than necessary are more difficult to process when the referent is already salient than when it is not because the extra information in these expressions serves a discourse function only when the referent is not focused and therefore has to be properly identified and possibly reactivated in working memory (Gordon, Grosz and Gilliom 1993; Almor 1999).

We propose that the balance between processing cost and discourse function provides a systematic way to explain the effects of propositional contrastiveness on complement choice. As discussed above, RtO constructions are a cross-linguistically marked structure in that they involve a dissociation between theta-role assignment and grammatical-function assignment, which causes more processing difficulty, compared to their unraised counterparts. The use of such marked structures is justified if they serve some special discourse function beyond expressing a topic-predication relation. We argue that the high salience of the proposition expressed by a raised structure may justify the use of that structure: RtO is justified when used for adding contrastiveness or the speaker's attitude toward the embedded proposition such as affirmation, denial or disagreement. When RtO constructions are used this way, higher processing cost will be balanced with their discourse function or communicative effect. In non-contrastive context, however, embedded Sentential Predicates do not serve special discourse function beyond expressing a topic-predication relation, leading to an overall preference for less marked, unraised structures. Thus this analysis can correctly predict the gradient pattern of complement choice, while offering an explanation for why contrastive salience is relevant to the choice between the two different types of complement clauses.

6. Conclusions

This paper has examined the variation displayed by the verb *sayngkakha-* 'think' between the complement clause involving Raising-to-object (RtO) and the complement clause without raising. Through a corpus study on the distribution of the complement clauses of *sayngkakha-* 'think', we have demonstrated that the choice between the two types of complement clauses is strongly affected by the contrastiveness of the proposition expressed by those clauses.

Going one step further, we have also attempted to provide a possible explanation for why the two types of complement clauses are distributed the way they are. We have proposed that the pattern of complement choice observed in the corpus data reflects the speaker's attempt to balance between processing cost and discourse function.

Notes

[i] RtO typically occurs with cognition verbs such as *believe* and *consider*, many verbs of intention, desire or decision such as *expect, need* and *want*, and verbs of discovery (e.g., *find*). A small semantic group of verbs with similar meanings triggers RtO in Korean, *sayngkakha-* 'think', *mit-* 'believe' and *po-* 'consider' being notably frequent. The most frequent verbs in English RtO constructions are *expect, allow, find*, and *require* (Biber, Johansson, Leech and Conrad 1999).

[ii] The other important feature of topics is accessibility. Topic referents have the property of having a high level of accessibility, with referents that are high accessible making better topics than less accessible referents (Lambrecht 1994).

[iii] All examples presented in this section are from the Sejong corpus of Korean.

[iv] Note that members of a set of contrastive propositions are not necessarily contradictory in logical sense. They are only mutually exclusive in the speaker's belief.

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Korean Non-final –*ta*- as an Indirect Evidential Marker*

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1. Introduction

In the Korean plain style speech (where participants have the same social status, and are in the informal situation), when people ask questions, two question morphemes can be used: the simple form –*ni* and the complex form –*tani*:

(1) a. John-i ne-lul cohaha-ess-ni?
John-Nom you-Acc like-Past-Q
'Did John like you?'
b. John-i ne-lul cohaha-ess-ta-ni?
John-Nom you-Acc cohaha-Past-*ta*-Q
'Did John like you?'
Implication: the addressee's answer is expected to be based on indirect evidence.

The difference between –*ni* and –*tani* is that the complex form –*tani* carries the implication that the addressee's answer is based on his/her indirect evidence (*indirect evidential implication*, henceforth). One might think that the –*tani* is responsible for the indirect evidential implication, but I propose that –*tani* can be decomposed into –*ta*- and the question marker –*ni* (cf. 1a), and that this non-final –*ta*- is an indirect evidential marker carrying the indirect evidential implication. This proposal is supported by the fact that the non-final –*ta*- also carries the indirect evidential implication in declaratives. The non-final –*ta*- in –*tani* is homophonous as the sentence-final –*ta*, the declarative marker used in the plain style speech. However, the final –*ta* does not carry the indirect evidential implication (see 2a), and only the non-final –*ta*- carries the indirect evidential implication that the speaker has indirect evidence about the assertion (see 2b).

(2) a. John-i ne-lul cohaha-ess-ta.
John-Nom you-Acc like-Past-Decl
'John liked you.'

b. John-i ne-lul cohaha-ess-ta-nta.
John-Nom you-Acc cohaha-Past-*ta*-Decl
'John liked you'
Implication: the speaker has indirect evidence that John liked the addressee.

One problem in (1) and (2) is that the implication carried by the non-final *–ta-* in the declarative is different from the implication in the question. In questions the indirect evidential implication is the addressee's (see 1b), whereas in declaratives the indirect evidential implication is the speaker's (see 2b). This phenomenon, which I will refer to as *the evidential perspective shift* (the perspective of the indirect evidential implication is shifted from the speaker's to the addressee's) is difficult to account for in compositional semantics. The evidential implication is similar to pronouns, in the sense that it varies depending on who the speaker is. However, the denotations of pronouns are not shifted under questions (for example, both in 1b and in 2b the indexical *ne* 'you' always denotes the addressee), whereas the evidential implication does shift from the speaker's (in 2b) to the addressee's (in 1b). Why is the evidential perspective, but not the denotation of the pronoun, shifted under questions?

The main proposals of this paper are that i) the Korean non-final *–ta-* is an indirect evidential marker, carrying an implication that the speaker's assertion is based on indirect evidence, and that ii) the evidential perspective shift can be accounted for by examining pragmatics of the question-answer exchange carefully. To do that, in this paper we first introduce the basic notion of evidentiality (Section 2), and then propose that the indirect evidential implication of *–ta-* is presuppositional (Section 3). Then we introduce several assumptions about the semantics of pronouns as indexicals and the pragmatics of questions (Section 4). After that we provide our pragmatic analysis of the evidential perspective shift (Section 5). We will also show that the behavior of the reason question with respect to the indirect evidential implication is different from other questions, and try to account for why (Section 6). Finally we summarize our discussion, and mention its implications (Section 7).

2. Evidentiality

Evidentiality is "a linguistic category whose primary meaning is source of information" (Aikhenvald 2004: 3). By using evidential morphemes the speaker indicates where the assertion is based: direct perception, someone else, inference, and so on. There are various sources available for a speaker, and it differs cross-linguistically how a language grammaticalize different evidential sources. some languages only distinguish firsthand sources from non-firsthand sources, but other languages have more fine-grained distinctions. However, in general the

following three types of source are most widely discussed in the literature (the underlined part is only an approximation: it does not mean that evidentials are embedding predicates, or that they have truth conditional meanings):

(3) i) Direct perception: "I saw *p*, ……"
ii) Hearsay: "I heard from someone else that *p*…"
iii) Inferential: "I guess that *p*, …"

For the semantics of evidentials, Matthewson et al.(2007: especially section 3) discuss three different views suggested in the previous literature.

1) Evidentials as illocutionary operators: evidentials are treated as operators applied to *utterances*, changing the illocutionary forces and/or the sincerity conditions in a proposition. In this view evidentials do not affect the truth-conditional meaning. (see Faller 2002 for Cuzco Quechua, among others.)
2) Evidentials as epistemic modals with 'extra meaning components': evidentials are applied to *propositions*, adding evidential *presuppositions*. (Garrett 2001 for Tibetan, and McCready and Ogata 2007 for Japanese, a.o.)
3) Evidentials as spatiotemporal operators: some spatiotemporal operators are assumed to 'indirectly' provide evidential meanings because of their deictic natures. (Faller 2004 for Quechua, and Chung 2005 for Korean, a.o.)

In this paper we do not consider the third option, since the Korean non-final *–ta-* is obviously not a spatiotemporal operator. However, in the next section we will show that the Korean non-final *–ta-* is not an illocutionary operator, either, and that the evidential implication of *–ta-* is a presupposition.

3. Evidential Implication as Presupposition

The evidential implication of *–ta-* is not truth-conditional: a piece of evidence comes from the fact that the evidential implication cannot be questioned or negated (cf. Faller 2002, Matthewson et al. 2007). First see (4).

(4) John-un Mary-lul po-ass-ta-ni?
John-Top Mary-Acc see-Past-*ta*-Q
'Did John see Mary?'
Implication: the addressee has indirect evidence that John saw Mary.

If the evidential implication of the non-final *–ta-* would be truth-conditional (corresponding to the expression as *someone said*), (4) would mean 'do you have any indirect evidence about the fact that John saw Mary?', where the indirect evidential implication is questioned. However, (4) only means 'did John

see Mary?' with the indirect evidential implication. This shows that the evidential implication with the non-final *–ta-* is not truth-conditional.

(5) and (6) show that the evidential implication of *–ta-* cannot be negated in declaratives or in questions. If the evidential implication of (5) would be truth-conditional, (5) would mean that 'the speaker does not have indirect evidence that John beat his own dog', but (5) only means that John did not beat his own dog, with the indirect evidential implication. Similarly, (6) does not mean 'do you not have indirect evidence that John beat his own dog?', but only means 'did John beat his own dog?' with the indirect evidential implication. This means that the indirect evidential implication of *–ta-* is not truth-conditional.

(5) John-i caki kay-lul an ttayli-ess-ta-nta.
John-Nom self dog-Acc Neg beat-Past-*ta*-Decl
'John did not beat his own dog.'
Implication: The speaker has indirect evidence that J. did not beat his dog.

(6) John-i caki kay-lul an ttali-ess-ta-ni?
John-i self dog-Acc Neg beat-Past-*ta*-Q
'Did John not beat his own dog?'
Implication: The addressee is expected to answer based on indirect evidence.

If the evidential implication of *–ta-* is not truth-conditional, is it illocutionary, or presuppositional? (7) shows the sentence with the non-final *–ta-* becomes infelicitous when the proposition without the non-final *–ta-* is known to be true.[1]

(7) #Pi-ka o-n-ta-nta. Kuliko pi-ka o-nta.
Rain-Nom come-Pres-*ta*-Decl And rain-Nom come-Decl
'(Somebody says) it rains, and it rains.'

If the indirect evidential implication of *–ta-* is illocutionary, then (7) should be felicitous, because, by definition, the illocutionary operator does not affect the truth-condition, but affects the sincerity condition of a given proposition. However, (7) is infelicitous, which shows that the indirect evidential implication carried by the non-final *–ta-* is not illocutionary, but presuppositional.

To conclude the section, all previous examples show that the Korean non-final *–ta-* is not a truth-conditional operator or an illocutionary operator, but an operator which carries the indirect evidential presupposition.

4. Semantics of Indexicals and Questions

In this section I show several assumptions about pronouns and questions, which are required to propose our own analysis of the semantics of the non-final *–ta-* and the evidential perspective shift in questions.

4.1. Pronouns as indexicals

I adopt Kaplan(1977/1989)'s semantics of pronouns as indexicals, according to which the denotation of pronouns is context-sensitive. Specifically I adopt Kaplan(1977/1989)'s two-step semantics, according to which utterance context parameters are separated from evaluation parameters. In this paper, following von Fintel(2005), I assume that the utterance context *c* is the triple of the world of utterance w_c, the time of utterance t_c, and the speaker of the utterance s_c, and the evaluation parameter is the world of evaluation *w*:[2]

(8) a. Utterance context $c = \langle w_c, t_c, s_c \rangle$
b. Evaluation parameters: the world of evaluation *w*

According to Kaplan, the denotation of demonstratives/pronouns is determined by the context (8a), whereas the predicates are evaluated depending on the world of evaluation (8b). To understand how Kaplan's semantics works, see (9):

(9) He must be rich.

In (9) the denotation of *he* may vary depending on the speaker's context. For example, if in the speaker's context *he* denotes *The President of GM*, then (9) is true in the speaker's context if and only if (9') is true:

(9') The President of GM must be rich.

When the denotation of *he* is determined, the predicate *must be rich* is evaluated in the possible worlds (that is, the worlds of evaluation) accessible from the world of utterance. Since *must* denotes epistemic necessity, (9) (and therefore 9') is true iff for every world *w'* accessible from the world of utterance (which is the actual world, w_c), the President of GM is rich in *w'*.

4.2. Questions

We adopt Hamblin(1973) and Karttunen(1977)'s semantics of questions: the extension of a question is a set of possible answers (propositions), derived by the question morpheme Q and the wh-word. For example, the LF and the extension of the question (10a) are (10b) and (10c), respectively:

(10) a. Who did John meet?
b. LF: [Who_1 1 [Q [John met t_1]]]
c. $\{\lambda w.$ John met x in w: $x \in D_e\}$
$= \{\lambda w.$ J. met A in w, $\lambda w.$ J. met B in w, $\lambda w.$ J. met C in w, …$\}$

In yes/no questions, instead of wh-words, we assume a covert *whether*. For example, the question (11a) has the LF (11b) and the extension (11c).

(11) a. Did John meet Mary?
b. LF: [*whether*$_1$ 1 [Q [John met Mary]]]
c. {λw. John met Mary in w, λw. John did not meet Mary in w}[3]

To understand the evidential perspective shift, think about the pragmatics of the question-answer exchange in detail. The speaker asks a question in his/her context c_s, and the addressee picks up a proposition in the given set of possible answers (that is, the extension of the question) in his/her context c_a. This means that two contexts become salient in the question-answer exchange: the speaker's context c_s and the addressee's context c_a. For a question to be felicitous, we have to assume that the speaker should not have an idea about what he/she is asking, since, if a speaker already has any idea, including any type of evidence, about what he/she is asking, he/she does not need to ask a question at all.

5. Proposal

I propose the lexical entry for the Korean non-final –*ta*- is (13):

(13) $[[\text{-}ta\text{-}]]^{c,w}$(p) is defined iff the speaker in *c* has indirect evidence that p
If defined, $[[\text{-}ta\text{-}]]^{c,w}$(p) is true iff p is true in w (abbreviated as Ind-evi(c))[4]

-*ta*- is assumed to introduce the presupposition that the speaker has indirect evidence that the assertion is true. Note that -*ta*- is context-sensitive, and therefore is also treated as a specific kind of indexicals: the presupposition it introduces varies depending on context.

5.1. Declaratives

Now let us see how we can derive the indirect evidential implication in declaratives and in questions. The cases of declaratives are straightforward: (14) is an example of declaratives, and (15) is the LF of (14):

(14) John-un ne-lul cohaha-ess-ta-nta.
John-Top you-Acc like-Past-*ta*-Decl
'John liked you'
Implication: The speaker has indirect evidence that John liked the addressee.
(15) $[[\text{-}ta\text{-}]]^{c,w}$ ([[John likes you]])^{c,w}

For any context *c*, the denotation of (15) is derived as follows:

1) $[[\text{you}]]^{c}$ denotes the person the speaker *s* addresses to in c
2) Therefore, $[[\text{John likes you}]]^{c,w}$ is true iff John likes the person the speaker *s* in c addressees to in w
3) $[[\text{-}ta\text{-}]]^{c,w}$ combines with $[[\text{John likes you}]]^{c,w}$, and introduces a definedness condition: the speaker has indirect evidence that John likes the person the speaker s in **c** addresses to in w
4) If defined, then $[[\text{-}ta\text{-}]]^{c,w}([[\text{John likes you}]]^{c,w})$ is true iff John likes the person the speaker *s* in c addresses to in w

After the derivation of the LF, the speaker's context c_s is applied, and the context variable *c* is identified with the speaker's context c_s. Note that we do not need any context change: both evidentials and indexicals are calculated in the speaker's context. To shift the evidential context from the speaker's context to the addressee's context is an unnecessary meta-conversational move, therefore should be avoided.[5]

5.2. Questions

What happens in questions, and why is the evidential perspective shifted in questions? See the example of yes/no questions (16), and its LF (17).[6]

(16) John-un ne-lul cohaha-ess-ta-ni?
John-Top you-Acc like-Past-Decl-Q
'Did John like you?'
Implication: you (the addressee) have indirect evidence about whether John liked you or not.

(17) (vi)[Whether$_1$ (v)1[(iv)[*-ni* (iii)[*-ta-* (ii)[$t_{1<st,st>}$ (i)[John liked you]]]]]]

In (17) the evidential morpheme *–ta-* locates under the question morpheme *-ni* (cf. the Mirror Principle of Baker 1985). The covert *whether* is generated under *–ta-* and moves out, since we would like to assure that both alternatives are based on the addressee's indirect evidence. Then, for any context *c*, the denotation of (17) is derived in the following steps:

i) John liked you in w in c
ii) g(1)(John liked you in w in c) (t_1 is replaced by the assignment function)
iii) *-ta-* (g(1)(John liked you in w in c))
iv) {*-ta-* (g(1)(John liked you in w in c))}
v) $\lambda f_{<st,st>}$.{*-ta-* (g(1)(John liked you in w in c))}
vi) {λw:Ind-evi(c).John liked you in c in w,

λw:Ind-evi(c).John did not like you in c in w}

For any context c, the indexical [[you]]^{c,w} denotes the addressee to whom the speaker talks to in w. Then the denotation of the question (16) can be rewritten as (18), where we have a set of two possible answers:

(18) {λw:Ind-evi(c).John liked the addressee in c in w,
λw:Ind-evi(c).John did not like the addressee in c in w}

The addressee is to pick up one of propositions in (18) as an answer. In (18), if c for [[-*ta*-]]^{c,w} is speaker-dependent, it means the speaker already has indirect evidence about whether John liked Mary or not, which makes the question infelicitous (since the speaker already has indirect evidence, the speaker does not need to ask the question). Therefore, for the question to be felicitous, c for [[-*ta*-]]^{c,w} in questions should be addressee-dependent, which means that *the speaker's context c_s should be shifted to the addressee's context c_a*.

After the context is shifted from c_s to c_a, finally we have (19) as the extension of the question (16). Each of the alternatives is defined iff the addressee in c_s (= the speaker in c_a) has indirect evidence that John likes the person the speaker *s* in c_s addressees to in w:

(19) {λw:Ind-evi($\underline{c_a}$).John liked the addressee in c_s in w,
λw:Ind-evi($\underline{c_a}$).John did not like the addressee in c_s in w}

6. The Non-Final –*ta*- and the Reason Question

The reason question involving *way* 'why' is different from other types of questions in two respects. First, unlike other questions, the reason question entails that that the proposition in question is true. For example, when asking (20), John beat Mary is regarded as true.

(20) Way John-i Mary-lul ttali-ess-ni?
Why John-Nom Mary-Acc beat-Past-Q
'Why did John beat Mary?'

Second, when the reason question is used with the non-final –*ta*-, it becomes ambiguous with respect to the indirect evidential implication. See (21):

(21) Way John-i Mary-lul ttali-ess-ta-ni?
Why John-Nom Mary-Acc beat-Past-*ta*-Q
'Why did John beat Mary?' (with the indirect evidential implication)

In (21), the non-final *–ta-* may be related to the speaker or to the addressee: when it is related to the speaker, the implication in (21) is that the speaker has indirect evidence that John beat Mary, but when it is related to the addressee, the implication in (21) is that the addressee's answer to why John beat Mary is based on indirect evidence.[7]

How can we account for the ambiguity of the reason question with *–ta-*? One possible account for this ambiguity is to appeal to the semantics of the reason question. For example, in (21), since the question already entails that John beat Mary, with the non-final *–ta-* the speaker may indicate that he/she knows that John beat Mary based on his/her indirect evidence. In this case the speaker can still further ask why John beat Mary, because, even though he/she already knows that John beat Mary based on indirect evidence, he/she may not know why. In this case the evidential perspective shift may be regarded as unnecessary, and therefore be avoided.

What if the speaker already has direct evidence that John beat Mary? In this case the non-final *–ta-* cannot be used to indicate that the speaker has indirect evidence that John beat Mary. However, the speaker can still use the non-final *–ta-* to indicate that the addressee's answer is expected to be based on indirect evidence, just like *wh*-argument questions and other *wh*-adjunct questions.

To summarize, the reason question with *–ta-* is ambiguous with respect to the indirect evidential implication because it entails the proposition in question. Other types of questions do not show this ambiguity with *–ta-* because they do not entail the proposition in question.

7. Conclusion and Further Implications

In this paper we treat the Korean non-final *–ta-* as an indirect evidential. We also propose that the Korean non-final *–ta-* is not a truth-conditional operator or an illocutionary operator, but an operator introducing the indirect evidential presupposition. Finally we explain the evidential perspective shift in terms of the pragmatics of the question-answer exchange.

Our pragmatic account for the evidential perspective shift can be extended to the evidentials in other languages and to different evidentials. (22) is an example of the Tibetan direct evidential *song* (Garrett 2001: 228), and (23) is an example of the Japanese inferential evidential *soo* (Emi Mukai, p.c.). Both examples show the evidential perspective shift which our proposal can also explain.

(22) a. bkra.shisza.khang-la phyin-song
Tashi restaurant-Loc go-DIR.PAST
'Tashi went to the restaurant'
Implication: the speaker has direct evidence for the fact Tashi went to the restaurant.

b. bkra.shisza.khang-la phyin-song-ngas
Tashi restaurant-Loc go-DIR.PAST-Q
'Did Tashi go to the restaurant?'
Implication: the addressee is expected to have direct evidence about whether Tashi went to the restaurant or not.

(23) a. gogo-kara ame-ga furi-soo-da.
Afternoon-from rain-Nom come-*soo*-Cop.Decl
'It will rain afternoon'
Implication: Based on the speaker's guess/inference, it will rain.

b. gogo-kara ame-ga furi-soo-na-no?
Afternoon-from rain-Nom come-*soo*-Cop.Q
'Will it rain afternoon?'
Implication: The addressee is expected to answer based on guess/inference.

Our account can also be applied to other epistemic modals, which also show the perspective shift similar to what we saw above in cases of evidentials. See (24), where in (24a) the interpretation of the epistemic modal *might* is dependent on possible worlds compatible with the speaker's context, whereas in (24b) it is dependent on possible worlds compatible with the addressee's context. Here we can find the perspective shift of epistemic modals, which may also be accounted for in terms of the pragmatics of the question-answer exchange.

(24) a. John might like your brother.
b. Might John like your brother?

There are remaining questions in our proposal. We have to understand how the syntactic structure of the reason question (cf. Ko 2005) interacts with the indirect evidential. We also need to show how the speaker's direct or indirect evidence (rather than the addressee's) interacts with questions different from reason questions. I leave these questions for the topic of future researches.

Notes

* I would like to thank audiences in SemPra (Semantics/Pragmatics in USC), in the 18th Japanese/Korean Linguistics Conference (City University in New York, Nov. 6-8, 2008), and in the 2008 Western Conference on Linguistics (UCDavis, Nov. 14-16, 2008) for their comments and suggestions. I am also grateful to Emi Mukai for Japanese data, and Semoon Hoe for a discussion on the near-final version of this paper. Special thanks go to Elena Guerzoni for the extensive discussions and detailed comments on the materials in this paper. All remaining errors are mine.

1. This test is originally suggested in Faller(2002) and Matthewson et al.(2007) to see whether a given evidential morpheme is an epistemic modal (with the evidential presupposition) or an illocutionary operator. The result of (7) actually provides a piece of evidence that *–ta-* is not an illocutionary operator, but an epistemic modal (as first proposed in Izvorski 1997, and further

developed in Matthewson et al. 2007). However, unlike the epistemic modal in English, the non-final *–ta-* seems not to encode the speaker's certainty:

(i) Pi-ka o-n-ta-nta Kuliko na-nun kukes-ul hwaksilhi mit-e. / an mit-e.
rain-Nom come-Pres-*ta*-Decl And I-Top it-Acc certainly believe-Decl / Neg believe-Decl
'It rains, and I certainly believe it/I certainly do not believe it.'

To solve this problem, Lim(in preparation) adopts Matthewson et al.(2007)'s analysis on evidentials in St'át'imcets, and proposes that the non-final *–ta-* is an epistemic modal which does not encode the speaker's certainty. Since our main concern is the evidential perspective shift, for convenience, in this paper I simply treat the non-final *–ta-* as a partial identity function, which introduces the indirect evidential presupposition and does not introduce any type of epistemic modality. However, in the following notes I will also provide a lexical entry for the non-final *–ta-* as epistemic modals.

2. We only indicate three parameters which are minimally required: we may need the parameter of the place of utterance, or other parameters which are required to interpret other types of indexicals. For our purpose, however, these three parameters are enough. We also simplify the evaluation parameter by ignoring tense parameters.

3. The lexical entries for the question morpheme *-ni*, *who*, and the covert *whether* are assumed as follows (cf. Guerzoni 2003):

$[[\text{-}ni]] = \lambda p_{st}.\{p\}$ $[[who]] = \lambda P_{et}.\exists x_e\,[\text{person}(x) \,\&\, P(x)=1]$

$[[whether]] = \lambda f_{<st,<st,t>>}\exists h_{<st,st>}[(h=\lambda p.p \vee h=\lambda p.\sim p) \,\&\, f(h)=1]$

That is, the question morpheme generates a set of a proposition from a given proposition, and the wh-word generates a set of alternatives.

4. If we assume that the non-final *–ta-* is an epistemic modal without encoding the speaker's certainty (cf. footnote 1), the lexical entry for *–ta-* would be like (13') (cf. Lim in preparation). Here the choice function f is adopted to account for the quantificational variability of the non-final *–ta-*. When it is an identity function the non-final *–ta-* expresses the speaker's strongest certainty (due to the universal quantifier over the possible worlds in the modal base B), but when the set of world selected by the choice function f is a proper subset of the modal base B, then the entire proposition with the given modal expresses the less strong certainty on the embedded proposition.

(13') $[[\text{-}ta\text{-}]]^{c,w}$ is applied to p iff the context *c* provides a modal base B such that for all worlds w', $w' \in B(w)$ iff the indirect evidence of the speaker in w in c holds in w'.
If defined, $[[\text{-}ta\text{-}]]^{c,w} = \lambda f_{<st,st>}.\,\lambda p_{st}.\forall w'[w' \in f(B(w)) \rightarrow p(w')]$
(where f is a choice function which takes the set of worlds provided by the modal base B and returns a specific set of possible worlds)

5. See the Principle of Economy in Romero and Han(2004: 629): "Do not use a meta-conversational move unless necessary (to resolve epistemic conflict or to ensure Quality)."

6. In this paper I only deal with the case of yes-no questions, since, as far as the evidential perspective shift is concerned, we can apply the same reasoning to wh-argument questions.

7. Note that, when the non-final *–ta-* is related to the addressee in (21), the speaker may have direct evidence that John beat Mary. This is possible because, even though the speaker the speaker actually saw that John beat Mary, the speaker may still not know the reason why John beat Mary.

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Movement Out of "Islands": The Case of Finite Embedded Clauses

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1. Introduction

Dayal (1996) contends that finite embedded clauses in Hindi/Urdu/Urdu are rendered islands for movement, as they obligatorily right adjoin to the main clause as adjuncts. We present novel evidence suggesting that she is wrong since both A and A-bar elements can move out of these clauses. However, since Hindi/Urdu/Urdu is by default SOV, it raises an interesting puzzle. If the SVO order restricted for finite embedded clauses (1) is derived via some kind of clausal movement to a post-verbal position, how do we explain their porous nature?

(1) Main maantaa-hu ki [Raam-ne ek kitaab paRhii]
I believe that [Ram-Erg a book read]
"I believe that Ram read a book."

With Takahashi (1994), if we assume that movement freezes the internal structure of the moved element, then any displacement out of moved finite complements is an enigma for the theory. This is the primary problem addressed in this paper. We provide an analysis here that not only derives the correct word order for finite complements but also explains the possibility of extraction from them. Some theoretical outcomes of our analysis are: a) finite clausal complements cannot enter into probe-goal relations because they don't have Case to get valued, b) movement is never altruistic; it must satisfy some featural requirement of the mover/goal and c) adjunction to the phase-edge takes place only after all featural requirements of the phase head has been satisfied.

The discussion in section 2 provides an overview of some basic word-order facts about Hindi/Urdu and the consequences on extractions out of finite clauses. This section also summarizes Dayal's (1996) analysis and points out some of its problems. In section 3, we sketch out an alternative account to capture both SOV and SVO word-order patterns while proposing a reanalysis of possible extraction domains in Hindi/Urdu. In section 4, we conclude with some remarks on feature checking and non-altruistic movement in natural language.

2. Some Facts about Hindi/Urdu

Some languages like Hindi/Urdu (also Tamil and German) show a dichotomy in their word-order: SOV order with nominal complements (2) and infinitival complements (3), and SVO with finite clausal complements (4).

(2) Ram-ne Sita-ko dekha
Ram-Erg Sita-Acc saw
"Ram saw Sita"
(3) Ram-ne [$_{IP}$Sita-ko dekh-na] chaha
Ram-Erg [$_{IP}$Sita-Acc see-Inf] wanted
"Ram wanted to see Sita."
(4) Suresh-ne (yeh) socha [$_{CP}$ ki Ram-ne Sita-ko dekha]
Suresh-Erg (this) thought [$_{CP}$ that Ram-Erg Sita-Acc saw]
"Suresh thought that Ram saw Sita."

This dichotomy in the word-order is often related to the issue of derived and base-generated word-orders and possible extractions out of them. In Hindi/Urdu, this issue becomes more interesting because a parallel dichotomy is observed in question formation. Hindi/Urdu appears to be Wh in-situ in its question formation, due to the lack of overt fronting of Wh-phrases in examples like (5), below. Similar is the case with non-finite complement clauses, where the Wh-phrase appears inside the embedded clause but takes matrix scope and gives direct question interpretation, as in (6).

(5) Ram-ne kis-ko dekha
Ram who-Acc saw
"Who did Ram see?"
(6) Ram-ne [$_{IP}$ kis-ko dekh-na] Chaha
Ram-Erg [$_{IP}$Who-Acc see-Inf] wanted
"Who did Ram want to see?"

Hindi/Urdu however behaves differently from other Wh in-situ languages like Chinese in allowing direct question interpretation of Wh-phrases inside finite

complements. Compare Chinese example (7 a) with Hindi/Urdu (7 b), and notice that the Chinese example is ambiguous between a direct and an indirect question interpretation, whereas Hindi/Urdu allows only indirect question interpretation.

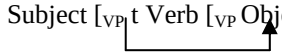
(7) a. ni zhidao [$_{CP}$ ta zuo-le sheme]
you know [$_{CP}$ he did what]
"What do you know he did?" AND "You know what he did."
b. tum jaante-ho [$_{CP}$ ki us-ne kyaa kiyaa]
you know [$_{CP}$ Comp he-Erg what did]
" You know what he did" NOT "What do you know he did?"

To form direct question out of finite clauses, Hindi/Urdu employs two kinds of strategies, i) scrambling the embedded Wh-phase to the left edge of the main clause (8 a), or b) Wh scope-marking strategy, where a Wh-element (often referred as Wh scope-marker) in the matrix clause marks the scope of the in-situ Wh-phrase in the embedded clause (8 b).

(8) a. kis-ko$_1$ Suresh-ne socha [$_{CP}$ ki Ram-ne t$_1$ dekha]
Wh-Acc, Suresh thought Comp Ram-Erg saw
"Who did Suresh think that Ram saw?"
b. Suresh-ne kya socha [$_{CP}$ ki Ram-ne kis-ko dekha]
Suresh-Erg what thought [$_{CP}$ Comp Ram-Erg Who-Acc saw]
"Who did Suresh think that Ram saw?"

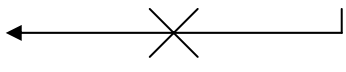
To account for word-order dichotomy of Hindi/Urdu, Dayal (1996) suggests that the basic word-order of Hindi/Urdu is SOV, and the SVO order with finite clausal complements is derived by right extra-posing the finite embedded clause.

(9) a Subject Object$_{nominal}$ Verb
b. Subject [$_{VP}$ t Verb [$_{VP}$ Object$_{Finite\ clause}$]]



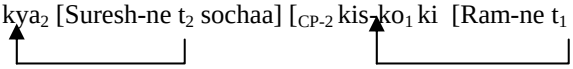
Dayal (1996) also claims that the absence of a direct question interpretation for embedded Wh-phrases is due to the island-status of finite complements**.** More concretely**,** it is the positioning of the finite clause that makes it an island. Finite clauses are right adjoined to the matrix clause, and by virtue of being in an adjoined position, finite clauses in Hindi/Urdu behave as adjuncts and thus act as islands for extraction, see (10). The absence of direct question interpretation in finite embedded clauses is thus a CED effect.

(10). [$_{IP}$…..[$_{VP}$…….t$_1$…..] [CP$_1$ ……]]



Indeed, Dayal's criticism of Direct Dependency Approach[1] (McDaniel, 1989) was also based on the island-hood of finite clauses. Since finite clauses are islands for extraction, it is not possible to form a relation between the Wh scope-marker and the embedded Wh-phrase via movement. Dayal's Indirect Dependency Account of Wh scope-marking implies no movement relation between the Wh scope-marker and the embedded Wh–phrase; both elements are base generated in different clauses and get into a long distance binding relation. In her account, sentence (11 a) would thus have the LF representation (11 b).

(11) a. Suresh-ne kya$_2$ socha [$_{CP}$ ki Ram-ne kis-ko dekha] $_2$
Suresh-Erg what thought [$_{CP}$ Comp Ram-Erg Sita-Acc saw]
"Who did Suresh think that Ram saw?"
b [$_{CP}$ [$_{CP}$ kya$_2$ [Suresh-ne t_2 sochaa] [$_{CP-2}$ kis-ko$_1$ ki [Ram-ne t_1 dekha] $_2$]



2.1 PROBLEMS for Dayal's account

What we aim to show in this section is that contra Dayal's predictions, finite clauses allow both A and A-bar extractions out of them. Consider the following cases of (hyper)-raising (12 a) and long-distance scrambling (12 b) out of finite embedded clauses in Hindi/Urdu.

(12) a. raam$_1$ lagtaa-hai [$_{CP}$ ki [t_1 party-me aaye-gaa]
Ram seems that party-in come-will
"Ram seems that he will come to the party."
b. raam$_1$-se, mohan-ne socha [$_{CP}$ ki [sita t_1 pyaar karti-hai]
Ram-from Mohan-Erg thought that Sita love does
"Mohan thought that Sita loves Ram."

Extraction is not restricted to A-movement alone; Hindi/Urdu also allows Wh-phrases to scramble out of finite embedded clauses. Observe the following example (13) from Mahajan (1987).

(13) kis-ko$_1$ tum jaante-ho [$_{CP}$ ki us-ne t_1 dekhaa]
what, you know Comp he-Erg did
"What do you know he did?" NOT " You know what he did"

Dayal acknowledges the acceptability of cases like (33 a) and suggests that finite clauses are islands for LF-movement. This view however is problematic under a derivational view of grammar where both overt and covert operations satisfy uniformity (Chomsky 1995). In such a framework, both overt and covert movement must be regulated by the same constraints.

The other problem for Dayal is that even those cases which are claimed to involve LF Wh-movement, seems to allow movement out of finite clauses. Consider the following question (14) from Hindi/Urdu, which is ambiguous in that it allows both single (15 a) and pair-list answers (15 b).

(14) **kaun** jaanta-hai [$_{CP}$ ki kis-ne **kya** khayaa]
Who knows Comp Who-Erg what ate
"Who knows who ate what?"
(15) a. John knows who ate what, Bill know who ate what, etc.
b. John knows who ate an apple, Bill knows who ate a cake, etc.

A pair-list answer for (14) is only possible by giving wide scope to the embedded Wh, and wide scope for the embedded Wh-phrase can only be derived by extracting it out of the finite complement clause covertly.

Given these facts, it is clear that finite clauses are not islands for movement of the embedded Wh-phrase. Dayal's criticism of Direct Dependency approach thereby looses its ground. The next question before us is, if finite clauses are not islands for extraction, then how does one explain the absence of direct question reading in examples like (16)? Cases like (16) in Hindi/Urdu have the same interpretation as its corresponding English sentence (17), where the verb "know" takes an interrogative CP, similar to verbs like "wonder".

(16) tum jaante-ho [$_{CP}$ ki us-ne kyaa kiyaa]
you know Comp he-Erg what did
"You know what he did" NOT "What do you know he did?"
(17) You know what he did.

We suggest that in cases like (16), the verb "know" in Hindi/Urdu behaves like the interrogative verb "know" in English, which takes an interrogative complement and doesn't involve Wh-movement out of the complement clause. Consider verbs like" believe" in Hindi/Urdu which result in unacceptability (18) when placed in the same structure as (16).

(18) *tum maante-ho [$_{CP}$ ki us-ne kyaa kiyaa]
you believes Comp he-Erg what did
"What do you know he did?"

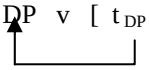
We propose that the ungrammaticality of (18) ensues from the surface position of the wh-phrase which, in this case, is also its base-generated position. Hindi/Urdu wh-phrases obligatorily move in narrow syntax, though the surface effects are not immediately apparent. This is partly due to the default SOV order of the languages, and partly due to the vP-edge landing sites of wh-phrases. In (18), since the Wh-phrase doesn't move, it leads in ungrammaticality.

3. An Alternative Account

For our proposal, we borrow two assumptions from Dayal (1996), namely (a) the basic word-order of Hindi/Urdu is SOV, and (b) the finite clause base generates as sister to lexical V, and later gets right adjoined to the vP in Hindi/Urdu.

We propose that the v head in Hindi/Urdu carries a strong EPP feature, which must be checked. For simple clauses, DP complements move to spec, vP to check the EPP on v. However, DP-movement is greedy as well, since nominals have an unvalued Case feature that v must give a value to, see (19).

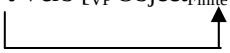
(19) a. Ram-ne Sita-ko dekha
Ram-Erg Sita-Acc saw
"Ram saw Sita"
b. $[_{IP}\ .[_{vP}\ DP\ \ v\ \ [\ t_{DP}\ V]$



Finite clauses on the other hand don't have any Case requirement (c.f. Stowell, 1981)[2]. As a result, finite clauses don't enter into a probe-goal relation with the v head and thus right adjoined to the vP, as we show in (20 b) below

(20) a. Suresh-ne $[_{VP}$ socha $[_{CP}$ ki Ram-ne Sita-ko dekha]]
Suresh-Erg thought that Ram-Erg Sita-Acc saw
"Suresh (this) thought that Ram saw Sita."

b. Subject $[_{VP}$ t Verb $[_{VP}$ Object$_{\text{Finite clause}}$]]



The EPP feature of the v head in cases that involve finite complements is checked by a pronominal clitic "yeh". Consider example (21) below.

(21). Suresh-ne yeh socha $[_{CP}$ ki Ram-ne Sita-ko dekha]
Suresh-Erg this thought that Ram-Erg Sita-Acc saw
"Suresh (this) thought that Ram saw Sita."

We take this to suggest that movement is never altruistic; it must also satisfy some checking requirement of the goal. In other words, movement which primarily involves X-0 adjunction or XP substitution are occurrences of probe-goal relations which demand some feature satisfaction for both the probe and the goal. Finite clauses on the other hand undergo right adjunction in Hindi/Urdu. XP-adjunction unlike other kinds of movement (like substitution) does not involve any feature checking and thus seems to lie outside the probe-

goal relation. This property of adjunction differentiates it from movement triggered by probe-goal requirements.

3. 1 WHEN movement becomes possible out of adjoined structures

By our anlaysis, post-verbal finite clauses in Hindi-Urdu are adjuncts. If so, how do we explain their porous nature? To account for this aberrant behavior, we must force all and any movement out of finite clauses to take place before the complement clause attaches itself to the right of the tree. As a complement, it is transparent to items in the main tree, which in turn facilitates probe-goal relations between items that it contains and outside heads. However, once it adjoins to the right of the tree, items internal to it are rendered invisible inside the frozen chunk of structure.

We propose that though all instances of movement out of finite clauses – while they are still complements - like scrambling, hyper-raising, Wh-movement, are driven by some featural requirement of a higher functional head, they also satisfy some featural requirement at the v phase head. In case of raising, as for instance in (22 a), the DP moves to satisfy the EPP feature of matrix T, but on its way to T, it also lands at the v edge, satisfying some featural requirements. Consider the following case (22 b) where if the spec. vP position is filled, scrambling out of finite clause is not allowed.

(22) a. raam$_1$ [$_{vP}$ lagtaa-hai [$_{CP}$ ki [t$_1$ party-me aaye-gaa]
Ram seems that party-in come-will
"Ram seems that he will come to the party."
b. *raam [$_{vP}$ **yeh** lagtaa-hai [[$_{CP}$ ki [t$_1$ party-me aaye-gaa]
Ram this seems that party-in come-will

Similar is the case with scrambling (23 a), where long distance scrambling of the DP is blocked by an element in the matrix Spec, vP position (23 b).

(23) a. raam$_1$-se, mohan-ne [$_{vP}$ socha [$_{CP}$ ki [sita t$_1$ pyaar karti-hai]
Ram-from Mohan-Erg thought that Sita love does
"Mohan thought that Sita loves Ram."

b *raam$_1$-se, mohan-ne [$_{vP}$ yeh socha [$_{CP}$ ki [sita t$_1$ pyaar karti-hai]
Ram-from Mohan-Erg this thought that Sita love does

This shows that movement out of a finite clause always proceeds through Spec, vP, implying that all such instances satisfy some feature on the verbal head.

A final important upshot of this work is that adjunction to a phase necessarily applies after all featural requirements of the phase edge have been satisfied. If the grammar had the option to right-adjoin to vP before its featural requirements

were satisfied, we would wrongly predict islandhood status for finite complement clauses.

3.2 WH-MOVEMENT out of finite clauses

As we noticed in section 2, Hindi/Urdu employs two strategies to form Wh-questions. One way to form direct questions out of finite clauses in Hindi/Urdu is to scramble the embedded Wh-phase to the left periphery of the matrix clause, see example (13), repeated below as (24).

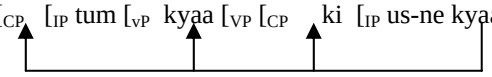
(24) kyaa$_1$ tum jaante-ho [$_{CP}$ ki us-ne t_1 kiyaa]
what, you know Comp he-Erg did
"What do you know he did?"

Another technique that Hindi/Urdu employs is Wh scope-marking where a Wh-element in the matrix clause marks the scope of the Wh-phrase in the embedded clause, see (25).

(25) tum kyaa jaante-ho [$_{CP}$ ki us-ne kyaa kiyaa]
you what know Comp he-Erg what did
"What do you know he did?"

Notice that the Wh scope-marker in Hindi/Urdu appears next to the v head. We suggest that this happens because the scope-marker checks the EPP feature of the v head on its way to C. Pronunciation of Wh-phrase depends on the EPP feature of the head whose projection it targets. The C head in Hindi/Urdu doesn't have an EPP feature whereas the v-head does and as a consequence, the Wh-element gets there. Consider structure (26) for a sentence like (25).

(26) [$_{CP}$ [$_{IP}$ tum [$_{vP}$ kyaa [$_{VP}$ [$_{CP}$ ki [$_{IP}$ us-ne kyaa kiyaa] jaante-ho]]]]]



Evidence in favor of this movement analysis of Wh scope-marking comes from, (i) multiple occurrence of the Wh scope in all intermediate clauses (27), and (ii) island sensitivity of Wh scope-marking structures (28).

(27) a. raam **kyaa** sochtaa-hai [$_{CP}$ ki John **kyaa** maantaa-hai [$_{CP}$ ki Bill
Ram what thinks Comp John what believes Comp Bill
kis-se pyaar karta-hai]]
wh-with love does be
"Who does Ram think that John believes that Bill loves?"
b. *raam **kyaa** sochtaa-hai [$_{CP}$ ki John maantaa-hai [$_{CP}$ ki Bill
Ram what thinks Comp John believes Comp Bill

kis-se pyaar karta-hai]]
wh-with love does

c. *raam sochtaa hai [$_{CP}$ ki John **kyaa** maantaa hai [$_{CP}$ ki Bill
Ram thinks Comp John what believes Comp Bill
kis-se pyaar karta-hai
wh-with love does

We suggest that these intermediate copies result from the successive cyclic movement of the Wh-operator. If *kyaa* is just there to mark the scope of the Wh-phrase (as claimed in the base generation account by Dayal, 1996), then it should only appear in the highest clause and not in each intermediate clause.

(28) *[raam-ne **kya** kaha [$_{CP}$ki ravii-ko [$_{DP}$ye baat [$_{CP}$ ki mira **kya**
Ram-erg what said Comp Ravi-dat this fact Comp Mira what
khaegi] pata-hai]]
eat-will knows
"What did Ram say that Ravi knows the fact that Mira will eat?"

An account in terms of overt movement can also provide the most natural explanation for why the following structures are bad. Assuming that island effects are PF violations, it must be only overt movement that is subjected to a PF constraint that results in islands. [3] We extend this movement account of Wh scope-marking constructions to multiple questions like (14), repeated here as (29), and suggest that Wh-movement is always "overt".

(29) **kaun** jaanta-hai [$_{CP}$ ki kis-ne **kya** khayaa]
Who knows Comp Who-Erg what ate
"Who knows who ate what?"

In line with single cycle theory (Pesestky, 2000), we propose that the movement of the second wh-phrase "kya" out of the finite clause also happens before the finite clause gets right adjoined.

4. Conclusion

In this paper, we tried to provide an alternative analysis for word-order dichotomy seen in languages like Hindi/Urdu, and attempted to relate it to the presence and absence of overt Wh–fronting as well as to the form of Wh scope-marking in this language. The analysis proposed for Hindi/Urdu data in this paper can be extended to German and Tamil (a Dravidian language spoken in South-India) which show very similar properties. Both Tamil and German like

Hindi/Urdu exhibit SOV order with nominal complements (30) and SVO order with finite clausal complement (31).

(30) a. Rama Seetha-ai paarthan [Tamil]
Ram Sita-Acc saw
"Ram saw Sita."
b. John hat Marie gesehan [German]
John has Mary seen
"John has seen Mary."
(31) a. Suresh ninaithan [$_{CP}$ Ram Seetha-ai paarthan endru] [Tamil]
Suresh thought Ram Sita-Acc saw that
"Suresh thought that Ram saw Sita."
b. Bill hat gedacht [$_{CP}$ daß John Marie gesehen hat] [German]
Bill has thought that John Mary seen has
"Bill thought that John has seen Mary."

Similar to Hindi/Urdu, both German and Tamil, allow extraction out of finite clauses. Consider the following cases showing long-distance scrambling out of finite clauses.

(32) a. Seetha-ai, Suresh ninaithan [$_{CP}$ Ram t paarthan endru] [Tamil]
Sita-Acc Suresh thought Ram saw that
"Suresh thought that Ram saw Sita."
(b) [Diese Buch] hat der Hans gesagt, [$_{CP}$ dass die Maria t besitzt] [German]
this book has the Hans said that the Maria owns
"This book, Hans said that Maria owns."

German allows overt Wh-movement out of finite clauses, as in examples (33 a). Tamil being a Wh "in-situ" language doesn't exhibit that option, but it allows long distance scrambling of the Wh-phrase out of the finite clauses (33 b).

(33) a. Wen hat Bill gedacht [$_{IP}$ daß John gesehen hat
Who has Bill thought Comp John seen has
"Who did Bill think that John has seen?"
b. yaar-ai, Suresh ninaithan [$_{CP}$ Ram t paarthan endru]
who-Acc Suresh thought Ram saw that
"Who did Suresh think that Ram saw?"

Tamil, like Hindi/Urdu, also allows movement of the second Wh-phrase out of finite clauses, as we can see in the case of multiple questions, where examples like (34 a) in Tamil allow a pair-list reading like (34 b).
(34) a. yaar theriyum [$_{CP}$ yaar yaar-ai paarthan endru]
Who knows who who-Acc saw that

"Who knows who saw whom?"
b. John knows who saw Mary, Peter knows who saw Susan etc..

Now let's consider Wh scope-marking constructions in German and Tamil.

(35) a. Was has Bill gedacht [$_{CP}$ wen John gesehen hat] [German]
what has Bill thought whom John seen has
"Who did Bill think that John has seen?"
b. Bill enna ninaithan [$_{CP}$ John yaar-ai paarthan endru] [Tamil]
Bill what thought John who-Acc saw that
"Who did Bill think that John saw?"

Wh scope-marking constructions in both German and Tamil show properties similar to Hindi/Urdu Wh scope-marking constructions, namely (a) the obligatory presence of copies of the Wh scope-marker in every intermediate clause, see (36a) for German[4] and (36b) for Tamil, and (b) island sensitivity, consider the following examples; (37a) for German and (36b) for Tamil.

(36) a. **was** glaubt Marie **was** Bill denkt wen John gesehen hat
What believes Mary what Bill thought who John seen has
"Who does Mary believe that Bill thinks that John saw?"
b. Mary enna nambinal Bill enna ninaithan [$_{CP}$ John yaar-ai paarthan endru]
Mary what believed Bill what thought John who-Acc saw that
"Who did Mary believe that Bill think that John saw?"
(37) a.*was hat John gesagt was Bill [die behaptung dass Marie isst] glaubt
what has John say what Bill the fact that Mary eat knows
"What did John say that Bill knows the fact that Mary will eat?"
b*John enna solgiran[Bill-uku[Mary enna sapiduval enbathu]theriyum endru
John what says Bill-Dat Mary what eat-will that fact knows that
"What did John say that Bill knows the fact that Mary will eat?"

The difference between German on one hand and Hindi/Urdu and Tamil on the other hand is that it is the C head in German which carries the EPP feature and thus seem to allow both Wh fronting and Wh scope-marking, with the scope-marker appearing in the C-domain. Hindi/Urdu and Tamil on the other don't have an EPP feature on their C head and thus don't allow any phrase to appear there. The EPP feature of the v head in Hindi/Urdu and Tamil results in their Wh "in-situ" appearance as well as their Wh scope-marking form, with the scope marker appearing at the v domain.

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Notes

[1] McDaniel (1989): Wh scope-marking constructions involved an expletive-associate relationship between the wh scope-marker and the embedded wh-phrase, where at a later stage the embedded Wh-phrase moves to replace the Wh scope-marker.
[2] Case Resistance Principle: Case may not be assigned to a category bearing a case-assigning feature. Stowell (1981) argued that CPs cannot be assigned case since they bear a case-assigning feature, that is, [+tense].
[3] Fox and Lasnik (2003) provide evidence suggesting that island violations are PF constraints.
[4] Marácz (1990) noted that iterative Wh scope-marker insertion is possible in both German and Hungarian.

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The Revival of Scottish Gaelic

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1 Introduction

The Gaelic-language community in Scotland has felt itself beleaguered for centuries, a casualty of language shift as more and more speakers abandoned it in favor of the more prestigious and more powerful English-language culture. Neither has this shift been purely a matter of cultural preferences. On many occasions, law enforced the abandonment of Gaelic, as in 1595 when James VI of Scotland (and I of England), initiated an official Scottish (and later, British) policy providing "for the erecting of English schools for rooting out the Irish [Gaelic] language" (cited in MacLean, 1995, p. 201). Since the anti-Gaelic language act of 1595, the Gaelic language has suffered continual decline, marginalized as a language, its speakers shunted to the sidelines of the English-speaking imperium except as they shifted to English themselves, enduring, as one recent writer put it,

> ceithir cheud bliadhna de leth-bhreith leis an stàit an aghaidh ar cànain, ar cultair 's ar dearbh-aithneachaidh. (MacIlleathain, 2008, p. 1) [… four hundred years of discrimination by the state against our language, our culture and our identity. (my translation)]

This discrimination, combined with the economic and political marginalization of Gaelic society, has resulted in a decline in the proportion of Gaelic speakers from nearly 25% of the Scottish population in the early modern period to about 1% currently (McLeod, 2006, p. 3).

However, the past quarter century has seen increasing activity aimed towards the revival of Gaelic and the building of a new Gaelic community. There is a Gaelic proverb that goes: *Nuair a bhriseas aon bhò an gàrradh, thèid a dhà-dheug a-mach air*. (When one cow breaks the garden wall, 12 of them go out of it.) In this sense, three instances of "wall breaking" have lead to the coincidence of Three such "wall breakings" stand out – two that date back more than a quarter century ago and the third in the past decade. The first of these would be the founding in 1973 of Sabhal Mòr Ostaig, the first Gaelic college in the

modern sense, on the Isle of Skye. The low status of Gaelic at that time and the self-regard of its speakers cannot be understated:

> To many observers, [Gaelic and Gaelic-speaking people] evoked poverty and hardship, people eking a living from subsistence farming and fishing. The antithesis of cosmopolitan 1970s success. (College is a symbol of economic revival on Skye, 2005)

The effect of the college was both symbolic and tangible – symbolic in the sense that it asserted that Gaelic was viable as an institutional, modern language, and the second in that it provided a venue for the framing of modern life in Gaelic terms, and it might be argued, a model for Gaelic medium education at all levels. In establishing Gaelic as a medium in higher education, Sabhal Mòr in a sense justified the teaching through Gaelic at the primary and secondary levels.

As a function of government at the primary and secondary levels, and to a lesser extent in the realms of higher education, participation in Gaelic medium education have increased greatly since the 1970s and 1980s: from 32 playgroups to more than 2,600 today; from 2 Gaelic medium primary schools to more than 50 today; from no secondary schools to more than 35 today (Foglam Gàidhlig, n.d.). As in the United States, there is no single curriculum across all school districts. Some districts offer full-fledged immersion education for native Gaelic speakers and non-native learners, while others offer more restricted subject matter education along the lines of "foreign language" instruction. Participation in Gaelic medium education is on a voluntary basis and because of location and accessibility is not available to all.

Currently, about 6,900 students participate in Gaelic medium education in Scotland in pre-school through secondary school. While these numbers are small in American terms, perhaps we can understand them in greater perspective on a per capital basis, which would amount to 12% of the Gaelic population being engaged in Gaelic medium education, or .14% of the Scottish population, which would be the equivalent to more than 400,000 American children participating in a heritage language education program – perhaps, of a Native American language (Foglam Gàidhlig: Gaelic education, n.d.; U.S. Census Bureau, 2008; Gaelic Medium Education in the Gaelic Medium Units, n.d.; Scottish Parliamentary Corporate Body, 2008). While these numbers provide Gaelic activists no more than hopes of language revival, they do give solid indication of the entrenchment of the Gaelic language within modern Scottish society.

One of the more dynamic council groups – the Council for the Western Isles – Comhlairle nan Eilean Siar (the population of which is estimated to be 60%-70% Gaelic) – has drafted what might be called a "typical" plan for Gaelic medium education, which calls for full immersion in Gaelic for students in the early primary grades. As students progress from lower to higher grades, they are

exposed to more and more English-language instruction, until in the seventh grade, they receive instruction 50% in Gaelic and 50% in English. (Gaelic Medium Education in the Gaelic Medium Units, n.d.)

Following these efforts, the policy making agency, the Gaelic Board – Am Bòrd na Gàidhlig – has established "hard" targets for Gaelic education and use, which amounts to quadrupling the number of 1st year primary students from present levels and nearly doubling the number of fluent speakers (Scottish Parliamentary Corporate Body, 2008, p. 12).

Neither should higher education in Gaelic go unmentioned, as post-secondary education is integral to the revival of the language and the language-community. As noted above, the establishment of Sabhal Mòr Ostaig, the first Gaelic college in the modern sense, Sabhal Mòr offers four major courses of study in Gaelic Language and Culture, Gaelic and (economic) Development, Gaelic and Media Studies, and Gaelic and Traditional Music Paired with the University of the Highlands and Islands, a consortium of colleges in and around the Scottish Highlands, Sabhal Mòr has become a focal point in the intellectual life of the Gaelic community. Also important are several venues of non-formal and adult education, including immersion education offered by Sabhal Mòr, the Atlantic Gaelic Academy (in the diasporic community of Nova Scotia), and various local and cultural entities.

2 Language Modernization and Regularization

The second "wall breaking" event from roughly this time period was the (often overlooked) establishment of the Gaelic Orthographic Conventions in 1976 as a part of the goal to move Gaelic into the modern era, by regularizing the language,

> removing the inconsistencies, indecisions and minor irritations that arise from the absence of a firmly defined standard, and that in doing so they will help teachers and learners (and indeed all writers of Gaelic) to write the language more confidently. (Scottish Certificate of Education Examination Board, Forward, 1981)

Today, this modernization is carried forward by Sabhal Mòr Ostaig in its publication of contemporary technological terminology both on the Internet and in print (*Stòr-dàta Briathrachais Gàidhlig [Gaelic Terminology Database], 1993; Stòr-dàta Briathrachais Gàidhlig* [Online Gaelic Terminology Database], 2006). As well, "old" information technology such as the Gaelic learners' organization Clì Gàidhlig's magazine *Cothrom* (Opportunity) combines material of general interest and of relevance to learners, glossaries of contemporary terms in its quarterly editions. A recent edition of *Cothrom*, for example, offered more

than a hundred terms having to do with telephone and cell-phone technology (NicPhàdraig, 2008).

This last is of especial interest because as recently as the early 1990s, the arguably most popular Gaelic textbook in the world -- MacKinnon's (1992) *Teach Yourself Gaelic* – was offering vocabulary culled from the 18th and 19th century Gaelic world, such as

> Tha an tuathanaich a' tughadh chruach. [The farmers are thatching stacks.] (p. 109)

Or

> Am b'ann an dè a bha Calum ag obair anns an achadh? [Was it today that Calum was working in the field?] (p. 33)

The vocabulary of this late 20th-century text was little changed from that of texts nearly a century older, such as MacLaren's (1911/1960) *Gaelic Self-Taught* or Calder's (1923/1996) *A Gaelic Grammer*, with many references to the rural environment that for so long bound the Gaelic world.

In contrast, the import of the introduction into Gaelic of modern, technological terminology such as *Cothrom's* or Sabhal Mòr Ostaig's online Stòr-data glossary cannot be undervalued, for it means that Gaelic speakers, educators and what one might call "activists" are not merely engaged in an effort to revive an ancient language as it once was – replete with references to the "traditional" rural Gaelic world of sheep, crofts, and fishing -- in other words, theirs is not a "heritage weekend" project – but rather, they are quickly contemporizing Gaelic with the apparent aim of transforming it into a language suitable for use in a modern, technological global city.

3 Government

The third "wall breaking" might be said to be the Gaelic Language Bill that was passed into law in 2005. Perhaps one of the most profound changes in the landscape of the Gaelic revival is the Gaelic Bill introduced in September 2004 and was passed into law in 2005. This legislation established Gaelic as an official language of Scotland and provided a variety of means of funding for its maintenance. The Gaelic Bill established the Bòrd na Gàidhlig (The Gaelic Board) as an advisory body whose aim is "securing the status of the Gaelic language as an official language of Scotland" (Gaelic, 2004, p. 1). The Bòrd is a non-governmental agency (NGO) without the power to implement any of its plans, though it does have the authority to contract independently. The Bòrd is charged with "promoting, and facilitating the promotion of, the use and

understanding of … the Gaelic language, Gaelic education and Gaelic culture" (Bill, 2004, p. 1). The Bòrd's powers are for the most part advisory. The purpose of the *Bòrd na Gàidhlig* (The Gaelic Board) is to increase the number of Gaelic speakers within Scotland and also "strengthen Gaelic as a family and community language" (*Bòrd*, 2004). The venues which it sees as most conducive to these aims are mainly in education, through Gaelic medium schools, and adult immersion classes, but also in the fields of culture and arts, and in the promotion of economic development and social activities that will maintain and nurture the Gaelic community.

Though the Bòrd is charged with developing a plan toward the establishment of Gaelic as an official language, it does not have the power itself to implement any such plan; in regards to other government agencies, it may require "any Scottish public authority … to prepare a Gaelic language plan" (Bill, 2004, p.2). The powers of the Bòrd are further constrained by the limitation of considerations such as being required to consider "the extent which the Gaelic language is used" (Bill, 2004, p. 3) in any particular region of Scotland. Furthermore, any plan submitted by a regional authority to the Bòrd must be approved by the Parliament before it is enacted into law. The Bòrd does not have authority to require such reports from United Kingdom authorities operating within Scotland, such as Inland Revenue (the British equivalent of the Internal Revenue Service in the United States).

The *Bòrd* holds the position of possibly serving as the organizing body, central authority and implementary force for the future of Gaelic education. It drafted a National Plan for Gaelic which "proposes measures to normalize the use and promote the development of Gaelic and its culture across the full spectrum of home and community life … across Scotland" (*Bòrd*, 2006) and a Guidance on Gaelic Language Plans, which is comprised of guidelines for public organizations submitting proposals for their treatment of Gaelic and Gaelic speakers.

The National Plan for Gaelic: 2008-2013 (Scottish Parliamentary Corporate Body, 2008). enunciates a "vision" for Gaelic as a "healthy, vibrant language increasingly used, valued and respected in a modern, multicultural and multilingual Scotland" (p. 9), and under the imprimatur of the national government, the *Plan* sets out steps to implement that broad vision. This Gaelic Language Act reflects a sea shift in the attitudes of the ruling authorities in Scotland towards Gaelic and a radical change in the legal positioning of the language. From a pariah language of a marginalized people, it is now officially recognized by the national government, and while this official status should not be thought of as creating the current revival, it does lend credence and credibility to the endeavors of Gaelic educators, workers, and advocates.

The *Plan* outlines definite and definitive policies for implementation in regards to the use of Gaelic in government and for encouraging its wider use and acceptance in the society at large. The overarching policy aim is the creation of

a “bilingual corporate identity” (p. 6), which by itself might be seen as purely cosmetic – composed as it is of such things as Gaelic-English signage and Gaelic government publications, including Internet web pages, but also encompassing the actual use of Gaelic in government business and public services; however, as public visibility and official sanction of, and access to a language may enhance its status, and as enhanced status may very well impact upon its use, these measures may be of significant importance – if for no other reason than they mark a turn-around from the centuries-long policy of suppression.

It should be emphasized that this policy is not a top-down imposition of a language ideology upon a nation, but a governmental response to what seems to be a bottom-up movement. As well, it is probably significant that almost immediately upon wresting some sort of local autonomy from the national United Kingdom government in London, the Scots asserted their autonomy to linguistically (and symbolically) differentiate themselves from the dominant English. Just as Fishman (1989, 1991) admonishes that governmental language policy cannot by itself effect language change, nor can a single institution bear the weight of carrying such a heavy cargo; accordingly, the movement to revive Gaelic has many participants both in and outside of official government spheres, in and out of formal and non-formal educational venues.

4 NGOs

Non-governmental organizations overlap and interplay with governmental functions in many ways so that it is sometimes difficult to keep them separate. As noted above, Am Bòrd Gàidhlig – The Gaelic Board – which though charged by the Scottish government with responsibilities under the Gaelic Bill and receiving financing from the government, is not per se a government agency but is nevertheless is central to the creation of plans that impact government actions. Likewise, other non-governmental agencies playing integral support roles in this concerted language-revival campaign would include the Comunn na Gàidhlig (The Gaelic Society), an independent organization whose goal is to support Gaelic language and culture, but which is also instrumental in the recruitment of Gaelic teachers into the new system of Gaelic medium education (*Thig a Theagasg*, n.d.).

5 Media and the Arts

Perhaps nothing illustrates the convergence of many individual contributions in the revival of Gaelic than what is happening in media. First, the media – encompassing radio, print, television and film – is widely recognized as being

integral to the re-integration of the Gaelic world and integrated in some respects into venues of formal and informal education. Indeed, it would be difficult to say where Gaelic media is not educational, or part and parcel of the educational movement. This is clear first and foremost in that one of four courses for degree at the Gaelic college – Sabhal Mòr Ostaig – is for Gaelic media studies.

One of the most obvious examples of the integration of media and education is in the opening up of intercommunication and educational opportunities through the Internet. Not only does the Gaelic college Sabhal Mòr Ostaig offer online courses that are available worldwide, but so does the Gaelic College in Nova Scotia – which it calls Beul an Tobair, or "The Well of the Mouth" (Gaelic College).

The Internet offers an abundance of sites, including that of Sabhal Mòr, with resources and materials for learners and speakers, such as dictionaries and glossaries of modern terminology. Such a resource can be found in the *Stòr-dàta Briathrachais Gàidhlig* (2006) [The Gaelic Terminology Database], which is the result of a consortium of individuals and institutions to gather together not only "traditional" Gaelic words, but also terminology of a more technological or "modern" nature. The work was begun in 1986 which resulted a book that currently out of publication (*Stòr-dàta Briathrachais Gàidhlig*, 1993) and in a still-ongoing online compendium of terms in an searchable online database maintained by the Gaelic college, Sabhal Mòr Ostaig.

BBC Scotland broadcasts Gaelic language and music programs from Radio nan Gàidheil (Gaelic Radio) of Gaelic radio programs, storing recordings of past broadcasts for up to a week for later podcasting. BBC also sponsors the website *Air Splaoid!* (Air splaoid! N.d.), an online educational and entertainment site for children. The site is the product of Cànan, the publisher of *Stòr-Data* (1993; 2006) and the publishing and media arm of the Gaelic college Sabhal Mòr Ostaig.

The media most recently drawn upon to interconnect the Gaelic world are those of television and film. The advent of Gaelic film and digital television promises to connect the Gaelic community in ways that were not possible until almost this very year, for it was in 2008 that the first Gaelic-language film was produced – *Seachd, the Inaccessible Pinnacle*, and in September 2008, the BBC launched its Gaelic language television service, BBC Alba, which is scheduled to carry original programming in Gaelic, with a gradually expanding offering (Launch day for new Gaelic channel, 2008). The recently launched FilmG: Gàidhlig Goirid – Gaelic Short (FilmG, n.d.) is dedicated to creating film and television productions in Gaelic. More traditional Gaelic art forms cannot go unmentioned in this synopsis of the Gaelic arts that are part of the loose Gaelic revival coalition. For instance, the yearly Mòd, a Gaelic language festival featuring music, poetry story telling, and drama, is a recurrent feature in the Gaelic community and has been for more than a hundred years since its inception.

6 Conclusion

Lastly, perhaps, we should consider for a moment the motivation or motivations behind this language revival, which, to put this activity in a wider context, does seem coincident with the concern about an impending wave of what Crystal (2000) refers to as the "language death" half the world's languages by the end of the 21st century. However, the efforts on behalf of Gaelic are focused not on a general linguistic concerns, but rather on a love of the language and culture and issues of group and personal identities that language sometimes marks. These revival efforts are coincident with similar endeavors within many other small, formerly submerged areas in Europe and elsewhere, such as Bretons in Brittany; the Basque and Catalans in Spain, the Maori in New Zealand, the native Hawaiians and Native Americans in the United States to affirm and assert group identify that contravenes dominant, hegemonic cultures.

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Some Syntactic Considerations Regarding the Focalizing *Ser* ('to be') Construction in Colombian Spanish*

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1. Introduction

Pseudo-cleft constructions are often employed in Spanish to focus certain constituents within a sentence. A sentence such as (1), for example, can be transformed into a pseudo-cleft sentence such as (2), which is comprised by a subordinate clause (*lo que Juan estudió* 'what Juan studied'), and a matrix clause (*fue lingüística* 'was linguistics') where the direct object (*lingüística* 'linguistics') is the focused constituent and is c-commanded by the copula verb *fue* 'was' (> *ser* 'to be')[1]:

(1) Juan estudió lingüística
Juan study.3SG.PRET linguistics
'Juan studied linguistics'

(2) [**Lo que** Juan estudió] [fue <u>lingüística</u>]
the.NEUT what Juan study.3SG.PRET be.3SG.PRET linguistics
'**What** Juan studied was <u>linguistics</u>'

In few dialects of Spanish (Venezuelan, Ecuadorian, Panamanian, Colombian, and Dominican), a sentence involving the same focus interpretation can also be created without the relative clause (*lo que* 'what'), as in (3):

(3) Juan estudió fue <u>lingüística</u>
Juan study.3SG.PRET be.3SG.PRET linguistics
'It was <u>linguistics</u> that Juan studied'

The structure in (3), here referred to as the Focalizing *Ser* structure (henceforth FS), has not been widely studied. It has been reported to occur in

Brazilian Portuguese (Mikolajczak 2003; Oliveira and Braga 1997), Venezuelan Spanish (Sedano 1988, 1990, 1994, 1995, 2003a, 2003b), Colombian Spanish (Albor 1986; Curnow and Travis 2003), Caribbean Spanish (Bosque 1999; Camacho 2006), and Dominican Spanish (Toribio 2002, 1992).

Despite several efforts (Toribio 1992, 2002; Curnow and Travis 2003; Bosque 1999; Camacho 2006), it is still unclear what the syntactic configuration of the FS is. Hence, the aim of the present study is to provide an account of the syntactic structure of the FS, specifically in terms of the placement of *ser* ('to be') within the clause, the type of constituents that may be FS-focused, and the morpho-syntactic relation that *ser* ('to be') establishes with certain elements in the sentence. This study does not include a comprehensive syntactic analysis of the FS, but it briefly introduces a theoretical proposal that adequately explains the data here presented[2].

This paper is organized as follows: section 2 shortly discusses previous studies on the FS; section 3 provides some generalizations regarding the syntax of the FS; section 4 introduces our theoretical proposal for the FS; and, section 5 states some conclusions and addresses certain aspects for future research.

2. Previous Research on the FS

2.1. The FS as a pseudo-cleft

Looking at examples (2) and (3), the pseudo-cleft and the FS seem to have the same syntactic structure. In fact, according to Albor (1986), Sedano (1988, 1990, 1994, 1995, 2003a, 2003b), and Toribio (1992, 2002), the only structural difference between the pseudo-cleft and the FS is that the relative clause (*lo que* 'what', in (2)) is not pronounced.

Albor (1986), for example, describes the FS as a syntactic derivation of the pseudo-cleft. He attributes the FS to Colombian and Ecuadorian dialects, and claims that its use is geographically, socially, and stylistically more extended than usually thought: it is found in various dialectal regions, in educated and non-educated populations, in colloquial speech, and in literary and news texts.[3]

Based on her statistical analysis of the FS in Caracas Spanish, Sedano (2003a, 2003b) suggests that although the FS and the pseudo-cleft are practically equivalent, the FS is structurally simpler (it lacks a relative clause), which facilitates the production of focus (it allows last-minute focalization).

Finally, Toribio (1992, 2002) proposes a unified syntactic analysis of the FS and the pseudo-cleft, and claims that the FS "is the null operator counterpart of the traditional pseudo-cleft." (Toribio, 2002: 134). Thus, according to her analysis, examples (2) and (3) above would be structured as shown in (4) and (5), respectively:

(4) **Lo** **que** Juan estudió fue <u>lingüística</u>
[lo (pro) [CP OP que [IP Juan estudió *t*…
the.NEUT what Juan study.3SG.PRET be.3SG.PRET linguistics
'**What** Juan studied was <u>linguistics</u>'

(5) ~~**Lo** **que**~~ Juan estudió fue <u>lingüística</u>
[lo (pro) [CP OP que [IP Juan estudió *t*…
the.NEUT what Juan study.3SG.PRET be.3SG.PRET linguistics
'~~**What**~~ Juan studied was <u>linguistics</u>'

2.2. The FS as an independent structure

At first sight, the analysis of the FS as a pseudo-cleft seems logical and appealing. However, as initially pointed out by some scholars (Bosque 1999; Curnow and Travis 2003; Camacho 2006), there are certain syntactic contexts in which the FS and the pseudo-cleft are not interchangeable, which suggests that they are indeed structurally different. Curnow and Travis (2003) show, for example, that the pseudo-cleft is sensitive to clitic climbing (6)-(7), whereas the FS is not (8)-(9):

(6) ok Lo que quiero es ir**me**
the.NEUT what want.1SG.PRES be.3SG.PRES go. INF- CL
'What I want is <u>to leave</u>'

(7) * Lo que **me**$_i$ quiero es ir$_i$
the.NEUT what CL want.1SG.PRES be.3SG.PRES go. INF
'What I want is <u>to leave</u>'

(8) ok Quiero es ir**me**
want.1SG.PRES be.3SG.PRES go. INF- CL
'It is <u>leaving</u> that I want to do'

(9) ok **Me**$_i$ quiero es ir$_i$
CL want.1SG.PRES be.3SG.PRES go. INF
'It is <u>leaving</u> that I want to do'

Furthermore, according to Curnow and Travis (2003) and Bosque (1999), the pseudo-cleft cannot focus negative polarity items (10), whereas the FS can (11):

(10) * El que **no** vino fue <u>nadie</u>
the.MASC what not come.3SG.PRET be.3SG.PRET nobody
'The one who **did not** come was <u>nobody</u>'

(11) [ok] **No** vino fue nadie
not come.3SG.PRET be.3SG.PRET nobody
'It was nobody who came'

Lastly, one more piece of compelling evidence against the idea that the pseudo-cleft and the FS are structurally equivalent comes from Bosque's (1999) observation regarding *wh*-extraction. According to him, focused constituents can be extracted out of the pseudo-cleft (12), but not out of the FS (13):

(12) [ok] **¿Quién** fue el que salió?
who be.3SG.PRET the.MASC what leave.3SG.PRET
'Who was it that left?'

(13) * ¿**Quién** salió fue?
who leave.3SG.PRET be.3SG.PRET
'Who was it that left?'

3. The Syntax of the FS

3.1. The position of the FS

The FS must not occur sentence-initially, either before the pre-verbal subject (14) or before the main verb (15), or sentence-finally (16):

(14) * Es **Lucrecia y David** están en Caracas
be.3SG.PRES Lucrecia and David be.3PL.PRES in Caracas
'It is in Caracas where **Lucrecia and David** are'

(15) * Lucrecia y David es **están** en Caracas
Lucrecia and David be.3SG.PRES be.3PL.PRES in Caracas
'It is in Caracas where Lucrecia and David **are**'

(16) * Lucrecia y David están en Caracas es
Lucrecia and David be.3PL.PRES in Caracas be.3SG.PRES
'It is in Caracas where Lucrecia and David are[4]'

Therefore, the FS can only occur post-verbally, immediately to the left of the focused element. However, the FS does not necessarily need to be adjacent to the main verb. In (17), for example, the DP *plata* ('money') intervenes between the FS and the main verb of the sentence (*será* 'it might be'):

(17) [ok] Tendrá plata será **la familia**
have.3SG.FUT (PROBABILITY) money be.3SG.FUT the family
'It might be **his family** who has money'

In terms of its focus projection, the FS may focus more than one constituent (18), or it may focus only the most adjacent constituent (19):

(18) [ok] Gustavo le traía era **un regalo a la mamá**
Gustavo CL bring.3SG.IMP be.3SG.IMP a gift to the mother
'It was **a gift for his mother** that Gustavo brought'

(19) [ok] Gustavo le traía era **un regalo** a la mamá
Gustavo CL bring.3SG.IMP be.3SG.IMP a gift to the mother
'It was **a gift** that Gustavo brought for his mother'[5]

3.2. FS-focused constituents

The FS may focus a wide variety of elements in a sentence, such as PPs (20), AdjPs (21), and even CPs (22):

(20) Nevó fue **en Berlín**
snow.3SG.PRET be.3SG.PRET in Berlin
'It was **in Berlin** where it snowed'

(21) Los jugadores están es **súper cansados**
the players be.3PL.PRES be.3SG.PRES super tired
'It is **super tired** that the players are'

(22) Dijo fue **que venía mañana**
say.3SG.PRET be.3SG.PRET that come.3SG.IMP tomorrow
'It was **that he would come tomorrow** that he said'

Furthermore, adverbs can be FS-focused, as long as they are VP-adverbs, or "lower adverbs" following Cinque's (1999) terminology. Hence, IP-adverbs (or "higher adverbs") render ungrammatical outcomes when focused by the FS:

(23) [ok] Las tías llegaron fue **ayer**
the aunts arrive.3PL.PRET be.3SG.PRET yesterday
'It was **yesterday** when my aunts arrived'

(24) * No sé qué hacer es **francamente**
not know.1SG.PRES what do.INF be.3SG.PRES frankly
'It is **frankly** that I do not know what to do'

As for DPs, the FS may focus direct object DPs (25), indirect object DPs (26), and post-verbal subject DPs (27):

(25) El niño me trajo fue **una torta**
the child PRON bring.3SG.PRET be.3SG.PRET a cake
'It was **a cake** that the child brought for me'

(26) El niño les trajo una torta fue **a ellos**
the child PRON bring.3SG.PRET a cake be.3SG.PRET to they
'It was **for them** that the child brought a cake'

(27) Salió fue **Lucía**
leave.3SG.PRET be.3SG.PRET Lucía
'It was **Lucía** who left'[6]

Strikingly, as initially mentioned by Sedano (1995), the FS may also focus DP-internal constituents (28). Upon closer examination, we find that the FS can focus DP-internal stage-level predicates (29), but not DP-internal individual-level predicates (30):

(28) Me gusta la música es **moderna**
PRON like.3SG.PRES the music be.3SG.PRES modern
'It is **modern** that I like music'[7]

(29) [ok] Trajo el perro fue **encadenado**
bring.3SG.PRET the dog be.3SG.PRET chained
'It was **chained** that he brought the dog'

(30) * Trajo el perro fue **dálmata**
bring.3SG.PRET the dog be.3SG.PRET Dalmatian
'It was **Dalmatian** that he brought the dog'

Going back to question formation, the FS cannot focus *wh*-words that have moved to CP (see (13), repeated here as (31)). However, the FS can focus *wh*-words that have not moved to CP and that remain in-situ at D-structure (32):

(31) * ¿**Quién** salió fue?
who leave.3SG.PRET be.3SG.PRET
'Who was it that left?'

(32) [ok] ¿Salió fue **quién**?
leave.3SG.PRET be.3SG.PRET who
'It was **who** that left?'

As illustrated so far, the FS cannot focus constituents that have moved to high-IP positions (anywhere higher than INFL). As suggested by Bosque (1999) and Camacho (2006), the FS can only focus elements that are placed within the VP. However, the fact that the FS can focus auxiliaries (perfectives (33), and progressives (34)), suggests that it is not contained inside the VP[8]:

(33) Hemos es **estado** haciendo la tarea
have.1PL.PRES be.3SG.PRES be.PERF do.PROGR the homework
'It is doing our homework that we **have** been doing'

(34) Hemos estado es **haciendo** la tarea
have.1PL.PRES be.PERF be.3SG.PRES do.PROGR the homework
'It is **doing** our homework that we have been doing'

3.3. The verb *ser* ('to be')

The verb *ser* in the FS structure presents some interesting agreement patterns. Firstly, *ser* must agree in tense and aspect with the main verb of the sentence:

(35) ok Nosotros nos **conocimos** fue en Cali
we PRON know.1PL.**PRET** be.3SG.**PRET** in Cali
'It was in Cali where we **met**'

(36) * Nosotros nos **conocimos** es en Cali
we PRON know.1PL.**PRET** be.3SG.**PRES** in Cali
'It is in Cali where we **met**'

(37) * Nosotros nos **conocimos** era en Cali
we PRON know.1PL.**PRET** be.3SG.**IMP** in Cali
'It was in Cali where we **met**'

Also, in cases of FS-focused post-verbal subjects, *ser* must agree in person and number with the subject and with the main verb:

(38) ok Llegué fui **yo**
arrive.**1SG**.PRET be.**1SG**.PRET **I**
'It was **I** who arrived'

(39) * Llegué fue **yo**
arrive.**1SG**.PRET be.**3SG**.PRET **I**
'It was **I** who arrived'

(40) * Llegó fue **yo**
arrive.**3SG**.PRET be.**3SG**.PRET **I**
'It was **I** who arrived'

(41) * Llegó fui **yo**
arrive.**3SG**.PRET be.**1SG**.PRET **I**
'It was **I** who arrived'

Lastly, *ser* may optionally agree in number with plural FS-focused direct objects (42)-(43). However, this option is not available between *ser* and plural FS-focused indirect objects (44)-(45):

(42) ok Tengo es **dos gatos**
have.1SG.PRES be.**3SG**.PRES two cats
'It is **two cats** that I have'

(43) ok Tengo son **dos gatos**
have.1SG.PRES be.**3PL**.PRES two cats
'It is **two cats** that I have'

(44) ok Les dio plata fue **a ellos**
PRON give.3SG.PRET money be.**3SG**.PRET to they
'It was **they** to whom he gave money'

(45) * Les dio plata fueron **a ellos**
PRON give.3SG.PRET money be.**3PL**.PRET to they
'It was **they** to whom he gave money'

4. What is the FS?

Taking into account the evidence shown in section 2.2 it becomes clear that the FS should not be treated as an incomplete version of the pseudo-cleft. Curnow and Travis (2003), for example, suggest that the FS is a particle. However, this would imply that it can occur anywhere in the sentence, and that it would be a fixed form. As illustrated in section 3, the position of the FS is highly constrained (it must appear below INFL), and the verb *ser* ('to be') obligatorily checks agreement features with the main verb and with post-verbal subjects, and optionally with plural direct objects.

Camacho (2006) claims that the FS is a Copula Phrase that is generated as an adjunct of VP, whose subject is null, and whose predicate is a focused VP. Under this view, the FS must only focus single, domain-final constituents.

However, as we have found in the Colombian Spanish data, the FS can indeed focus more than one constituent (see example (18)), or a single constituent that is not at the end of the clause (see example (19)).

Bosque (1999), on the other hand, argues that the FS is a Focus Phrase inside the VP, where the non-copulative verb *ser* ('to be') functions as the head of the focus projection. Although this proposal correctly predicts most of the cases shown in section 3, it fails to account for FS-focused auxiliaries (see (33)-(34)), as these would not be located inside VP, but immediately above it[9].

Given this, and based on research conducted by Belletti (2004), Horvath (1986), and Yanagida (1995), we propose that the FS is in a Focus Phrase (FocP), generated below INFL and above *v*P. Hence, *ser* ('to be') is generated as the head of this Focus Phrase (F°), which allows it to establish tense and aspect agreement with the main verb, person and number agreement with post-verbal subjects, and number agreement with direct objects.

Thus, a sentence such as (46) is generated as in (47), where we claim that the focused constituent (*ellos* 'they') checks person and number features with F°, and is bound by a Focus Operator (located in [Spec, FocP]). The main verb (*vienen* 'come.3PL.PRES') then moves and adjoins to *ser* ('to be') in F°, and it finally moves from F° to T°, by means of *excorporation* (Roberts, 1991):

(46) Vienen son **ellos**
come.3PL.PRES be.3PL.PRES they
'It is **they** who are coming'

(47) $[_{IP}$ Vienen$_{\mathbf{j}}$ $[_{FocP}$ OP$_1$ $[_{F°}$ $\boldsymbol{t}_{\mathbf{j}}$ son $[_{vP}$ **ellos**$_1$ $[_{v'}$ $[_{VP}$ $\boldsymbol{t}_{\mathbf{j}}$]]]]]]

This type of analysis allows us to satisfactorily account for the position of the FS (always below INFL and above the focused element), and for the agreement relation between *ser* ('to be') and certain constituents (head to head agreement between *ser* and the main verb; head to specifier agreement between *ser* and the subject, and between *ser* and the direct object).

5. Conclusions

The FS has been reported and described in the literature (Albor 1986; Sedano 1990), but its formal properties have not been completely clarified, despite several efforts (Bosque 1999; Toribio 1992, 2002; Curnow and Travis 2003; Camacho 2006). This dialectally-marked form has been previously examined as an incomplete form of a cleft structure (Albor 1986; Sedano 1990; Toribio 1992, 2002), but later research shows that it is syntactically unrelated to clefts (Bosque 1999; Curnow and Travis 2003; Camacho 2006). The present study maintains this latter claim, according to which the FS and the pseudo-cleft are different

syntactic structures. It also proposes that that FS is in a Focus Phrase, generated below IP and above *v*P, following Belletti's (2004) suggestion that both focus and topic projections may be found within the internal periphery of IP. Finally, the data here analyzed suggest that this IP-internal FocP is comprised by a [Spec, FocP] and a Focus head F°, which in this case is *ser* ('to be').

This study is valuable for the fields of syntax and information structure since it provides further support for the claim that sentential configuration agrees with the informational layout of a language (i.e. focus and topic). Furthermore, this study introduces an innovative solution for the structure of the FS and highlights a range of syntactic properties, which have not been widely discussed in the literature: the FS may focus a *wh*-in-situ, but must not occur in cases of *wh*-extraction; it may intervene between auxiliaries; it may only focus VP-adverbs; and it can appear within the DP, between a noun and a post-nominal modifier. Finally, the study shows that *ser* ('to be') must agree in tense and aspect with the main verb and in person and number with post-verbal subjects. However, it may agree in number with direct objects, but not with indirect objects.

Notes

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[1] Pseudo-clefts have been extensively studied in Spanish (e.g. Goldsmith 1981, 1986; Sornicola 1988; Guitart 1989; Sedano 1990; Toribio 1992, 2002). Toribio (2002: 139), in particular, suggests that pseudo-clefts in Spanish comprise an FP (Focus Phrase) complement whose head selects a CP or IP. Hence, the focused constituent is generated in [Spec, FP], *ser* ('to be') moves from F to I, and the embedded CP raises to [Spec, IP].

[2] Most of the data used in this study comes from utterances evaluated by native speakers of Colombian Spanish. A group of forty-five university students from Bucaramanga, Colombia, conducted acceptability judgments on 125 sentences (84 of which contained the FS). Each sentence was part of a mini-dialogue and participants were asked to rate them using a scale from 1 (least acceptable) to 5 (most acceptable).

[3] I personally have found the FS in written comments on the internet (e.g. personal blogs, newspapers, etc.), and I have heard it being used numerous times on national T.V. (e.g. news broadcasts, soap operas, talk shows, etc.).

[4] According to Toribio (1999, 2002), the FS can occur sentence-finally in Dominican Spanish. However, the acceptability judgments that I conducted strongly suggest that the FS does not occur sentence-finally in Colombian Spanish.

[5] Camacho (2006) claims that the FS can only focus single clause-final constituents. Thus, neither sentence (18) nor (19) are grammatical under his analysis. However, based on the results of my acceptability judgments, sentences such as (18) and (19) are perfectly acceptable in Colombian Spanish.

[6] Toribio (1992, 2002) claims that post-verbal subjects must not be focused by the FS in Dominican Spanish. However, based on the acceptability judgments that I conducted and data that I have gathered from T.V. programs, I have found that FS-focused post-verbal subjects are completely acceptable in Colombian Spanish.

[7] This example comes from Sedano (1995: 60), and is cited in Bosque (1999: 24).

[8] Please note that the FS must not focus auxiliaries that have moved to INFL. Hence, a sentence such as (i) is rendered ungrammatical:

(i)* Es hemos estado haciendo la tarea
be.3SG.PRES have.1PL.PRES be.PERF do.PROGR. the homework
'It is doing our homework that we have been doing'

[9] As suggested in the literature (e.g. Klein 1968; Adger 2003), auxiliary verbs are generated inside Auxiliary Phrases (Perfective Phrases, or Progressive Phrases) above *v*P.

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Intrusive Vowels as Examples of Gestural Mistiming: Evidence from Mandarin-English Interlanguage

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1. Introduction

Vowel epenthesis in consonant clusters is a salient and stereotypical feature of the interlanguage of Asian-first-language learners of English. This study examines advanced Mandarin L1 English learners' production of stop + liquid consonant clusters in word medial complex onsets, specifically addressing non-target cluster productions. In an analysis grounded in Optimality Theory and Gestural Phonology non-target productions are shown to be largely a result of the mistiming of the articulatory gestures of the consonants in the cluster.

Participants are seven advanced Mandarin L1 first year graduate and study abroad students at a northern California university. Their task consisted of reading and recording mono-morphemic English words with word medial, syllable initial, stop + liquid clusters. Clusters were analyzed acoustically using Praat phonetics software, allowing for a fine grained analysis of cluster production. The clusters are also transcribed aurally to capture overall patterns of accuracy.

At the segmental level participants are broadly accurate, nearly never conflating /l/ and /r/, and consistently contrasting stop consonants, however at the level of the cluster there are non-target patterns which are apparent with a close phonetic analysis. In complex onset clusters, the type of non-target production found varies significantly ($p \leq 0.001$) depending on both the place of articulation and the voicing specification of the stop segment. Heterorganic clusters are produced with an intrusive vowel in over half of all opportunities, while homorganic clusters showed much lower rates of intrusion. For all clusters the type of non-target production found varies significantly ($p \leq 0.001$) depending on both the place of articulation and the voicing specification of the stop segment. Heterorganic clusters are more likely to contain an intrusive vowel

following a voiceless stop than a voiced stop, while homorganic clusters are likely to concurrently be affricated and have the liquid segment deleted when voiceless. Both the intrusive vowels and the affrication and liquid deletion found in this study are analyzed as being the result of a mis-coordination of the articulatory gestures necessary to produce the cluster.

2. Previous Research

First, a brief justification for the use of the term 'consonant cluster' for two consonant segments that may or may not cross syllable boundaries must be provided. What is considered a consonant cluster is largely dependent on how syllable structure is defined. In contrast with strictly traditional syllable parameters current work on the interface of phonotactics and syllable structure constraints (Steriade, 1999) presents evidence that phonotactic interactions between consonants are dependent on linear positional differences in perceptability rather than syllable position constraints. Steriade argues that native-speaker perception of syllable boundaries is intuitively based on the analogy of a syllable as a “one-vowelled word” (p. 23) and their knowledge of acceptable word boundaries. Word medially these divisions are often ambiguous and different choices are made by different speakers. For example, the word 'sibling' could be syllabified one of three ways; *sib.ling, si.bling* or with an ambisyllabic /b/ *si[b]ling.* Although an attempt was made to chose stimuli for this study with medial stop + liquid clusters that were, as unambiguously as possible, the complex onset of the second syllable, many of the tokens, like 'sibling', are able to be syllabified in multiple ways. Steriade's argument that the linear position of the consonants in medial consonant clusters, rather than the syllable boundaries, more strongly affects the ways in which those consonants interact, supports both the inclusion of ambiguously syllabifyable clusters and the comparison of those clusters to clusters in non-word medial positions.

Three factors which are likely to influence the participants' production of the cluster - transfer of L1 constraints to L2 production, universal markedness constraints and gestural coordination - are outlined in the following section.

2.1 Cross linguistic effects

The first factor that could affect participants' performance consists of the cross linguistic effects of the participants' L1 on their L2. Transfer of linguistic features from a person's first language to their interlanguage system and second language performance is found at all linguistic levels including phonological, morphological, lexical, syntactic and pragmatic features. Two types of transfer are possible: negative transfer and positive transfer. In cases of negative transfer the L1 and L2 constraints differ and errors are expected, conversely, in cases of

positive transfer the L1 and L2 constraints are the same and the L1 structure supports native-like performance in the L2 (Major, 2001). A negative transfer effect would be expected to be particularly strong with regard to syllable structure constraints, as English is much more permissive than Mandarin. Complex onsets are not allowed in Mandarin, so onsets could be expected to either have a vowel epenthesized between the two segments or to have one of the segments deleted. Thus, if there is a robust cross linguistic interference effect on syllable structure it would be expected that whenever possible, by epenthesis or deletion, syllables would be of the CV(r) type.

2.2 Universal markedness effects

Many studies in SLA have noted the emergence of patterns that cannot be explained in terms of L1 transfer or L2 processes (Broselow, Chen & Wang, 1998). These patterns are attributed to universal patterns of markedness, which are proposed here as the second possible factor influencing patterns of production of consonant clusters. This second factor would generally have effects congruent with those exerted by Mandarin, at least in terms of syllable structure. Cross linguistically the Mandarin-type syllable (CV with a highly restricted coda) is strongly preferred to English's heavy syllables. Syllable markedness effects would be expected to influence participant performance in the same way as L1 transfer, while also selecting for a repair strategy, because universally epenthesis is preferred over deletion to repair disallowed syllable types (Broselow et al.,1998). Thus, universal markedness constraints would reinforce the preference for lighter syllables, and encourage epenthesis as a repair strategy.

2.3 Gestural coordination

The third factor that may influence participants' accuracy on clusters disallowed in their L1 is their ability to coordinate the necessary articulatory gestures. Evidence of the importance of gestural timing in the production of consonant clusters can be found in studies of first language production (Bradley, 2004, 2006, 2007a; Romero, 2008), and second language acquisition (Davidson, 2004, 2006a, 2006b; Davidson & Stone, 2003). Within a model of gestural phonology much of what is generally called epenthesis can be explained as the spreading apart, or alternately non-overlap, of articulatory gestures. The 'svarabhakti' or short schwa vowel attested in Spanish /r/+C clusters is explained not as epenthesis, but as a result of the temporal coordination of articulatory gestures (Bradley, 2004, 2006; Romero, 2008). Similar analysis of Norwegian apicoalveolar tap-consonant clusters shows that when the /ɾC/ cluster is not coarticulated, a transitional vowel fragment is inserted between the tap and the following consonant (Bradley 2006). Davidson and Stone (2004) conducted an

ultrasound study of English L1 participants producing novel Polish onset clusters. The participants, who had no previous experience with Slavic languages, were asked to produce clusters which are phonotactically illegal in English. The pseudo-Polish words were presented in writing and in a recording by a native speaker of Polish. Ultrasound recordings of /zC/ clusters show no evidence of movement toward an epenthsized schwa target in recordings, even when a schwa is visible on the acoustic record. The researchers hypothesize that speakers are failing to produce the clusters with the appropriate gestural motions, resulting in a schwa-like open vocal tract where the gestures are pulled apart. In a similar experiment using pseudo-Czeck words and English native speakers Davidson (2006a) shows that schwas inserted between segments of a consonant cluster differ significantly in both length and formant values from lexical schwas in the same environment. She shows that the predominant type of cluster repair is the insertion of 'transitional vowels' but that the type of repair strategy used varies depending on the type of cluster. She concluded that these 'transitional vowels' are best explained by gestural phonology as the failure of speakers to coordinate the gestural actions sufficiently to prevent the underlying vowel from being expressed.

3. Methods

3.1 Participants

Participants are six Chinese and Taiwanese graduate students and one Taiwanese undergraduate exchange student, all in their first year at a northern California university. All participants are fluent speakers of standard Mandarin Chinese although one reported a home language of Cantonese and several others reported at least receptive proficiency in a local dialect of southern China

3.2 Materials

Materials consisted of thirty mono-morphemic English words with word medial, but syllable initial, stop-liquid clusters (ie. Libra /br/ and atrocious /tr/). Tokens were balanced across all possible combinations, with the exception of /tl/ and /dl/ clusters. Words were not controlled for frequency.

3.3 Analysis

The tasks were recorded on a hand-held Sony Digital Voice Recorder with an integrated microphone, held by the participant during the recording. The digital voice files were downloaded and converted from Sony’s proprietary file type to

a .wav file, then each token was saved as an individual file for further analysis.

All tokens were transcribed impressionistically by the researcher, as well as being measured and coded for a variety of features using Praat phonetic analysis software (Boersma & Weenink, 2008). Stops are tracked for voicing during the closure and release burst, the voice onset timing (VOT) when applicable, as well as the duration of both the closure and the release burst. A segment is considered to be voiced if there is a visible voicing bar in the spectrogram through the release burst. Liquid segments are tracked for duration, formant frequencies, voicing, the presence and intensity of upper spectra energy, and syllabicity. To measure the formant frequencies in a consistent manner, a Query Script was written for Praat which measures the duration of a highlighted segment, as well as the first three formant frequencies and their bandwidths. Formant values for all liquid consonants produced, as well as all intrusive vowels, are normalized to the Bark scale for each speaker to facilitate comparison of tokens across speakers.

Data were tested for statistical significance using several standard statistical tests of significance (Kirkman, 1996). Categorical results were tested using a chi-square test of distribution. For comparisons with any cells with an expected value of less than five, the Fisher Exact Test was used. To avoid the pitfalls of using multiple chi-squared analyses the p-value required to reject the null hypothesis was set at $p \leq 0.01$.

4. Results

Participants produce word medial stop + liquid clusters in an accurate, target-like manner in approximately 40% of all opportunities. Non-target productions consist of cluster medial vocalic segments (intrusive vowels), affrication of the stop, and deletion of the liquid, with very few tokens not fitting one of these four categories. The type of non-target production found varies significantly ($p \leq 0.001$) depending on both the place of articulation and the voicing specification of the stop segment. Surprisingly the identity of the liquid segment does not show a significant effect on the presence or absence of intrusive vowels.

4.1 Intrusive vowels

A segment was considered to be an intrusive vowel if it occurred between the two target segments and was measurably different than the liquid in formant value, intensity or trajectory. To a highly significant ($p < 0.001$) degree intrusive vowels are likely to occur when the stop segment in the cluster is voiced and much less likely to occur when the stop is voiceless (See Figure 1).

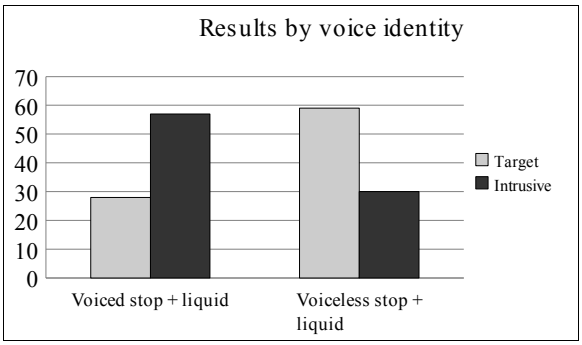

Figure 1 – Percentage of target vs. intrusive results by voice identity of the stop segment.

Although the liquid segment did not affect the presence or absence of the intrusive vowel, it did affect the formant values of the segment. As shown in Figure 2, intrusive vowels have lower F3 - F1 and F2 - F1 values before an /r/ than before an /l/.

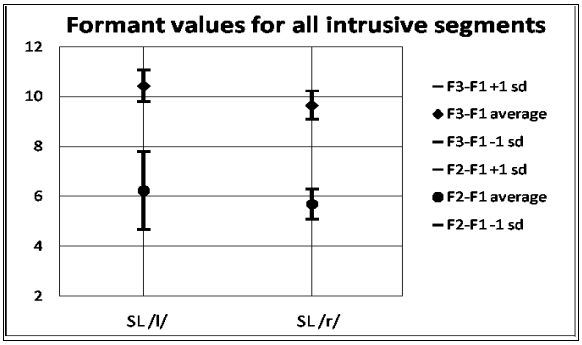

Figure 2 - Average F3-F1 and F2-F1 values for all intrusive vowels, normalized across speakers using the Bark scale.

Examples of clusters with intrusive vowels are shown in Figures 3 and 4, in the transcription the intrusive vowel is represented by a question mark, not to be confused with the glottal stop /ʔ/.

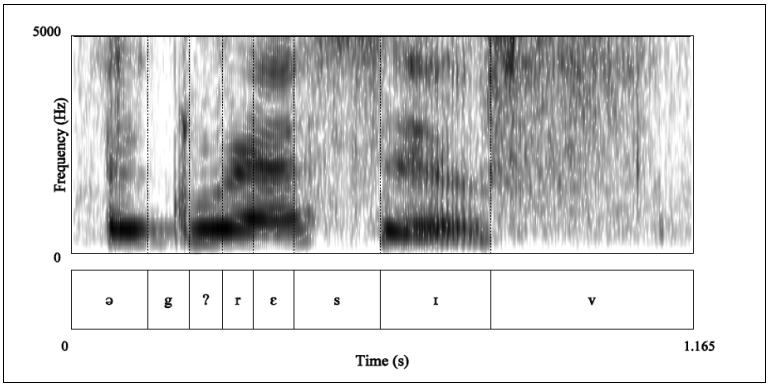

Figure 3 - Spectrogram and transcription of 'aggressive' as produced by participant G. The segment between the /g/ and the /r/ of the /gr/ cluster has a significantly lower and weaker F2 and F3.

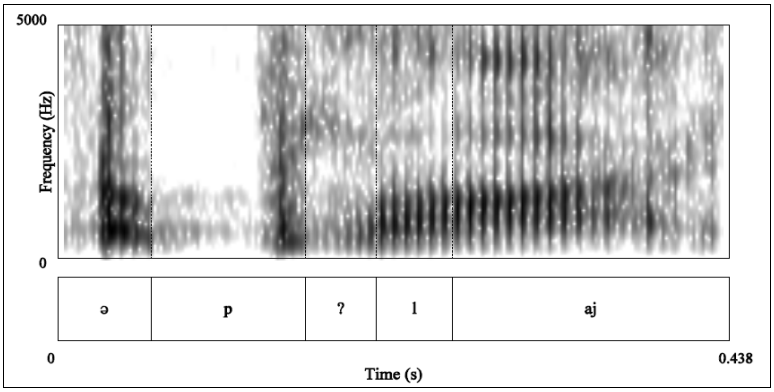

Figure 4 - Spectrogram and transcription of 'apply' as produced by participant A. The intrusive vowel is voiced, but shows very little formant organization.

4.2 Liquid deletion and affrication

The place of articulation of the stop consonant also significantly ($p<0.001$) affects the realization of the cluster. The heterorganic labial + liquid and velar + liquid are consistently produced either in a target-like manner or with an intrusive vowel (see Figure 5), while only the homorganic clusters are produced with an intrusive vowel, although much less frequently than the heterorganic clusters. Non-target homorganic clusters, as shown in Figure 6, are produced with an affricated stop and additionally, in some cases, with the liquid deleted. This pattern of affrication and liquid deletion does not occur in heterorganic clusters. An example of affrication with liquid deletion is shown in Figure 7.

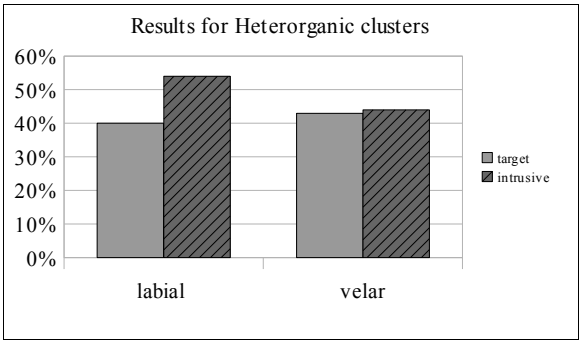

Figure 5 - Production results for heterorganic clusters, as a percentage of total clusters attempted by all participants.

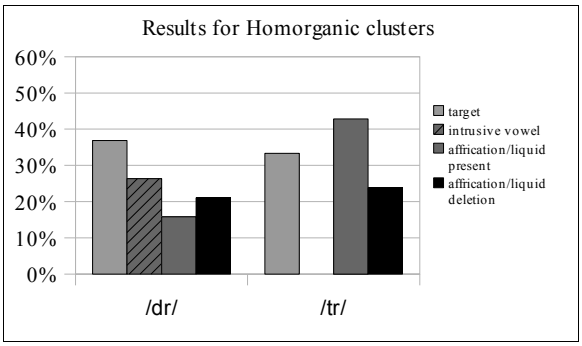

Figure 6 - Production results for homorganic clusters, as a percentage of total clusters attempted by all participants.

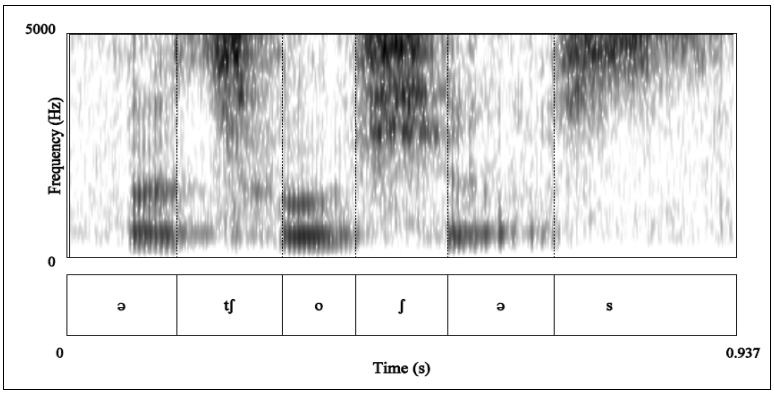

Figure 7 - Spectrogram and transcription of 'atrocious' by participant D. The stop constituent of the /tr/ cluster is affricated and the liquid deleted.

5. Discussion and Conclusion

Three possible factors - transfer of L1 constraints to L2 production, universal markedness constraints and gestural coordination - were proposed as being likely to affect the production of consonant clusters. Although any of the three could be responsible, the nature of the intrusive vowels, evidence of gestural overlap in the homorganic clusters and patterning based on the voicing specification of the stop member of the cluster suggest that mis-coordination of the articulatory gestures is responsible for the results shown. As listed below, Hall (2006, p. 391) outlines key features in distinguishing intrusive vowels motivated by gestural mistiming from epenthetic vowels, which are inserted phonologically.

a. The vowel's quality is either schwa, a copy of a nearby vowel or influenced by the place of the surrounding consonants.
b. If the vowel copies the quality of another vowel over an intervening consonant, that consonant is a sonorant or guttural.
c. The vowel generally occurs in heterorganic clusters.
d. The vowel is likely to be optional, have a highly variable duration or disappear at fast speech rates.
e. The vowel does not seem to have the function of repairing illicit structures. The consonant clusters in which the vowel occurs may be less marked, in terms of sonority sequencing, than clusters which surface without vowel insertion in the same language.

The intrusive vowels analyzed in this study clearly fit the definition of intrusive vowels outlined by Hall. Similar to Davidson's (2006) 'transitional vowels', the quality of the intrusive vowels is influenced by the adjacent segment, in this case the liquid, with the F3-F1 and F2-F1 values lower before an /r/ than an /l/, fitting both points (a) and (b). Point (c) is supported by the fact that intrusion occurs at much higher rates in clusters with labial and velar stops than in clusters with alveolar stops. Addressing point (d) and similar to other studies on the topic (Davidson and Stone, 2004; Davidson, 2006a), the intrusive vowels are not consistent in length, ranging from 21ms to 147ms (Average = 54ms, Standard Deviation = 24ms). The presence of the intrusive vowels is also highly variable across cluster types as well as across speakers, indicating that they are optional and not a phonological repair of a phonotactically marked cluster. Also significant, intrusive vowels are significantly more likely to occur following a voiced stop than a voiceless stop. These results are similar to voicing asymmetries found in French stop + liquid onset clusters (Colantoni and Steele, 2005).

Further evidence of the effects of gestural coordination is found in the participants' performance on the homorganic clusters. These clusters have much lower rates of intrusion than the heterorganic clusters, but much higher instances of liquid deletion and affrication. Affrication and liquid deletion occur in both

/dr/ and /tr/ clusters, but are much more frequent in the voiceless clusters. Intrusion is more likely in the voiced clusters, although it still occurs at much lower rates than in heterorganic clusters. In all cases, liquid deletion s co-occurs with affrication of the stop. In an analysis of affricated release of Spanish /tr/ clusters, Bradley (2006) proposes that the glottal spreading of the voiceless /t/ has the potential to devoice the rhotic, leading to a nearly complete co-articulation of the cluster, with the rhotic present only as voiceless upper spectra energy. Although upper spectra energy was not tracked in the affricates, Figure 7 shows an affricated and liquid-deleted /tr/ cluster with strong upper spectra energy, suggesting further investigation in this data is necessary. Analyzing affrication and liquid deletion not as separate processes, but as nearly complete coarticulation of the alveolar stop and the rhotic can explain why liquid deletion is dependent on affrication, but not vice versa.

In conclusion, the majority of non-target productions of word medial stop + liquid consonant clusters can be explained using a gestural model of phonology as either the overlap (affrication and liquid deletion) or spreading apart (intrusive segments) of the necessary articulatory gestures. Cluster-medial segments are found to be intrusive vowels rather than epenthetic vowels, following Hall's (2006) definition. Affrication without liquid deletion is partial coarticulation of the cluster, while what is coded as liquid deletion is actually nearly complete overlap of the articulatory gestures. Analyzing affrication and liquid deletion as nearly complete coarticulation of the alveolar stop and the rhotic can explain why liquid deletion is dependent on affrication, but not vice versa. Affrication without liquid deletion is partial coarticulation of the cluster, while what is coded as liquid deletion is actually nearly complete overlap of the articulatory gestures.

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Topic-focus Articulation and DP Scrambling as a Focus Movement in Japanese*

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1. Introduction

Among the many concerns in the syntactic analysis is how to deal with *wa*-marked phrases in Japanese. *Wa*-marked phrase is generally assumed to be a topic, but as will be discussed shortly, the fact is not that simple. Object DP scrambling into sentence initial position (middle scrambling in the sense of Tada(1993), henceforth DP scrambling) has also been discussed extensively, especially in terms of its optionality. One aim of this paper is to put forward the elaborated Japanese phrase structure that involves Topic Phrase (henceforth, TopP) and Focus Phrase (henceforth FP). Our claim is that when both the *wa*-marked phrase and scrambled DP appears sentence initially, *wa*-marked phrase serves as a topic and scrambled DP is a focus. On the other hand, when only the *wa*-marked topicalized DP appears, the subject plays a part of focus. This phrase structure is mainly based on Rizzi (1997), E.Kiss (1998) and Karimi (2005), but ours is crucially different from theirs in that ours has only one TopP slot.[1] Yanagida (1995) proposes FP. Watanabe (2003), mainly based on old Japanese data, also suggests TopP and FP. Their analysis, however, fail to examine scopal interactions between quantifiers.

Another aim of the paper is to scrutinize scopal interactions between quantifiers when DP scrambling is involved. Our claim is that DP scrambled into sentence initial position has wider scope. This scrambling is seen as a focus movement targeting Spec-FP. In contrast, *wa*-marked phrase moves into Spec-TopP. The organization of the paper is as follows: in section 2, we briefly mention the distinction between identificational focus and information focus due to E.Kiss (1998). In section 3, we present various Japanese data with DP scrambling. We also take up examples of DP scrambling and scrutinize scopal interactions between quantifiers. In section 4, we move on to the data on Italian, Hungarian, Korean, and Persian, which have similarity with Japanese ones. In section 5, we extensively discuss the elaborated Japanese phrase structure involving TopP and FP. Furthermore, in section 6, we discuss apparent problems of the analysis advocated here. Section 7 states the theoretical implications of our analysis, and concludes the paper.

2. Identificational Focus and Information Focus

Before entering the discussion on scrambling, let us touch on the distinction between identificational focus and information focus due to E.Kiss (1998). E.Kiss (1998) makes a distinction between identificational focus and information focus. E.Kiss (1998, 248) states that identificational focus expresses exhaustive identification, while information focus merely marks the nonpresupposed nature of the information it carries. She further notes that in Hungarian, identificational focus moves into the left periphery of the sentence and takes scope there, while information focus remains

in post verbal position.

When we adopt this distinction to Japanese, object DP scrambled into sentence initial position is a candidate to take up the role of indentificational focus. Let us begin by looking at examples in Japanese.

3. Data of Japanese DP scrambling

In this section we show various types of Japanese data with *wa*-marked DP and DP scrambling. The purpose is to prove the Topic-focus order.

3.1 Topic-focus order

3.1.1 Wa-o-ga sequence

(1) Taro no tanjyoobi no purezento-wa CD-o Hanako-ga kat-ta
T Gen britday Gen present-Top CD-Acc H-Nom buy-Past
"As for the birthday present for Taro, it is CD that Hanako bought."

In this sentence, *Taro no tanjyoobi no purezento* (=birthday present for Taro), *wa*-marked phrase, serves as a topic, which is seen to be already introduced into discourse, while *CD-o* (CD-Acc), scrambled DP, designates focus because it presents new information. The scrambled DP is more or less emphasized, if not given focal stress.

The same thing applies to the sentence below.

(2) Kazi-wa ryoori-o Hanako-ga suru
housework-Top cooking-Acc H-Nom does
"As for the housework, it is cooking that Hanako does."

In (2), *wa*-marked phrase is seen to be a topic, which is already introduced into the discourse. On the other hand, *ryoori-o* (=cooking-Acc), plays a part of focus because, as can be seen from the gross, this scrambled DP more or less shows exhaustive identification and claims that among the housework, it is cooking that *Hanako* does.

We can give another example to strengthen the view that *wa*-marked topic and scrambled DP constitute Topic-focus order.

(3) Mejaa riigu no kyuudan de wa Reddo Sokkusu-o Taro-ga ooen-suru
Major league Gen ball club among ToP Red Sox-Acc T-Nom root for-does
"As for the ball clubs in MLB, it is Red Sox that Taro roots for."

This sentence is used when we are talking about MLB and Taro roots for Red Sox. That is to say, the ball clubs in MLB serves as a topic, whereas Red Sox is a focus of the sentence. The scrambled DP more or less indicates exhaustive identification. This sentence means that it is Red Sox (not other clubs) that Taro roots for.

(4) Kaigi de wa Gichoo-o Taro-ga tantoo-suru
Meeting in Top chair-Acc T-Nom take charge of -does
"As for the meetings, it is Taro who takes the chair."

We utter a sentence like (4) when we are talking about job-sharing or something like that. The sentence means that among what we have to do, as for the meetings, it is Taro who takes the chair. Here again, *wa*-marked phrase acts as a topic, while scrambled DP serves as a focus.

(5) Sakka de wa Murakami Haruki-o Hanako-ga yoku yomu
writer among Top Haruki Murakami-Acc H-Nom often reads
"As for the writers, it is Haruki Murakami whose novels Hanako often reads."

In (5), too, *wa*-marked phrase is seen as a topic, whereas the scrambled DP acts as focus of the sentence. In this section, we have taken up examples where *wa*-marked phrases are immediately followed by scrambled DPs. This sequence is regarded as Topic-focus order.

3.1.2 *Wa-ga* sequence
Let us next move on to examples where *wa*-marked phrase shows up, followed by *ga*-marked subject.

(6) (Taro no tanjyoobi-no purezento de) CD-wa Hanako-ga kat-ta
(Taro Gen birthday Gen present among) CD-Top H-Nom buy-Past
"(Among the birthday presents for Taro,) As for CD, Hanako bought it."

In (6), *CD-wa* (=CD-Top) clearly is a topic of the sentence. *Hanako-ga* (=Hanako-Nom), on the other hand, serves as a focus. The sentence tells us that as for CD, it is Hanako who bought it, but we do not know anything about other things. This is confirmed because it is somewhat difficult to continue the sentence in (7) to (6).

(7) Demo CD-wa Jiro-mo kat-ta
But CD-Top J-also buy-Past
"But as for CD, Jiro also bought it."

This fact can be used to claim that the subject in (6) indicates exhaustive identification. Similar example is shown below.

(8) Ryoori-wa Hanako-ga suru
cooking-Top H-Nom does
"As for cooking, Hanako does it."

The sentence in (8) tells us that as for cooking, it is *Hanako* who does it. In this sentence, again, the subject presents exhaustive identification. This is another indication of the existence of Topic-focus order in Japanese.

(9) (Kaigi de) kiroku-wa Hanako-ga toru
(meetings in) record-Top H-Nom take charge of
"(In the meetings,) As for the record, Hanako takes charge of it."

The sentence in (9) means that as for the record, Hanako is in charge, or it is Hanako who takes every record of the meetings. Here again, *wa*-marked DP serves as a topic, whereas the subject is regarded as a focus of the sentence.

3.1.3 O-ga sequence
In this section, examples with DP scrambling are examined. When we scramble the DP object, the object is seen as focus of the sentence. This scrambled object designates identificational focus of the sentence. Here are some examples.

(10) Beetoruzu-o Taro-ga yoku kiku
the Beatles-Acc T-Nom often listens to
"It is the songs of the Beatles that Taro often listens to."

(11) Murakami Haruki-o Hanako-ga yoku yomu
Haruki Murakami-Acc H-Nom often reads
"It is Haruki Murakami's novels that Hanako often reads."

The objects in (10&11) designate identificational focus. (10) shows among many songs, it is the Beatles' songs that Taro often listens to. Similarly, (11) means that among many writers, it is Haruki Murakami's novels that Hanako often reads. If this line of analysis is on the right track, DP scrambling cannot be seen as an optional movement. Instead, this should be seen to move focus elements into sentence initial position.

3.1.4 Wa-wa-ga sequence

In the previous sections, we examined rather (too) straightforward examples with only one *wa*-marked phrase and a DP scrambled element. The fact is, however, not that simple. In the sections to follow, we take up more complicated examples where more than one *wa*-marked phrase appear in one sentence. Let us begin by the examples below.

(12) Taro no tanjyoobi-no purezento-wa CD-wa Hanako-ga kat-ta
T Gen birthday-Gen present-Top CD-Top H-Nom buy-Past
"As for the birthday present for Taro, as for CD, Hanako bought it."

It is a well-known fact since Kuno (1973) that when two *wa*-marked phrases occur continually, the second one is considered as contrastive focus. In (12) the first *wa*-marked DP serves as topic, while *CD-wa* serves as contrastive focus. We can give another example.

(13) Kazi-wa ryoori-wa Hanako-ga suru
housework-Top cooking-Top H-Nom does
"As for the housework, as for cooking, Hanako does it."

It is also often discussed in the literature that when two *wa*-marked phrases occur successively, the second one can be given stress. Yanagida (1995) discusses this construction, and states that the second one is considered as contrastive focus. Focused elements are usually given stress, so the second *wa*-marked phrases in (12&13) should be considered as focus. These examples are another indication of our claim of Topic-focus order. Gill and Tsoulas (2004, 133) report similar effect. They argue that in Korean, when two *nun*-marked phrases (*wa*-marked phrases in Japanese) occur consecutively, the second one receives a contrastive focus interpretation.

3.1.5 O-wa sequence

(14) CD-o Hanako-wa kat-ta
CD-Acc H-Top buy-Past
"It is CD that Hanako bought."

(15) Ryoori-o Hanako-wa suru
cooking-Acc H-Top does
"It is cooking that Hanako does."

Wa-marked phrases are usually considered to be topic of a sentence when they are in sentence initial position. However, they can easily act as a subject. In (14&15), where DP scrambling are involved, the scrambled objects act as focus, whereas *wa*-marked phrases serve as the subject. These examples are seemingly counterexamples for our

analysis, but actually they strengthen our view of Topic-focus order.

Up to now, we have presented examples to demonstrate Topic-focus order in Japanese. In the next section, we consider data where quantifiers have scopal interactions in the sentences with DP scrambling. Our main claim is that scrambled DPs have wider scope.

3.2 DP scrambling and scopal interactions between quantifiers

As is well known since Hoji (1985) that when DP scrambling occurs, scope ambiguity arises between quantifiers. In the base order, only the subject takes wider scope, while in the DP scrambling construction, both the subject and the object can have wider scope. The observation by Harada (1977), however, constitutes a counterexample to this widely-held view. In (16a), with the base order, the subject has wider scope, while in (16b), with DP scrambling, the scrambled object has wider scope. This interpretation is what we follow in this paper.

(16) a. Meimei-ga 1-satu-no hon-o yon-da
each-Nom 1-CL-gen book-Acc read-Past each>one, *one>each
b. 1-satu-no hon-o meimei-ga t yon-da *each>one, one>each
1-CL-Gen book-Acc each-Nom read-past (Harada 1977, 101-2)

Let us give some examples.

(17) a. Dono gakusei-mo natu-yasumi-chuu-ni hon-o 3-satu yon-da
every student summer-vacation-during book-Acc 3-CL read-Past
every>three, *three>every
"Every student is such that they read three books during the summer vacation."
b. Hon-o 3-satu dono gakusei-mo natu-yasumi-chuu-ni t yon-da
book-Acc 3-CL every student summer-vacation-during read-Past
??every>three, three>every
"It is three books that every student read during the summer vacation."

In (17a), with the base order, the subject scopes over the object. In contrast, in (17b), with DP scrambling, the dominant reading is that the scrambled DP has wider scope.

Let us next move on to the following examples.

(18)a. Dareka-ga (toshokan-no) hotondo-no hon-o kari-dasi-ta
someone-Nom (library-Gen) most-Gen book-Acc check out-Past
some>most, *most>some
" There is someone who checked out most of the books in the library."
b.(Toshokan-no) hotondo-no hon-o dareka-ga t kari-dasi-ta
(library-gen) most-Gen book-Acc someone-Nom check-out-Past
??some>most, most>some
"For most of the books in the library, there is someone who checked out them."

Here, again, in (18a), the subject takes wider scope, while in (18b), the dominant reading is that the scrambled DP has wider scope. If the scope judgement here is on the right track, this amounts to saying that in the base order, the object constitutes information focus, whereas in the construction with DP scrambling, the scrambled DP serves as identificational focus of the sentence. This is because, as is extensively discussed in E.Kiss (1998) and others, identificational focus has scopal interactions with other quantified elements, while information focus does not. We can confirm this by stress assignment on elements. Ishihara (2001) argues that the scrambled elements can be assigned additional stress. We can extend his analysis in cases in which DP scrambles into sentence initial position with the main stress on it.

(19) a. Nani-o Taro-ga kat-ta no?
what-Acc T-Nom buy-Past Q
"What did Taro buy?"
(19) b. Taro-ga hon-o kat-ta no
T-Nom book-Acc buy-Past
"Taro bought a book."
c. HON-O Taro-ga t kat-ta no
book-Acc T-Nom buy-Past
"It is a book that Taro bought."

Both (19b&c) can be uttered as an answer to the question in (19a), but (19c), with the main stress on the scrambled DP, is more natural as an answer. This indicates that DP scrambling is an instance of focus movement, which moves focalized element into sentence initial position.

This line of analysis is what is often discussed in Italian, Hungarian, Persian, and even Korean, where focused elements are usually given stress. In the next section, we take up examples from these languages.

4. Data from Italian, Hungarian, Korean, and Persian

In this section, we give examples from the above four languages.

4.1Data from Italian

(20) a. A Gianni, che cosa gli hai detto?
"To Gianni what did you tell him?"
b. A Gianni, QUESTO, domani, gli dovrete dire
" To John THIS tomorrow you should tell him"
(Rizzi 1997, 290)

Rizzi (1997) claims that in Italian, Topic and focus can co-occur, and the order can be Topic-focus, as in (20a), or Topic-focus-topic, as in (20b).

4.2 Data from Hungarian

E.Kiss (1998, 247) extensively discusses Hungarian data, and concludes that Hungarian has the following Topic-focus structure.

(21) [TopP $Mari_i$ [FP $Peterre_j$ $szavazott_k$ [VP t_k t_j t_i]]
Mary Peter voted-she
"As for Mary, it was Peter that she voted on."

Furthermore, let us consider Hungarian examples in which quantifier scope relations are rigid.

(22) a. KET NYELVET beszel mindenki
two languages-Acc speak-PRES-3SG everybody-Nom
two>every, *every>two
"TWO languages are spoken by everybody."
b. Ket nyelvet mindenki beszel
two languages everybody speaks (Puskas 2000, 106)

In (22a), where the object DP is focused, it has scope over the subject. In contrast, in

(22b), the object DP is in the topic field, it does not have scopal interactions with the subject. These data reveal that in Hungarian, quantifier scope relations are rigid, and that focus elements, but not the topic elements, have scopal interactions. The similar example isshown below.

(23) KEVES NEZO latott minden filmet
few spectator saw every film-Acc few>every, *every>few
"Few spectators saw every film." (E.Kiss 2008, 472)

In this example, again, the focused element scopes over the subject. The data shown above clearly indicates that Hungarian has Topic-focus order, and that only the focused elements have scopal interactions.

4.3 Data from Korean

(24) ku chayk-un (ejey) Chelswu-NUN (ejey) sa-ss-ta
the book-Top (yesterday) Chelswu-Foc (yesterday) buy-Past-M
"Chelswu bought the book (yesterday)"

Choe (1995,285) states that when more than two NP-*nun* phrases occur in a sentence, the first one obligatorily is interpreted as a topic, while the second one is interpreted as a contrastive focus. This is another indication of Topic-focus sequence.

4.4 Data from Persian

(25) una-ro RAHJUE diruz be man dad
they-ra Rahjue yesterday to me gave-3sg
"As for them, it was RAHJUE who gave them to me."

Karimi (2005,130) argues that Persian has a Topic-focus order, as shown in (25). Karimi (2005, 165-6)) also gives examples of scope interaction between quantifiers.

(26) a. har daneshju-i tu in kelas ye ketab-i-ro mi-xun-e
every student-ind in this class a book-ind-ra dur-read-3sg
every>one, *one>every
"Every student is this class reads one book."
b. [ye ketab-i-ro]$_i$ har danesshju-i tu in kelas t_i mi-xun-e
every>one, one>every
"There is one specific book that every student reads." =primary reading

In (26a), only the subject has wider scope. On the other hand, in (26b), both the subject and the object can have wider scope, but the primary reading is the one where the scrambled object has wider scope. This exhibits the fact similar to that in Japanese. That is to say, when DP scrambling is involved, the reading where the scrambled object has wider scope is dominant. This is more so when the scrambled object has focal stress.

In this section, we put forward data from Italian, Hungarian, Korean, and Persian to strengthen our view that when there are topic and focus in a sentence, they occur in the Topic-focus sequence, and that in many cases, DP scrambling has scope fixing effect. In the next section, we put forward the elaborated Japanese phrase structure.

5. Topic-focus Articulation in Japanese

The aim of this section is to put forward the elaborated Japanese phrase structure with TopP and FP. This is mainly based on what Rizzi (1997) proposes for Italian.

However, as will be shown shortly, ours is crucially different from his in that ours has only one slot for Topic. Karimi (2005) proposes a similar phrase structure for Persian, which has only one slot for Topic. This is because TP is a slot for another topic. This is very close to what we propose here. Let us start by looking at Rizzi's (1997) claim. Based on Italian data, Rizzi (1997, 297) proposes the following phrase structure.

(27) [Force P Force [TopP* Top [FocP Foc [TopP* Top [FinP Fin [IP]]]]]]

He proposes this because, as we saw (20b) in section 4.1, Italian allows multiple topics. E.Kiss (1998, 2007) and others also think of similar phrase structure for Hungarian. On the other hand, Karimi (2005, 122) proposes the following phrase structure for Persian, where there is only one TopP.

(28) [CP [TopP [FP [TP [T' [[vP [v' [XP [X']] v]]]]]]]]

Let us, now, propose the following phrase structure for Japanese.

(29) [CP [TopP [FP [TP [vP [VP V] v]T]F]Top]C]
This has only one slot for Topic and focus. Let us schematize how this works, taking up (2) and (8) as examples.

(30)a. Kazi-wa ryoori-o Hanako-ga suru (=(2))
housework-Top cooking-Acc H-Nom does
b. Ryoori-wa Hanako-ga suru (=(8))
cooking-Top H-Nom does
(31)a. [TopP kazi-wa [FP ryoori-o [TP Hanako-ga [vP tsubj [VP tobj suru]v]T]F]Top]
b. [TopP ryoori-wa [FP Hanako-ga [TP tsubj [vP tsubj [VP tobj suru]v]T]F]Top]

In (30a), *kazi-wa* is considered as topic, while *ryoori-o* is seen as focus. This has the structure shown in (31a). In contrast, in (30b), *ryoori-wa* is seen as topic, the subject as focus. The structure is represented in (31b). Let us show another example.

(32) a. Kazi-wa ryoori-wa Hanako-ga suru (=(13)
Housework-Top cooking-Top H-Nom does
b.[TopP kazi-wa [FP ryoori-wa [TP Hanako-ga [vP tsubj [VP tobj suru]v]T]F]Top]

(32b) is the structure for (32a), where two *wa*-marked phrases appear. The former serves as topic, while the latter as focus. Still other examples are shown below. In (33b), the scrambled DP moves into Spec-FP. Likewise, in (34b), the DP scrambles into Spec-FP. In (33b), the *ga*-marked subject, and in (34b), *wa*-marked DP moves into Spec-TP because both act as a subject of the sentences.

(33)a. Beetoruzu-o Taro-ga yoku kiku (=10)
the Beetles-Acc T-Nom often listens to
b. [FP Beetoruzu-o [TP Taro-ga [vP tsubj [VP yoku [VP tobj kiku]]v]T]F]
(34) a. CD-o Hanako-wa kat-ta (=14)
CD-Acc H-Top buy-Past
b. [FP CD-o [TP Hanako-wa [vP tsubj [VP tobj kat]v]ta]F]

6. Apparent Problems of Our Analysis

Up to now, we have claimed that DP scrambling in Japanese is a focus movement. Moreover, our claim is that, unlike Italian or Hungarian, Japanese has only one slot for both topic and focus. The following example may constitute a counterexample to

our analysis because it has *wa-ga-wa* sequence, and the second *wa* may be considered to be contrastive focus.

(35) a. Kaji-wa Hanako-ga ryoori-wa suru
housework-Top H-Nom cooking-Top does
b. Kaji-wa Hanako-ga ryoori-o suru
Housework-Top H-Nom cooking-Acc does

(36) Kazi-wa ryoori-wa Hanako-ga suru (=13)
Housework-Top cooking-Top H-Nom does

In (35a), *ryoori* (=cooking) is marked by *wa*, while it is marked by *o* in (35b). They contrast with (36), where *ryoori* is marked by *wa*, and scrambles into sentence initial position. Both *ryoori-wa* in (35a) and *ryoori-o* in (35b) should be regarded as an information focus because they both act only as an object. In (36), *wa*-marked DP scrambles, and serves as contrastive focus. This indicates that the object DP in the base position acts only as an information focus, while it can serve easily as a contrastive focus when it scrambles.

Another issue that comes to our mind is the distinction between contrastive focus and identificational focus. Here, we have argued that these two are the same. However, some works, such as Hovarth (2006), state that focus indicates exhaustive identification, and it differs from contrastive focus. It is our future issue to make a clearer distinction between these two notions.

Still another issue is how to deal with long distance scrambling in Japanese. Refer to Nakamura (2007) for a discussion.

7. Theoretical Implications and Conclusion

In this paper, we have argued that DP scrambling is a focus movement targeting Spec-FP. This implies that DP scrambling is not an optional but an obligatory operation to show the proper scope relations between quantifiers. We have also advocated the elaborated Japanese phrase structure involving TopP and FP above TP. *Wa*-marked phrases constitute topic and move into Spec-TopP, whereas scrambled DPs move into Spec-FP. The phrase structure is similar to what Rizzi (1997) proposes for Italian, but ours is crucially different from Rizzi's because ours has only one slot for topic.

Notes

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1 Endo (2007) also proposes the Japanese phrase structure similar to ours, but his analysis is based on Rizzi(1997), and he postulates multiple slots for topic.

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Functional Morphology in Pre-Symptomatic Huntington's Disease: Evidence from Hungarian

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1. Introduction

This study begins to explore language processing in pre-symptomatic Huntington's Disease individuals who are speakers of an agglutinative language, namely, Hungarian.

1.1 Huntington's Disease (HD)

HD is a rare autosomal dominantly inherited progressive neurodegenerative disorder involving atrophy of the basal ganglia, which leads to choreiform, involuntary movements, personality changes and dementia (Reiner et al., 1988). The onset of symptoms is highly variable. It usually takes place during mid-life, but it can occur at any time. The progression of the disease inevitably leads to death within 10-15 years. The characteristic neuropathological features of HD are macroscopic atrophy of the caudate nucleus, and neuronal loss and fibrillary astrogliosis in the striatum. The mutant gene causing HD, i.e., IT-15, codes a 348 kD, 3144 aa protein, huntingtin, which is widely distributed in both neurons and extraneuronal tissues. The mutation in HD involves the expansion of a trinucleotide (Cytosine-Adenine-Guanine) repeat encoding glutamine at the 5' end of the coding sequence, resulting in a polyglutamine stretch in the huntingtin protein. In healthy individuals, the CAG repeat number ranges from 9 to 35 (median: 19), while in patients with HD the range is 39-121 (median: 44). There is a borderline zone between normal and abnormal CAG repeat lengths (36-39) due to the incomplete penetrance of the disease phenotype

(Huntington's Disease Collab. Res. Group, 1993; Kremer et al., 1994; Rubinstein et al., 1996).

1.2 Huntington's Disease and language

Few studies have systematically examined language in HD. Here we attempt to address this gap by studying the ability to produce functional morphology in HD. Previous studies of HD patients' production of functional morphology focused on verb-related morphology, specifically the English past tense and the French present and future tenses, and suggested impaired performance in HD compared to healthy subjects (Ullman et al., 1997; Teichmann et al., 2005); for example, HD patients were reported to exhibit over-suffixation (e.g., *lookeded* instead of *looked*). Here we extend this line of investigation in three ways. First, we test the cross-linguistic validity of previous findings by examining Hungarian, a typologically different (i.e., agglutinative) language. Second, we investigate whether previous results hold across linguistic categories by examining nominal instead of verbal morphology. If previous results were found to hold across languages and linguistic categories, this would make it possible to establish that inflectional morphology is impaired in HD, a discovery of theoretical relevance to questions concerning the role of basal ganglia in language (Colombo et al., 1989; Fabbro et al., 1996; Lieberman, 2007). For example, the basal ganglia have been proposed to be involved specifically in syntactic and morpho-syntactic processing (e.g., Lieberman et al., 1992, Ullman et al., 1997, Ulman 2001, Kotz et al., 2003, Teichman et al., 2005).

Finally, we ask whether (genetically proven) HD individuals who are *pre*-symptomatic ("pre-HD") also show difficulties with functional morphology. A number of studies have tested pre-HD subjects on processing speed and memory (Campodonico, 1998; Solomon, 2007) yet, to the best of our knowledge, to date no study has tested pre-HD individuals on language. If the present investigation were to reveal deficits in pre-HD individuals' performance on functional morphology, this could have diagnostic value in clinical practice, that is, may be predictive of the onset of clinical symptoms. Determining the very earliest expression of HD's phenotype is critical for developing and testing preventative interventions.

1.3 Hungarian noun morphology

Hungarian is an agglutinative language. Its functional morphology is much richer than that of English. For example, the Hungarian nominal case system has more than 15 cases, depending on how they are counted. Here we focus on the singular and plural numbers and on the nominative and accusative cases. The singular number involves zero morphology, while the plural marker is the suffix *–k*. Nominative case is associated with the subject (the agent role) and involves

zero morphology. Accusative case is associated with the direct object (the patient/theme role) and involves the suffix *-t*. Thus, the singular nominative form of a noun involves the stem only, the plural nominative form consists of the stem plus the plural suffix, the singular accusative form involves the stem plus the accusative suffix, and the plural accusative form consists of the stem plus the plural suffix plus the accusative suffix (Figure 1).

Hungarian nouns fall into two categories: regular and irregular. When regular nouns combine with suffixes, the stem either does not change (i), or changes according to productive morpho-phonological rules such as vowel lengthening (ii):

(i)	*kert*	*kert- ek*	(no change)
	garden	garden-PL	
	'garden'	'gardens'	
(ii)	*róka*	*róká-k*	(low-vowel lengthening)
	fox	fox-PL	
	'fox'	'foxes'	

The morpho-phonological rules found in regular nouns are productive, applying regularly to any noun form provided that the general phonological contexts required for their application are obtained. Hungarian regular nouns resemble to a certain extent English nouns where productive phonological rules determine the phonological shape of the plural *-s* suffix, that is, [əz] when a stem ends in a sibilant (e.g. *bus, bush, badge*), [s] when the stem ends in a voiceless consonant (e.g. *cap, back*), and [z] in all other contexts (e.g. *cab, bag, call, spa, boy*). Figure 1 illustrates the regular noun *hal* 'fish' in the four forms of interest here.

Hungarian irregular nouns exhibit idiosyncratic morpho-phonological rules, that is, the change(s) that the stem undergoes when combining with a suffix are item-specific/non-productive. Figure 1 illustrates the irregular noun *ló* 'horse' in the four forms under investigation. (For further details on Hungarian morphology, the reader is referred to MacWhinney 1985).

Figure 1: Hungarian noun morphology

Number/case	Form	Regular	Irregular
SG.NOM.	stem	hal 'fish'	ló 'horse'
PL.NOM.	stem + /k/	hal-ak	lov-ak
SG.ACC.	stem + /t/	hal-at	lov-at
PL.ACC.	stem + /k/ + /t/	hal-ak-at	lov-ak-at

2. Methods

2.1 Subjects

Three pre-HD subjects (all monolingual Hungarian native speakers) participated in this study. They had positive family history for HD and had genetic testing for the expanded triplicate repeat in the "huntingtin" gene at IT-15; genetic testing was conducted at University of Pecs, Hungary. All three subjects tested positive for the mutation, having more than 40 *CAG* repeats (Table 1). Based on standardized neurological examination administered independently by the 3rd and 4th authors who are neurologists specializing in HD at the University of Szeged Hospital, it was determined that the three subjects were free of clinical neurological and motor symptoms. No subject showed evidence of dementia on the Mini-Mental State Examination (Folstein et al. 1975; MMSE normal range is 27-30).

Table 1: Demographic and clinical characteristics of the pre-HD subjects

ID	Age	Sex	Years educ.	Hand preference	# of CAG repeats*	MMSE	Neurological symptoms
FA	30	M	12	R	46/16	30	No
JB	43	F	18	R	42/19	30	No
VD	32	M	15	R	44/18	30	No

*Numbers of CAG repeats on abnormal and normal alleles

Each pre-HD subject was matched with three normal controls in terms of age (mean age = 35.44, SD = 5.77), gender (6 males, 3 females), and nonverbal IQ, which was measured by the Raven Intelligence Scale ($F(1,10) = 0.472$, $p = 0.508$). The nine normal controls had negative family history for HD or other neurodegenerative diseases. General cognitive ability for all subjects was evaluated based on a set of eight common neuropsychological measures (Table 2). These included measures of fluency (Semantic fluency), verbal /phonological working memory (Word recall, Digit span, and Non-word repetition), visuo-spatial working memory (Corsi Block tapping test), and complex working memory (Listening span, Reading span, and Backward digit span). The pre-HD subjects did not differ from the controls on six of these measures. Although the pre-HD group's performance was weaker compared to controls on the other two measures, their scores were nevertheless within the normal range or borderline (normal range for Listening span being 3-3.66, and for Corsi Blocks 5-7).

Table 2: Neuropsychological performance of pre-HD subjects

ID	Semantic fluency[1]	Word recall[2]	Digit Span[3]	Non-word repetition[4]	Listening Span [5]	Reading Span[6]	Backward Digit Span[7]	Corsi Blocks [8]
FA	18	5	5	6	2	2	5	5
JB	21	6	7	8	3	3,66	6	5
VD	18	4	5	5	3	3	4	5
Diff. from controls	t(10)= 0.543, p=0.731	t(10)=-1,282, p=0.229	t(10)=-0.732, p=0.481	t(10)=-1,342, p=0.209	t(10)=-2.293, p=0.045	t(10)=-1,273, p=0.232	t(10)=-1,282, p=0.229	t(10)=-2.481, p=0.033

[1] Rosser & Hodges, 1994
[2] Conway & Christiansen, 2005; Nemeth, Ivady, Mihaltz, Krajcsi, & Pleh, 2006
[3] Racsmány, Lukács, Németh, & Pléh, 2005
[4] Németh, Racsmány, Kónya, & Pléh, 2001; Gathercole, Willis, Baddeley, & Emslie, 1994
[5] Janacsek, Tánczos, Mészáros, & Nemeth, in press; Daneman & Blennerhassett, 1984
[6] Racsmány, Lukács, Németh, & Pléh, 2005; Daneman & Carpenter, 1980
[7] Conway et al., 2005
[8] Lezak, 1995

All participants provided written consent before testing began. This study was approved by the local ethical committee of the University of Szeged.

2.2 Task

Subjects participated in an experiment involving a Noun-Morphology Production Task. This is a picture-naming subtest of a longer protocol developed earlier for language impaired children by Pléh, Palotás and Lőrik (2002). Participants were given three practice items to ensure that they understood the task. The test items consisted of 18 regular nouns and 13 irregular nouns. Item length was 2-3 syllables. For each of the total 31 test items, subjects saw a total of four pictures designed to elicit the nominative singular form of the noun, the accusative singular form, the nominative plural form, and the accusative plural form, presented one at a time, via computer. For example, to elicit the nominative plural, participants were presented with a picture depicting multiple fish, and to elicit the accusative singular, participants were presented with a picture of a fisherman catching a fish. Participants were prompted with questions such as "What are these?" or "What is the fisherman catching?" For each noun, the four pictures followed the order described above.

Responses were tape-recorded and then transcribed and coded by the first author. The dependent variable was amount of errors. A response was coded as correct if it exactly matched the target form; otherwise, it was considered an error. Errors for regular verbs were classified into the following types: substitution, over-suffixation, and under-suffixation. Thus, for the noun *hal* 'fish' (which also represents the nominative singular form), an example of a substitution error would be production of the accusative instead of the plural suffix (**hal-at* 'fish-Acc' for *hal-ak* 'fish-Pl'), an example of an over-suffixation error would be production of both the accusative and plural suffixes in contexts where only the plural is required (**hal-ak-at* 'fish-Pl-Acc' for *hal-ak* 'fish-Pl'), and an example of an under-suffixation error would be production of only the plural suffix in contexts where both accusative and plural are required (**hal-ak* 'fish-Pl' for *hal-ak-at* 'fish-Pl-Acc'). Errors for irregular verbs consisted of the same types as for regular verbs except that they additionally included over-regularization errors, where an irregular noun such as *ló* 'horse' was regularized, as in **lót* instead of *lovat* 'horse-Acc.'

3. Results

Compared to healthy controls who performed at ceiling levels, the pre-HD subjects demonstrated a decline in performance on the production of morphologically complex noun forms. As shown in Table 3, the pre-HD subjects significantly differed from the healthy controls in the amount of overall

errors ($F(1,10) = 283$, $MSE = 132$, $p < 0.001$), showing significantly more errors with both regular ($F(1,10) = 26$, $MSE = 12$, $p < 0.001$) and irregular nouns ($F(1,10) = 155$, $MSE = 72$, $p < 0.001$). Additionally, the pre-HD subjects differed significantly from the normal controls on each type of error (except on under-suffixation errors in regular nouns, though a trend was observed even here ($F(1) = 3.75$, $MSE = 0.250$, $p = 0.082$). Pre-HD subjects produced significantly more errors on irregular nouns than regular nouns ($F(1,10) = 34.9$, $MSE = 15.13$, $p < 0.001$). There were no significant differences between regulars and irregulars among the control subjects as they had no errors at all.

The types of errors most common in the pre-HD group were substitution with regular nouns, and over-suffixation with irregular nouns. Across both regular and irregular nouns, the most prevalent type of error consisted in over-suffixation (Table 3).

Table 3: Production of morphologically complex nouns (plural, accusative, plural + accusative) in pre-HD and control subjects

		FA #	JB #	VD #	Pre-HD group (N=3) Mean	Control group (N=9) Mean	Group mean difference
Regular (54)	Correct (*hal, halat, halak, halakat*)	50	52	53	51.67	54	F(1,10)=26, MSE=12, p<0.001
	Errors	4	2	1	2.33	0	F(1,10)=26, MSE=12, p<0.001
	Substitution (*hal**ak*** for hal***at***)	2	1	1	1.33	0	F(1,10)=60, MSE=4, p<0.001
	Over-suffixation (*hal***akat** for hal***ak***)	1	1	0	0.67	0	F(1,10)=15, MSE=1, p=0.003
	Under-suffixation (*hal***ak** for hal***akat***)	1	0	0	0.33	0	F(1,10)=4, MSE=0.25, p=0.082
Irregular (39)	Correct *(ló, lóvat, lovak, lovakat)*	33	35	32	33.33	39	F(1,10)=155, MSE=72, p<0.001
	Errors	6	4	7	5.67	0	F(1,10)= 155, MSE=72, p<0.001
	Substitution (*lov***ak** for lóv***at***)	2	0	1	1	0	F(1,10)=11, MSE=2, p=0.007
	Over-suffixation (*lov***akat** for lov***ak***)	1	1	4	2	0	F(1,10)=15, MSE=9, p=0.003
	Under-suffixation (*lov***ak** for lov***ak***at)	1	1	1	1	0	N/A
	Over-regularization (*lót for *lovat*)	2	2	1	1.67	0	F(1,10)=60, MSE=16, p<0.001
Total (93)	Correct	83	87	85	85	93	F(1,10)=283, MSE=132, p<0.001
	Errors	10	6	8	7.66	0	F(1,10)=283, MSE=132, p<0.001
	Substitution	4	1	2	2	0	F(1,10)=26, MSE=12, p<0.001
	Over-suffixation	2	2	4	2.66	0	F(1,10)=60, MSE=16, p<0.001
	Under-suffixation	2	1	1	1.33	0	F(1,10)=60, MSE=4 , p<0.001
	Over-regularization	2	2	1	1.66	0	F(1,10)=94, MSE=6, p<0.001

4. Discussion

Our preliminary results cohere with previous findings regarding the impaired production of functional morphology in HD obtained based on the English past tense and the French present and future tenses (Ullman et al., 1997, Teichmann et al., 2005). The present results on Hungarian nominal inflectional morphology broaden the scope of this line of investigation, suggesting that the observed decline holds both across languages and linguistic categories.

The finding that the production of functional morphology is impaired in carriers of the HD mutation supports previous proposals arguing for the involvement of basal ganglia, particularly the caudate nucleus, in language (Colombo et al., 1989; Fabbro et al., 1996; Lieberman, 2007). In particular, it strengthens prior research claiming a role for the basal ganglia in syntactic and morpho-syntactic processing (Lieberman et al. 1990; Liberman et al., 1992; Ullman et al., 1997; Ullman, 2001; Kotz et al., 2003; Teichmann et al., 2005).

The fact that despite *the lack of motor or neurological symptoms* the pre-HD participants demonstrated a decline in their ability to produce functional morphology bears on the debate on whether or not pre-HD individuals exhibit any kind of cognitive impairment (Brandt, 2002). The present results lend support to earlier reports of decline in processing speed and memory preceding neurological symptoms (Campodonico et al., 1998; Solomon et al., 2007) and suggests that linguistic tests such as the one used here may have diagnostic value in HD, that is, may be predictive of the onset of clinical symptoms.

Notes

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Understood Arguments and Complex Logical Forms

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1 Introduction

This study deals with complement-drop phenomena in English. In such cases, the listener is able to recover missing information when the verb's complement is omitted. There are two main types of such constructions. In one, the understood argument has indefinite reference. This is known as the "unspecified object alternation" (Levin 1993) or as "indefinite null complement" verbs (Fillmore 1986). Here we will designate such verbs as "Indefinite Understood Argument" (IUA) verbs: this is because the use of an expression such as "null complement" implies that there is a null element in the syntax, a claim that has not been established.

Examples of IUA constructions are,

Indefinite Understood Argument (IUA) examples

(1) a. Klein baked a cake.
b. Klein baked **U** all day. ("**U**" is the understood element.)

(2) a. Levenson cleaned the house today.
b. Levenson cleaned **U** today.

The second type of understood-argument verbs are "Definite Understood Argument" (DUA) verbs. Here complement drop is possible only if discourse information supplies the content of what is understood.

Definite Understood Argument (DUA) examples.

(3) a. Sid sued Elaine.
b. Sid fell on Elaine's property. He sued **U**.

(4) a. He heard about Josh's arrival.
b. April told him about Josh's arrival, but he had already heard **U**.

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(4) a. He heard about Josh's arrival.
b. April told him about Josh's arrival, but he had already heard **U**.

Not all verbs permit IUA or DUA, e.g. *He {hit, kissed, annulled, etc.}* ***U.*** And, of those verbs that do permit it, not all *senses* of such verbs permit the alternation.

(5) a. Klein baked a potato/ *Klein baked **U** (compare (1))
b. He heard the speech./ *He heard **U**. (compare (4))

The main controversy regarding these alternations is how they are licensed, and what sort of information ought to appear in the lexical/functional representation. Previous studies have proposed that pragmatic factors are important for licensing, and that it is not possible to semantically distinguish alternating verbs from non-alternating ones. However, we will argue that it is not necessary to resort to explanatory factors outside the lexical-semantic structure of verbs in order to determine the conditions under which an English verb will permit the understood complement alternation.

Our goals in this study, then, are:

I. Provide licensing conditions for complement drop.
II. Give a lexical-semantic structure for such verbs that distinguishes them from non-alternating verbs.

Our central claims are,

(6) **Central claims of study**
I. Both $\mathbf{U_{DUA}}$ and $\mathbf{U_{IUA}}$ are of a structure that we describe as complex or *molecular*: **U = ∃x[P(x)]**
II. Overt complements of verbs that do not permit complement omission are of a simplex or *atomic* structure, **Overt complement = (VERB) d**

In this view, **U** is a formula, a structure with an unvalued variable; it is not a logical constant.

2 Earlier Proposals

Fillmore (1986). Fillmore focuses on DUA alternations; he states that neither a semantic or a pragmatic analysis can predict which verbs can alternate. A semantic account is disproved by such examples as,

(7) a. A: Why did you marry her?
b. B: Because mother insisted/*required/*demanded. (p.98)

Since these verbs are closely synonymous, a lexical-semantic account fails.

A pragmatic account is refuted by examples such as

(8) *Did you lock?

which cannot be rendered grammatical by contextual information.

Groefsema (1995). Groefsema disputes Fillmore's account on both fronts, the semantic and the pragmatic. Regarding semantics, she states that he does not provide an account of *how* the verbs of (7b) are related. Regarding pragmatics, she states that Fillmore does not give an account of what makes a referent immediately retrievable from the context (p.144).

Instead, Groefsema proposes a combined semantic-pragmatic account in which lexical-semantic features of verbs interact with principles of relevance. (See Jackendoff (1990), Sperber and Wilson (1986)). So, for instance, in

(9) Martina Navratilova has won again.

The conceptual address for *Martina Navratilova* "makes immediately accessible the assumption that [she] has won an instance of a tennis competition" (p.159). Also the verb selects for *instances*, not *types* of things; this gives the definite reading for the understood argument in (9) (p.147).

Problems with these accounts

Consider this contrast:

(10) a. Some people were having a picnic.
b. Mary watched them. c. Mary watched **U**.

(11) a. Some people were lying unconscious.
b. Mary watched them. c. *Mary watched **U**.

--Since *watch* is used in the same sense in both examples, Fillmore's explanation incorrectly predicts that (11c) should be grammatical.

--Since contextual details are similar for both (10) and (11), Groefsema's theory incorrectly predicts that the grammaticality status of (10c) and (11c) would be identical.

Furthermore, a fundamental inadequacy of a pragmatic approach is that (as pointed out by Fillmore (p.104)), elements with the thematic role of Patient are systematically excluded from the DUA alternation:

(12) *Did you lock? (=(8))/ *Did you hit?/ *Did you kiss?

An appeal to relevance does not account for this.

3 Structure of Indefinite Understood Complements

In providing a purely lexical-semantic account for these alternations, we begin by motivating the structure of (6I) for IUA verbs:

(13) **Claim**: the structure of $\mathbf{U}_{\mathbf{IUA}}$ is "∃x[P(x)]"

Our first point is that since these constructions are indefinite, existential quantification in the logical form is easily postulated.

(14) She baked **U**./ She knitted **U**./ She sculpted **U**.

can only mean that she baked, knitted, sculpted some unspecified object. Thus our initial logical form for *She baked **U*** could be

(15) ∃x[Bake(she,x)]

But this formula leaves out some information. Compare,

(16) Klein baked a cake. /Klein baked **U** all day.
(17) Klein baked potatoes all day./ *Klein baked **U** all day.

These examples show that there are limits on what the "∃x" can be.
Also there is a telicity entailment of the overt-complement form that is absent in the IUA form.

(18) a. She baked a cake. (telic event: a cake is produced)
b. She baked **U** for a while, but did not produce a cake. (result not entailed)

Therefore the lf of **U** in (18b) could not be

(19) *∃x[baked_goods(x)]

because that would mean that she produced something.
Where, then, is the indefiniteness to be found in the representation of $\mathbf{U}_{\mathbf{IUA}}$? We try to find the answer in the structure of the IUA verbs themselves.

3.1 Comparing IUA verbs with non-IUA verbs

In comparing the two types of verbs, we make one central observation: IUA verbs participate in other alternations beside the complement-drop one. Non-IUA verbs do not participate in these other alternations.

What we propose is that verbs that alternate in a way other than the IUA alternation are shown to have a complex lexical structure: this correlates with the complex or molecular structure we have given for "**U**". Verbs that do not so alternate are simplex, which correlates with non-omissible complements.

In describing these facts we focus on two types of IUA verbs: verbs of creation and verbs of cleaning.

(20) **IUA verbs of creation:** bake, knit, sculpt, write, cook
(21) **IUA verbs of cleaning:** clean, dust, iron, vacuum

The verbs in (20) can undergo the *material-product* alternation.

(22) **Creation verbs: Material/Product Alternation (& IUA alternation)**
a. **bake:** ingredients into a cake/ a cake out of ingredients
b. **knit:** yarn into a sweater/a sweater out of yarn
c. **sculpt:** marble into a statue/ a statue out of marble

The verbs in (21) can undergo the *substance/surface* alternation.

(23) **Verbs of cleaning: Substance/Surface Alternation (& IUA alternation)**
a. **clean:** dirt off surface/ surface of dirt
b. **dust:** lint off surface/ surface free of lint
c. **vacuum:** dirt out of carpet/ carpet

So we find a correlation between the possibility of complement drop and the possibility of some other type of alternation.

Now examine non-IUA verbs of creation and cleaning.

Creation verbs: (non-IUA): *build, fashion*
(24) a. build a house out of bricks/ *bricks into a house.
(no material/product alternation)
b. *He built **U** all day. **(IUA impossible)**
(25) a. fashion flowers out of silk/ *fashion silk into flowers
(no material/product alternation)
b. *Kerry fashioned.**U**. **(IUA impossible)**

Verbs of cleaning (non-IUA): *cleanse, purify*
(26) a. cleanse the floor of dirt/ *cleanse dirt off the floor
(no substance/surface alternation)
b. *He cleansed **U** **(IUA impossible)**
(27) a. purify the water/ *purify pollutants out of the water
(no substance/surface alternation)
b. *He purified **U**. **(IUA impossible)**

We conclude from these data that verbs that undergo the material/product or surface/substance alternations are thereby complex in structure: they take clausal complements. This correlates with participation in the IUA alternations.

And verbs not participating in such alternations are simplex: they take simple NP complements with no interior lexical structure. This correlates with the impossibility of complement drop. We make the following claim:

(28) **Claim**: The fact that the verbs of (20-21) have more than one complement argument shows transparently that a predication lf is possible for understood arguments.

This idea works out as follows:

"Full structure" of IUA verbs:

(29) *bake (a cake)* = bake [MATERIAL [into PRODUCT]]
(30) *clean (the floor)* = clean [SUBSTANCE [off SURFACE]]

"Full structure" of non-IUA verbs:

(31) *fashion (flowers)* = fashion [PRODUCT]
(32). *cleanse (the floor)* = cleanse [SURFACE]

We characterize the structures of (29 and (30) as complex or molecular. On these grounds we propose a similar structure for the **U**-element.

(33) **U** = [∃x [P(x)]]

This formula is comparable to the full structures given in (29-30). We give the logical forms of **U** as follows.

(34) a. **Full meaning of *John baked U:*** John baked unspecified ingredients with the intention of producing baked goods.
. b. **Lf**: John bake [∃x [to_become_BAKED_GOODS(x)]] (compare (29))

(35) a. **Full meaning of *Gail cleaned U*:** Gail cleaned some unspecified substance off a surface.
b. **Lf**: Gail clean [∃x [off_SURFACE(x)]] (compare (30))

These correlations also predict which *sense* of a verb may allow for IUA.

(36) *bake a cake* vs. *bake a potato*
a. bake ingredients/ bake a cake/ bake **U**
b. bake a potato/ bake ?(no other possibility for a complement)/ *bake **U**

The change-of-state sense of *bake*, as in (36b), does not allow for the material/product alternation. This provides evidence that there is no internal structure for this sense of *bake*: it is simplex. Thus the structure for the change of state sense is simply,

(37) (bake) d

This is an atomic structure for which no object drop is allowed.

4 DUA Verbs: Licensing Conditions and Logical Structure

For DUA verbs we make this claim:

(38) **Claim**: $\mathbf{U_{DUA}}$ is of the same "$\exists x[P(x)]$" structure as $\mathbf{U_{IUA}}$.

In substantiating this claim, we first describe licensing conditions for definite understood objects: There are two such licensing factors: each factor corresponds to a part of the molecular formula.

(39) **DUA licensing factors:**

A. Factor A: mention in discourse of arguments which could serve as an overt complement to the verb.

B. Factor B: Mention in discourse of an eventuality whose description includes semantic features of the verb.

Consider the following discourses.

1st example.

(40) **Discourse:**
a. Pete was in a mall.
Continuations:
b. Tim followed him.
c. *Tim followed **U**.

(41) **Discourse**
a. Pete was walking around the mall.
Continuations:
b. Tim followed him.
c. Tim followed **U**.

--Licensing Factor A is satisfied in both (40) and (41), by the mention of 'Pete'.
--Licensing Factor B is satisfied in (41) but not in (40). The idea of *motion* is part of the semantic structure of *follow*. The fact that Pete is moving is not given in (40). DUA is thus licensed in (41) but not in (40).

2nd Example:

(42) **Discourse.**
a. Sid didn't like Elaine
Continuations:
b. … so he sued her
c.. * ... so he sued **U**.

(43) **Discourse:**
a. Sid fell on Elaine's property
Continuations:
b. … so he sued her.
c.. ... so he sued **U**.

--Licensing Factor A is satisfied in both (42) and (43) by the mention of 'Elaine'.
--Licensing Factor B is satisfied in (43) but not in (42): That is, a *tort* is part of the meaning of *sue*. This concept appears in (43) but not in (42). Therefore only in (43) is DUA possible.

We correlate the licensing factors with the two bracketed sub-parts of the molecular formula.
--The first subpart, "∃x", represents the argument information supplied by Factor A.
--The second subpart, "P(x)", represents the eventuality information provided by Factor B.

Therefore the lfs of (41c) and (43c) are:

(44) *Tim follow **U*** = Tim follow [∃x[moving(x)]]
(*x* is the dropped argument—"Factor A".
Moving is the predicate, related to the meaning of *follow*—"Factor B".)

(45) *Sid sue **U*** = Sid sue [∃x[responsible_for_tort(x)]]
(*x* is the argument and *responsible_for_tort* is the predicate related to the meaning of *sue*.)

The understood element has two components; thus its semantic representation is complex or, in our terms, molecular.

4.1 Motivation for existential quantification in DUA structures

This analysis leaves us with one main question: Why is existential quantification part of the structure of $\mathbf{U_{DUA}}$? Why do we not represent $\mathbf{U_{DUA}}$ as an ordinary predication whose arguments have been saturated, as in:

(46) a. ?follow [Pete [walking]] b. ?sue [Mary [responsible_for_tort]]

We now provide evidence for an unvalued variable in the representation of $\mathbf{U_{DUA}}$. Such evidence is found in an analysis of **epistemological verbs.**
Compare:

Epistemological verbs.
(47) **Selecting for $U_{DUA.}$**: I know **U**./ I found out **U**./ I forgot **U**..
(48) **Not selecting for $U_{DUA:}$** *I believe **U**./ *I figured out **U**./ *I discovered **U**.

These verbs select for a variety of complement-types (*that*-clause, direct object, PP-complement). This leads us to ask: Which of these types does **U** stand in for in (47)? Can **U** denote any of these types, or can we narrow its denotation down to only one? In answering this question, we survey different complement-selection possibilities for DUA and non-DUA verbs.

Survey of DUA-verb and non-DUA-verb complements
I. All the verbs of (47-48) take *that*-clauses.
(49) I {know, found out, forgot, believe, figured out, discovered} that Bruce is innocent..
II. All take direct objects.
(50) a. I [know, forgot, believe, discover] Mary.
b. I {found, figured}Mary out.
III. But only DUA verbs take PP-complements.
(51) a. I [know, found out, forgot] about that.
b. *I [believe, figured out, discovered] about that.

Since omissibility is correlated only with a PP-complement, we conclude that this, rather than a *that*-clause or direct object, is the denotation of **U** in (47). The *about*-clause is what is being dropped
Here, we claim, is where the variable is introduced. *That*-clauses and direct objects are fully saturated phrases; an *about*-clause is not. (In describing a *that*-clause as a fully saturated phrase, we follow the standard view that a *that*-clause is a referential singular term (Vendler 1967, Chierchia 1982 inter alia).
Hence, in

(52) I know that Bruce is innocent.

the *that*-clause refers to what I know, and no information is missing. But in,

(53) I know about Bruce being innocent.

the *about*-clause *alludes* to what is known, but does not state it. Therefore we postulate an unsaturated argument in (53).
This idea can account for the contrast in (7):

(7) a. A: Why did you marry her?
b. B: Because mother insisted/*required/*demanded. (Fillmore 1986: 98)

Only *insist* takes a PP-complement (*insist on*). *Require* and *demand* do not. In an *insist on* predication, what is insisted is not specified, so the complement is omissible.

Consider also:

(54) hear **U** (example from Fillmore 1986: 99)
a. **Discourse:** Bruce is innocent.
Responses:
b. I heard about that./ c. I heard something about that./ d. I heard **U**.

About-clauses have a slot for existentially quantified variables, as shown in (54c). This allows us to give

(55) hear [∃x[about_Bruce_being_innocent(x)]]

as the logical form of the DUA form in (54c).

Finally, consider a non-epistemological DUA verb:

(56) choose **U**
a. **Discourse context**:: She was wondering which course to take.
Continuations:
b. Finally she chose a course./ c. Finally she chose **U**.

Here it is not known which course was chosen. The only possible argument for **U** is a variable, represented by *which* in the discourse. The lf of (56c) is then,

(57) choose [∃x[course (x)]]

Our conclusion is that the lexical semantics of U_{DUA} include an unvalued variable. Even if the speaker/listener do happen to know the referent for the variable, the identity of referent and variable is only entailed, and is not part of the meaning of the understood element **U**.

4.2 Why no omissible elements with Patient theta-role?

Our complex structure for **U** explains why **Did you lock?* is not possible. The overt complement of *lock* is an NP representing a simple physical object, such as a door, with no particular property being predicated of it. Thus we give the structure of the overt complement of *lock* as,

(58) (lock) d.

This idea also accounts for (11c): and the contrast between (4b) and (5b).

(11) (repeated) a. Some people were lying unconscious.
b. Mary watched them. c. *Mary watched **U**.

(4b) (repeated) April told him about Josh's arrival, but he had already heard **U**.
(5b) (repeated) He heard the speech/ *He heard **U**

In (11c) Mary is not watching them lie unconscious: she is simply watching them. Here again the complement is an atomic element, a logical constant,

The same is true in (5b); there is no unvalued element, as in (4b), but only a simple reference to an entity. The lfs for (11b) and (5b) are: are:

(59) a. watch d. b. hear d

Thus complement drop is predicted to be impossible.

We conclude further that elements with the Patient theta-role are a sub-class of atomic elements. Not all such elements refer to affected objects. Other thematic types, as in (5b) and (11b), can be represented by a logical constant. They would be considered atomic, and therefore non-omissible.

5 "∃x" as Definite or Indefinite

We offer a further hypothesis on the question of how, in our representations, we can distinguish between $\mathbf{U_{IUA}}$ and $\mathbf{U_{DUA}}$. How are indefinite or definite readings given?

For $\mathbf{U_{IUA}}$ we propose a **choice function** approach (Reinhart 1997, Winter 1997).

(60) a. He baked **U.**
b. **U** = [∃f [CH(f) ∧ to_become_baked_goods(f(flour, sugar, etc.)]]
(61) a. He ate **U**.
b. **U** = [∃f [CH(f) & meal(f(comestible items)]]

This approach captures the fact that the verb supplies information on the material out of which the product is made. The choice function selects appropriate materials out of which baked goods, or a meal, are produced. Use of a choice function also supplies motivation for the molecular structure, since this is necessary to define a choice function.

For $\mathbf{U_{DUA}}$ we suggest that the effect of definiteness is achieved by quantifier raising

(62) a. Sid followed **U**.
b. Sid follow [∃x [moving_along_Path(x)]] **basic structure**
c. ∃x[Sid follow [t [moving_along_Path(x)]]] **quantifier-raised structure**

High quantifier scope provides the effect of specificity or definiteness.

6 Conclusion

In this study we have proposed an analysis for complement drop in English that is based solely on the lexical semantic structure of the verbs in question. We have supplied evidence that an unvalued variable is present, not only in the representation of indefinite understood arguments, but in definite understood arguments as well. We have shown that it not necessary to resort to pragmatic factors, or a lexically specified omissibility feature, in order to account for these alternations. Explicit licensing factors must be present. For IUA verbs, these are present in the clausal structure of the verb itself. For DUA verbs, specific discourse information licenses complement drop: this information corresponds to semantic features of the verb. $\mathbf{U}_{\mathbf{DUA}}$ can have only a clausal or molecular structure. It may not denote a simplex element, such as a fully saturated proposition (a *that*-clause) or a physical object.

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Exemplars versus Mental Categories in the Tonal Phonology of Yoruba

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1. Introduction

Several tone languages show a fall in fundamental frequency across an utterance, and a special case of this is known as "Downstep". Some tone languages counter repetitions of this fall with a "Reset" of the tone in question. One of these is the West African language Yoruba. Relying on the careful study of Yoruba tonal patterns in Laniran and Clements (2003), this article addresses the puzzle posed by reset levels. Such levels are indeed higher than recent downstepped tones, but significantly lower than the canonical value of the tone in question. It is proposed that mental categories of tones are partially updated by each exemplar, so that each downstep lowers the category. This makes it possible to argue that the notion of 'reset' is a descriptive artifact, in the sense that after a sequence of downsteps there is in fact only a failure to downstep the tone further. When that occurs, the tonal category will manifest itself at the current (updated) value, which explains its non-canonical level.

The article is organized as follows. The rest of Section 1 provides background on various phenomena that are found in Yoruba, such as Downstep (section 1.1), Reset (section 1.2) and High Tone Raising (section 1.3). Section 2 analyses the Reset phenomenon, and proposes a hypothesis (section 2.1) to account for the levels to which H tones are reset. The article concludes with Section 3.

1.1 Downstep

In tone languages, it is common to find a fall in fundamental frequency across an utterance. Gussenhoven (2004) refers to this general phenomenon as "declination". Within this general phenomenon there are more specific ones that are tied to various grammatical contexts, such as Downstep in Yoruba. This language has three lexically distinct level tones: High (H), Mid (M) and Low (L) tones. Only the H tone undergoes Downstep, and this occurs only in the context of a preceding L tone as shown in Fig.(1) below.

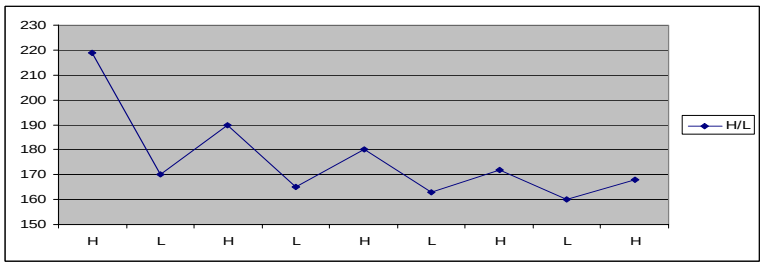

Fig.(1) Utterance with HLHL… alternating tone sequence showing Downstep[i]

1.2 Reset

After several successive Downsteps, the H tone appears to be typically "reset" to a higher f0 value. This is intuitively understood as, and has been assumed to be, a way to avoid neutralizing the contrast between the H and the M tones. I will also assume that this is the correct reason for this phenomenon.

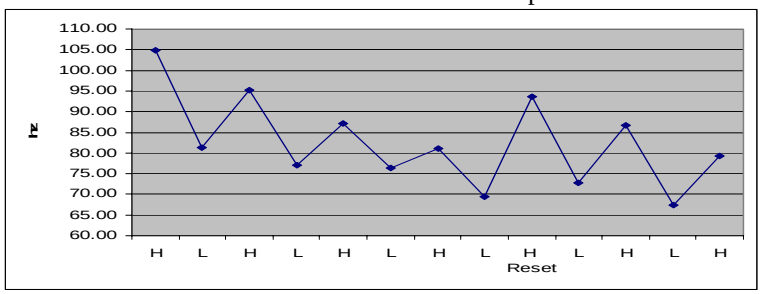

Fig.(2) HLHL… sequence showing a single Reset

Before addressing the issue of the exact reset level in cases like this, it will be necessary to characterize another grammatical phenomenon that contributes to the level of H tones, namely High Tone Raising, as discussed next.

1.3 High Tone Raising

In addition to Downsteps and Resets, High tones in Yoruba are affected by "High Tone Raising" (HTR), which raises a high tone when just before a low tone. The exact amount of HTR can be measured directly for the first occurrence of an H tone, such as that of Fig.(2), by comparing it with the first H tone of an all H tone sequence as in Fig.(3).

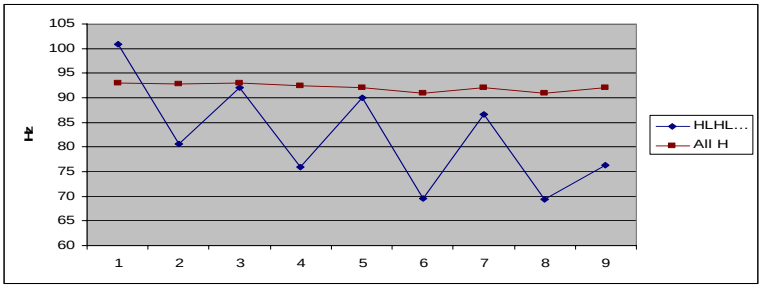

Fig.(3) HLHL… sequence contrasted with an all H sequence

In Fig.(3), the initial H in the HLH sequence is affected by HTR but not by downstep, while the initial H of the all H sequence is affected by neither. Hence the difference between them gives the amount of HTR for that tone.

In the discussion that follows, I will assume that HTR amounts are always proportional to the current distance between the H and L tones, so that HTR amounts on subsequent H tones in Fig.(3) can be inferred from the amount already measured on the first H.

With this in mind, I now turn to the reset.

2 Reset Levels

While the phenomenon of Reset itself would not be surprising as a way to avoid neutralization of H and M tones, the level to which Reset takes the H tone is puzzling as noted above. There are two striking features of the latter phenomenon, namely:

(a) the Reset level is never as high as the initial H tone and

(b) when there are multiple Resets, as in Fig.(4), these form different patterns depending on the pattern of the preceding Downsteps, as will be discussed below.

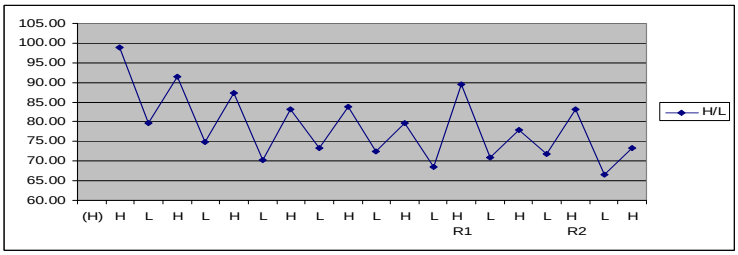

Fig.(4) Two Reset points for a particular pattern of Downstep

2.1 The Updating Hypothesis

To deal with these issues, I advance the hypothesis that for each mental category, speakers allow successive exemplars to update the category. This perspective is reminiscent of the Exemplar Theory of Goldinger (1996), (1998), Johnson (1997),Pierrehumbert (2001), (2006). However, it differs from those proposals in taking the category to be a specific formal object, which will manifest itself at the Reset, rather than a mere abstraction over exemplars. Within this hypothesis, I will then make the claim that the levels of Reset simply reflect the current value of the mental category for the H tone, referred to henceforth as 'C-H'.

Specifically, I propose that C-H is calculated via the Updating function in (5) below

(5) Updating Function:

$$C\text{-}H_n = C\text{-}H_{n-1} + (H_n - C\text{-}H_{n-1})/k$$

where H_n is the exemplar at point n, and k is a constant

Since many Resets are in the context of HTR (i.e. before an L tone), however, the true expectation for the reset level that also takes account of HTR will be as in (6).

(6) Expected Reset = C-H (+HTR)
where the portion in parentheses holds for HTR contexts

Aside from the constant k which is as yet undetermined, the combination of (5) and (6) thus enables us to determine, for each occurrence of H, what the 'reset' value would be *if* reset were indeed to occur at that H. That level would equal the current value of C-H, plus the value of HTR, if any. It is not within present goals to determine *when* a reset will occur, exactly, although avoidance of neutralization is taken as the determining factor for concreteness, but rather only what its level will be.

2.2 Category and Resets

We can test the hypothesis just proposed by applying the updating function to HLHL… sequences, and identifying the correct values for the constant k by trial and error. We distinguish single reset cases from multiple reset cases. In all cases the starting C-H value is determined by averaging over initial values in all H tone utterances in the Clements and Laniran study, for each speaker.

2.2.1 Single Reset

In the case of a single Reset, the constant *k* in the Updating Function can be simply chosen so that the actual Reset coincides with the Expected Reset value, as shown in Fig.(7) below, where the brown line segment at the reset point is the expected Reset value at that point. The pink line in the figure gives the C-H at each point, as updated by the previous H tone exemplar. The C-H values repeat unchanged during a L tones, since C-H is taken not to be affected by L tones..

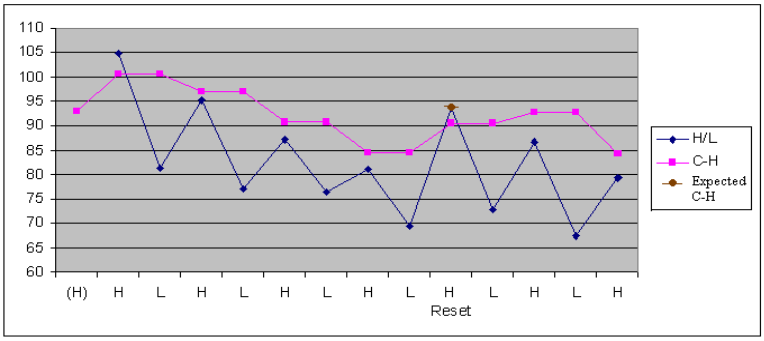

Fig.(7) Single Reset, HLHL… sequence, C-H and Expected C-H value

Initial H surmised from the all H data is calculated, and considered the canonical H value, and it is at this value that the C-H begins, in the figure given on the x-axis as (H). After the occurrence of each H, the C-H is updated, and hence the first C-H point after the canonical value, is raised because of the effect HTR (i.e. the second pink point in the figure). Due to HTR, the H tone is raised before a following L, and this raising of the H is reflected in the rise in the C-H. Later C-H values decrease because of the combined effect of Downstep – HTR on the H tones is negative. This negative effect is reflected on the C-H as it gets updated. Note that the C-H is unaffected by Ls, and hence, during an L exemplar, the C-H remains the same. The pink line in the Fig.(7) predicts the correct C-H value at Reset, because the distance to the brown mark is the value of HTR at that point.

2.2.2 Multiple Resets

While in the case of single resets it seems a trivial matter to choose a value of *k* that would lead to matching the value of the reset, the case of multiple resets is more challenging in this respect and hence more relevant to testing our hypothesis.

Consider here that Laniran and Clements (2003) show that speakers vary in the way they perform successive downsteps. They discuss two different patterns, one of roughly constant downsteps, and one of larger downsteps followed by smaller downsteps. These are illustrated in Figs.(8) and (9) below, where I refer to them as Constant and Fast-Slow patters, respectively.

It is interesting to observe that this difference correlates with a difference in the pattern of Reset. As can be seen in Fig.(8), with the Constant pattern of Downstep, the first Reset is higher than the second, while with the Fast-Slow pattern of Downstep, seen in Fig. (9), the opposite is true; i.e. the second Reset is higher than the first.

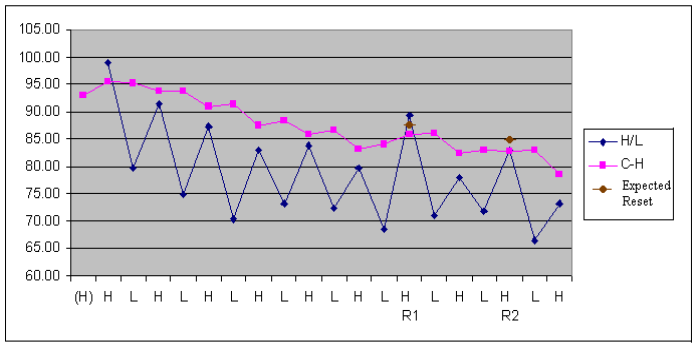

Fig.(8) Constant pattern: *k* set to split error between R1(undershoots) and R2 (overshoots)

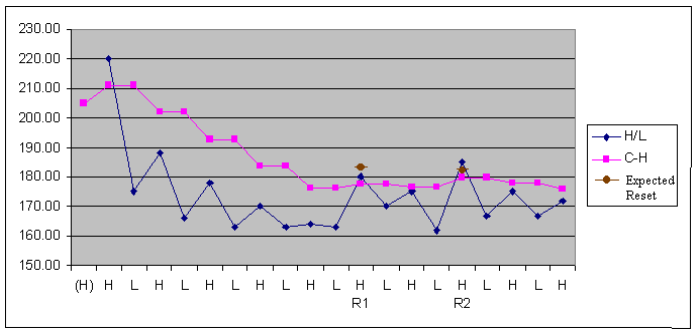

Fig.(9) Fast-Slow pattern: *k* set to split error between R1(overshoots) and R2 (undershoots)

As before, the pink line represents the updated C-H at each point for the best fitting value of *k*, while the brown points and line segments represent the expected value of the Reset (C-H + HTR) at that point. It can be seen that while our model only approximates the Reset values, it is nonetheless successful in

reproducing the difference between the two patterns, yielding a higher first Reset in the Constant pattern in Fig. (8), but not in the Fast-Slow pattern in Fig. (9). It is clear intuitively that it does so by way of the relatively higher C-H at the first Reset point in Fig.(8) than in Fig. (9).

To ensure that this result is not an artifact of the different pitch ranges utilized by different speakers, the two patterns were converted onto a common, normalized scale as reported in (10) and (11) below (initial C-H and C-L are 100 and 0 in both cases).

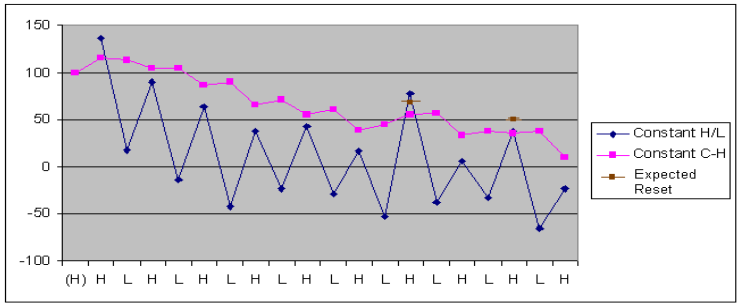

Fig.(10) Constant pattern on a normalized scale

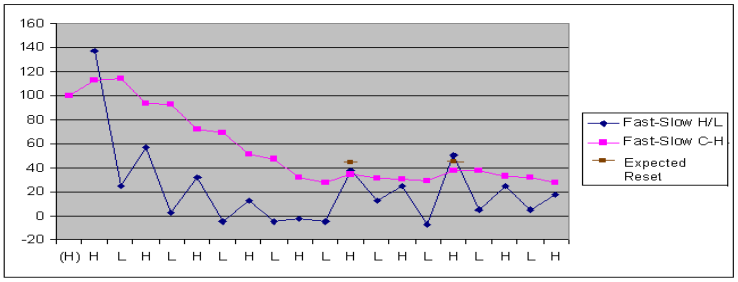

Fig.(11) Fast-Slow pattern on a normalized scale

Since the basic result appears to persist even under this transformation, we conclude that there is significant plausibility to the hypothesis that the phenomenon known as 'Reset' is in fact just a failed downstep, namely a manifestation of the current value of the tonal category C-H to which is added the HTR value, if the tone is in a HTR context (i.e. before an L tone).

This conclusion now raises the further question of how downstep values may be computed. Specifically, while one would have previously assumed that an H tone would be downstepped relative to the preceding H token, we now have to consider the possibility that downsteps may occur relative to the C-H rather than H exemplars. I turn to this in the next section.

2.3 Level to Compute Downstep

Consider then the two hypotheses below:

A. Downstep is from the preceding H tone:
Downstep H = $(H_{n-1} – H_n) – HTR_n$

B. Downstep is from the preceding C-H value:
Downstep C-H = $(C\text{-}H_{n-1} – H_n) – HTR_n$

A straightforward test for the relative validity of these two hypotheses is to see which one makes better predictions in terms of providing more consistent or less noisy Downstep amounts. Since the actual Downstep values are known from the data, and the HTR amounts can be calculated, it is possible to find the two amounts; i.e. $H_{n-1} – H_n$ and $C\text{-}H_{n-1} – H_n$. The results are shown in Fig.(12) below.

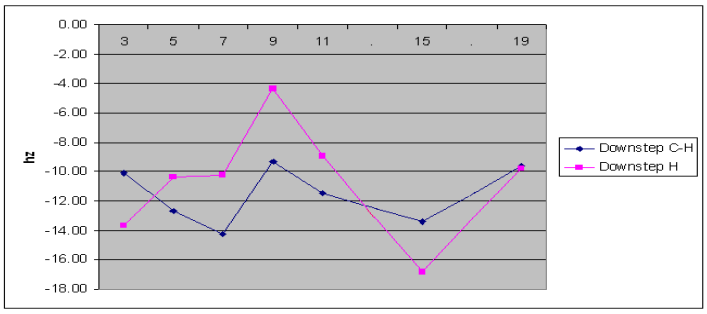

Fig.(12) Comparing hypotheses (A) Downstep from H; and (B) Downstep from C-H

Hypothesis A's Decline amounts show a variation between, roughly, 4 and 17hz, a difference of about 13hz. Hypothesis B's Decline amounts show a variation between, roughly, 9 and 14hz, a difference of about 5hz.

Hence, Hypothesis B yields a better behaved system, where unexplained variation is both less extreme, and perhaps more easily reducible to some natural oscillation. One may speculatively attribute it to the well known fact that values of f0 are controlled by two partially independent mechanical systems, generally referred to as Tone and Register (Yip 2002). A pattern such as the one observable in Fig.(12) might conceivably be produced if, at the same time as the tone system is producing accurate behavior, the register system undergoes some kind of slow change resembling a damped oscillation.

Note that hypothesis B above is not only superior in yielding more consistent downstep values, but it also yields the more coherent account of the 'Reset' phenomenon suggested above, as in (13)

(13) Hypothesis (B). 'Reset' = Absence of Downstep

Since on this hypothesis, the C-H enters into the calculation of the downstep, so long as the calculation yields zero downstep, the display of C-H will be automatic. On the other hand, on the alternative hypothesis (A), display of the C-H would not be directly expected. If anything, zero downstep from a previous H-exemplar, would predict the same H value as that exemplar, thus requiring the more complex account of Reset in (14), compared with (13).

(14) Hypothesis (A). Reset = Absence of Downstep; display of the C-H

Since updated tonal categories are thus not only essential in predicting the level of tonal resets but are also better predictors of downstep intervals, their existence is thus confirmed.

2.5 A thumbnail OT analysis

In sum, the phenomenon of 'Reset' is best reduced to just failure of Downstep. Putting aside the additional effects of HTR, if avoidance of tonal neutralizations is taken to be the triggering factor, the Optimality Theory (Prince and Smolensky 1993, 2004) style interaction would then be straightforwardly characterizable as in (15).

(15)

	/..HLH../	Maintain H/M contrast	Downstep	Faith C-H
a.	…HLH_{M}…	*!		**
b.	☞…$HLH_{C\text{-}H}$...		*	*

In (15), candidate (a) downsteps compromising tonal distinctions, while candidate (b) fails to downstep, thus automatically exhibiting the current value of C-H. Faith C-H requires faithfulness of the H exemplars to the C-H, and is hence violated twice for this section of candidate (a), while it is violated only once for candidate (b), since the second H exemplar returns to the C-H value.

3 Conclusion

This paper has claimed that mental categories for tones are updated by successive exemplars and enter into the calculation of future exemplars. The following considerations appear to support this claim.

1. There seems to be no alternative means to account for the apparently 'intermediate' levels of Reset then just the mental category.
2. To some approximation, this corrsectly predicts patterns of successive Resets from the preceding patterns of Downstep.
3. It yields more accurate predictions on the levels of Downstep and
4. It makes the descriptive notion of 'Reset' theoretically superfluous, simplifying the analysis

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Notes

[i] Figures are reconstructed from data from Laniran and Clements (2003)

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A Position Class Analysis of the Greek Verbal Paradigm*

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1 Introduction

1.1 Overview

In this paper, I give a decompositional analysis of tense and aspect morphemes in Classical Attic Greek and show that these morphemes attach to either side of the verb root in a predictable and semantically compositional way. Furthermore, I show that the data are easily accounted for within the Distributed Morphology framework (Halle & Marantz, 1993).

The verb in Greek inflects for various combinations of tense, mood, and aspect. Traditional pedagogically-oriented organizations of the data (e.g., Smyth, 1920) hide regularities and conflate data that can be more fully understood if kept separate. Explanations of the data from academic disciplines like classics have treated verb forms through paradigms of whole forms. Reference is sometimes made to separable pieces, most notably the so-called 'syllabic augment', which attaches at the far left side of the verb form. However, no complete break-down and analysis of the pieces of inflection has been attempted in modern morphological theory.

1.2 The traditional (Classicist's) approach

The Greek verbal system shows inflection for tense and aspect, mood, voice, person, and number. Participles also inflect for case and gender. Traditional grammars like Smyth (1920) as well as more modern textbooks like Groton (2000) divide the system of verbal inflection within a given voice category into moods and tenses within those moods. Traditionally, the Indicative[1] is described as having seven tenses: Present, Imperfect, Future, Aorist, Perfect, Pluperfect, and Future Perfect. When taught, verb forms are organized into sub-paradigms of Tense, Voice, and Mood, organized by person and number. There are possible pedagogical benefits to such an arrangement; however, there are drawbacks to

the traditional system. First, the traditional label of "tense" doesn't accurately reflect what it is labeling. Second, certain labels appear across paradigms, while others do not. Finally, in the traditional organization of the data we are left with unexplained holes. The analysis I propose below explains these facts easily.

1.3 What is being treated (and what is not)

There are two major groups of verbs in Greek which follow entirely different patterns of inflection. The analysis presented here is based on the inflectional patterns found within the more common system, whose first person singular present active indicative form ends in –ω /o:/. For expositional clarity, the data presented are predominantly drawn from the active voice, first person plural systems of the verbs used. However, the analysis works equally well for the other voices, persons and numbers. I follow the traditional analysis of moods in Greek (as in Smyth, 1920).

The paper is organized as follows: In section 2, I present the data. In section 3, I present my decompositional analysis. Section 4 is the formal morphological analysis in the Distributed Morphology framework. Section 5 is the conclusion.

2 The Data

2.1 Tense and aspect morphology in the active paradigm of -o: verbs

Let us consider a different organization of the data. We will use the verb *λύο* [lyo:] 'destroy'. In order to show the inflectional pieces that can be added to the root (in this case, [-ly-]), I have listed, divided, and glossed the various forms of the first person plural active system in (1) below. At this point, I have made divisions purely based on form—homophonous segments share a column. This first step does not seek to identify templatic slots, per se; these are proposed below after the segments in (1) below are analyzed according to their semantic and functional effects, and an argument is made from distributional information.

(1) *First person plural active system of [lyo:] 'We loosen/dissolve/destroy'*

	1	2	R	3	4	5	6	7	Gloss
1			ly				o	mɛn	We destroy [the city]. We are destroying [the city].
2	ɛ		ly				o	mɛn	We were destroying [the city].
3			ly			s	o	mɛn	We will destroy [the city]. We will be destroying [the city].

4	ɛ		ly		sa			mɛn	We destroyed [the city].
5		lɛ	ly	k			a	mɛn	We have destroyed [the city].
6	ɛ	lɛ	ly	k			ɛ	mɛn	We had destroyed [the city].
7		tɛ	t^hnɛ:	k		s	o	mɛn	We will have died/we will have been killed.#
8			ly				o:	mɛn	We may be destroying [the city].
9			ly		s		o:	mɛn	We may destroy [the city].
10		lɛ	ly	k			o:	mɛn	We may have destroyed [the city].
11			ly				oi	mɛn	Would that we be destroying [the city].
12			ly			s	oi	mɛn	Would that we shall be destroying [the city]. Would that we shall destroy [the city].
13			ly		sa		i	mɛn	Would that we destroy [the city].
14		lɛ	ly	k			oi	mɛn	Would that we had destroyed [the city].
15									Would that we shall have destroyed [the city]. (by periphrasis only)

Only two verbs form their Future Perfect Active Indicatives like this ('lyo:' is not one of them); Here I substitute [tɛt^{h}nɛ:ksomɛn], from the verb [t^{h}nɛ:sko] 'I die/am killed'.

In the above data we can notice several pieces that attach to the verb root with varying degrees of freedom: [ɛ-][2], [lɛ-] (reduplication)[3], [-k], [-s], and [-sa]. I will argue that the root ('R') is flanked on either side by the inflectional pieces that mark aspect, and that these pieces are flanked on either side by the pieces that mark tense. (Column 6 contains a combination of the "thematic vowel" and the inflection for mood; I do not treat these here.[4] The pieces in column 7 convey person, number, and voice information, also not treated here.) This will be analyzed in the Distributed Morphology section as a result of the hierarchical embedding after head-to-head movement of the lexical root (V°) within Aspect (Asp°), and Aspect within Tense (T°). The linear order of the affixes is determined by this embedding coupled with specifications of the Vocabulary Items (phonological reflexes of the morphemes) as prefixes or suffixes. Now that we have presented the pieces of inflection in the Greek verb, let us consider a decompositional analysis that allows us to explain these pieces.

3 Position Class Analysis

Here I give a templatic analysis of the verb in Greek. I propose that the distribution of the tense, mood, and aspect morphology in Greek supports a decomposition of the Greek verb into: A root with 2 slots on either side for possible tense and aspect affixes, a slot for mood and theme vowel information, and a slot on the far right for agreement suffixes:

(2) *Morphological template for the Greek verb*

Slot	**1**	**2**	**R**	**3**	**4**	**5**	**6**
Semantic features	tense	aspect	ROOT	aspect	tense	thematic vowel/ mood	person/ number/ voice

3.1 Arguments for decomposition: The basic analysis

I propose that the separable pieces of inflection visible in figure 1 pattern in the ways that they do because of the relationships of tense and aspect shared among them. Notice the following about the pieces in figure 1: First, the pieces in columns 1 ([ε-]) and 5 ([-s]) are in complementary distribution—that is, there is no row in which both pieces occur. This is consistent with the semantic content identified for these affixes above, as they express mutually incompatible tenses—the former expressing past tense and the latter future tense. Next, the pieces in columns 2 (reduplication) and 3 ([-k]) share a discontinuous dependency—that is, neither occurs without the other. In the current analysis, this dependency occurs because the pieces are reflexes of the same tense/aspect combination—relational perfective aspect (we will discuss the details of these meanings below). Next, the pieces in columns 2 and 3 are in complementary distribution with those in 4 ([-sa])—that is, there is no form with reduplication and [-k] as well as [-sa]. Again, this is consistent with the semantic content for these affixes identified above, as they express mutually incompatible aspects—the former expresses relational aspect and the latter nonrelational aspect. Finally, the pieces in columns 4 ([-sa]) and 5 ([-s]) are in complementary distribution. This fact will be accounted for separately from the above facts. Based on the above meanings and distributions, the morphological template introduced in (2) is justified.

Given these observations and an analysis of the corresponding semantics, we propose that the following morpheme positions that will give us the three tense and three aspect distinctions found in Greek. Subscripts refer to "slot" number in the template in (2)—that is, the position the morpheme appears in with respect to the verb root. Since the focus here is on tense and aspect, we will be concerned with slots 1, 2, 3, and 4, the slots closest to the root. The templatic

slots directly on either side of the verb root (2 and 3) are reserved for aspectual information, and the slots directly outside these, slots 1 and 4, are reserved for expressing tense information.

(3) *Tense and aspect distinctions and their corresponding morphemes*

Tense (relative time)	**Morpheme**
past	ε-$_1$
present (simultaneous)	∅$_{1,4}$
future (subsequent)	-s-$_4$

Aspect	**Secondary aspect**	**Morpheme**
imperfective	N/A	∅$_{2,3}$
perfective	relational	RED$_2$ and -k-$_3$
	nonrelational	-sa-$_3$

The position class analysis determines the following hierarchical order of the morphemes with respect to the root: [T[Asp[V]]]. This order is consistent with the Mirror Principle (Baker, 1985). Each affix, regardless of its status as a prefix or suffix, conforms to this hierarchy. This fact suggests that further syntactic analysis is warranted.

4 Distributed Morphology Analysis

4.1 The analysis

Two features of Distributed Morphology framework (starting with Halle & Marantz (1993)) are particularly important to our purposes here. One is the hypothesis of *late insertion*. This refers to the idea that the phonological features of a given morpheme are not specified until after the syntax. The second feature of interest to us is the *underspecification* of Vocabulary Items. This is the hypothesis that Vocabulary Items do not necessarily "need to be fully specified for the syntactic positions where they can be inserted" (Harley & Noyer, 1999, p. 2). That is, a given Vocabulary Item may have a list of features that is a subset of all the possible features that *could* be listed at the terminal node. This feature, in combination with the Subset Principle, can lead to ruling out the insertion of a VI with more features specified, in favor of one with fewer specified. Next I will propose the set of features I believe to be in play in the

case of Greek tense and aspect inflectional morphology. Then I will list the Vocabulary Items: the phonological strings that are competing for insertion, and the contexts in which they are inserted.

Since the semantic elements considered here are tense and aspect, I assume that the syntactic terminal nodes (morphemes) which are at issue are Tense° and Aspect°. The features of these morphemes can be seen in the table below:

(4) *Features of tense and aspect morphemes in the Greek verb*

Semantic feature	*Syntactic features*
Tense	[+/-past], [+/-future]
Aspect	[+/-pfv], [+/-rel]

Assuming that cross-classification of both bivalent features is possible in each of the Tense° and Aspect° terminal nodes, the following are the theoretically possible Tense and Aspect morphemes of Greek.

(5) *Possible Tense and Aspect morphemes of Greek*

Tense

	+Past	-Past
+Fut	[logically impossible]	[-past, +fut]
-Fut	[+past, -fut]	[-past, -fut]

Aspect

	+Pfv	-Pfv
+Rel	[+pfv, +rel]	[-pfv, +rel]
-Rel	[+pfv, -rel]	[-pfv, -rel]

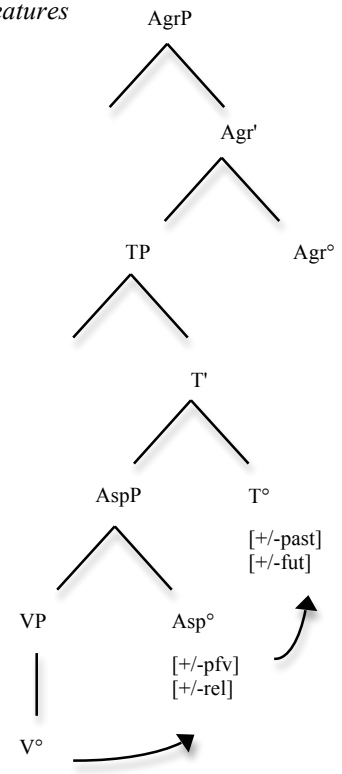
The Vocabulary Items which would compete for insertion into these nodes, then, would be as follows. Phonological signals are listed on the left, and their featural contexts for insertion are listed on the right.

(6) *Greek Vocabulary Items*

Aspect		***Tense***	
RED-	←→ [+pfv, +rel]	ε-	←→ [+past]
-k	←→ [+pfv, +rel]	-s	←→ [+fut]
-sa	←→ [+pfv, -rel]	∅	←→ elsewhere
∅	←→ elsewhere		

We can see underspecification at work in (6). The VIs are specified for the features they are sensitive to, and no other features. For example, [ɛ-] is sensitive to the feature [+past], so it is specified for this feature. However, it is not sensitive to a feature [-past], [-fut], or any features of aspect, so it is not specified for any of these features. The input to the syntax, before head-to-head movement, can be seen in figure 7 (the arrows indicate where T° will move).

(7) *Input to the Greek syntax, with* possible *features*

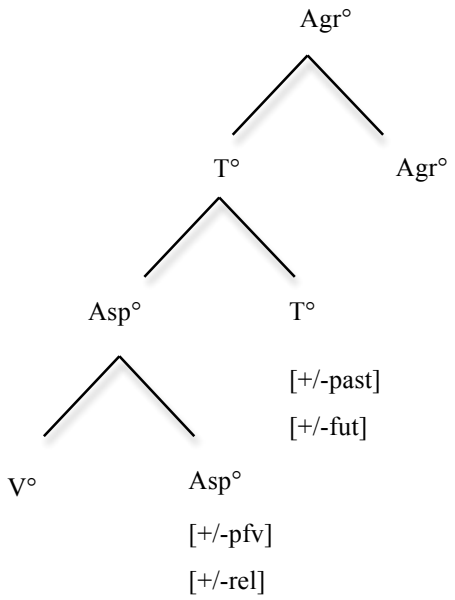


The specification of each morpheme as a prefix or a suffix is determined by its Vocabulary Item. In the syntax, the complex head created by movement from V to Asp to T specifies the relative embeddedness of the morpheme positions. This relative embeddedness, in combination with the affixal specifications (which you can see in the VIs above), produces the correct output order for the morphemes with respect to the verb root.

The output of the syntax (and the input to the morphology), then, would look like the figure in (8)—the complex head T°. This tree contains three terminal nodes of interest to us: V°, T°, and Asp° (the Agr° node would contain agreement features). V° would eventually be realized (at Vocabulary Insertion)

by the root morpheme of the lexical item in question. The Asp° terminal node would have a feature bundle made up of a combination of the aspect features [+/-pfv] and [+/-rel]. The T° terminal node would have a feature bundle made up of a combination of the tense features [+/-past] and [+/-fut].

(8) *Output of the syntax (after head movement), with* possible *features*

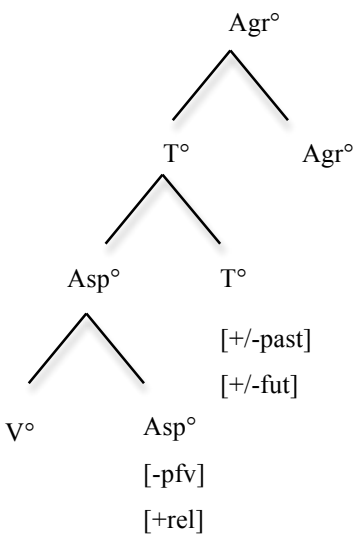


Of the sixteen logical possible combinations of features that would result in functionally different outputs, nine combinations are attested in seven different forms. Those forms that are not attested are ruled out either by a semantic violation (namely, opposing tense specifications), or by the rule of Greek that prohibits a verb from being marked for both relational and imperfective aspects. This can be captured by the language-specific Impoverishment rule in (9a).

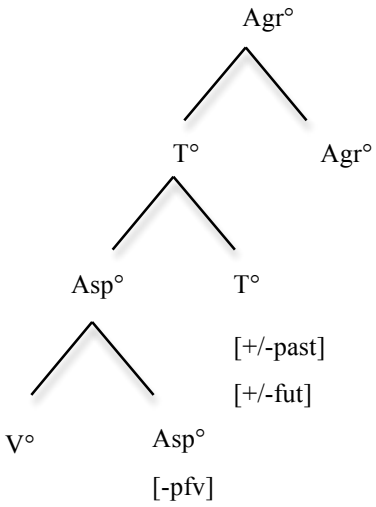
(9a) [-pfv, +rel] → [-pfv]

This rule operates in any case where the Asp° terminal node carries a feature bundle containing [-pfv, +rel], as in the tree in (9b). The rule operates to remove the specification for [relative], leaving only the feature [-pfv] in that node, as in (9c).

(9b) *Before impoverishment*



(9c) *After impoverishment*



We are left with the following attested morphemes (abstract feature bundles) and their Spell-outs (Vocabulary Items—phonological instantiations).

(10) *Attested tense and aspect morphemes of Greek with their Vocabulary Items*

Terminal nod	Asp° +pfv +rel	Asp° +pfv -rel	Asp° -pfv -rel	T° +past -fut	T° -past +fut	T° -past -fut
Winning VIs	RED- ←→ [+pfv, +rel] -k ←→ [+pfv, +rel]	-sa ←→ [+pfv, -rel]	∅ ←→ else-where	ε- ←→ [+past]	-s ←→ [+fut]	∅ ←→ else-where

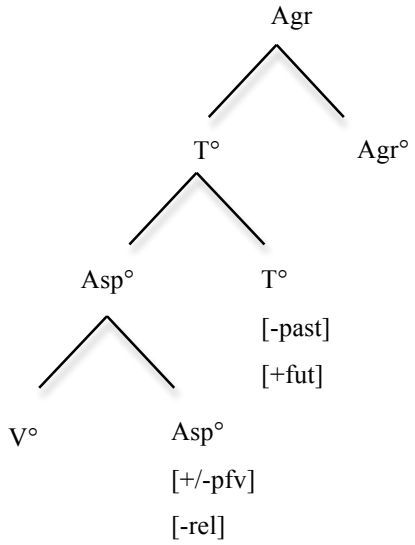
As noted above, morphemes always appear in a location consistent with the hierarchical relation established by the head-to-head movement of V° to Asp° to T°, regardless of whether a given Vocabulary Item surfaces as a prefix or as a suffix. The hierarchy among these three heads remains the same inside the complex T°, and this relationship remains consistent with the linear order of the Vocabulary Items after Spell-out. In the next section, I will discuss two major advantages of this Distributed Morphology analysis.

4.2 Advantages of the DM analysis

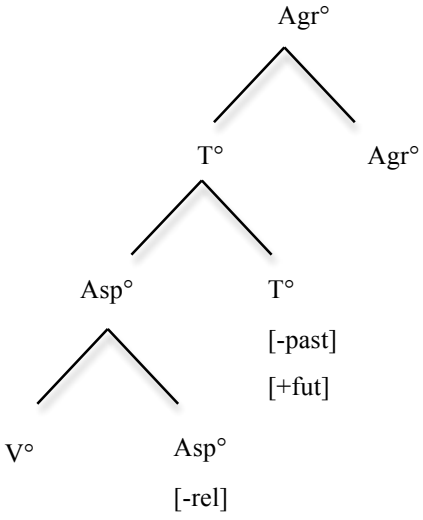
In the future tense, the imperfective and nonrelational (not 'Perfect') perfective forms are the same. In this case, a deliberate ordering of Vocabulary Items combined with the Elsewhere Principle will not suffice to explain the syncretisms. Instead, we must say that in a syntactic environment in which the Tense node carries the specification of [+fut], an Impoverishment rule operates on an Aspect terminal node carrying the feature bundle [+/-pfv, -rel], eliminating the feature [+/-pfv]. This rule can be seen in (12a). This operation of Impoverishment deletes either a [+pfv] or a [-pfv] feature, yielding an Aspect node specified only for [-rel] (as in (12c)); thus, the VI [-sa], which is specified for both [-rel] and [+pfv], cannot be inserted due to the Subset Principle. This yields an elsewhere case for the Aspect terminal node, and [∅] is inserted.

(12a) [+/-pfv, -rel] → [-rel] / _ +fut

(12b) *Before impoverishment*



(12c) *After impoverishment*



(13) *Vocabulary Items available for insertion*

✓[-sa] ←→ [+pfv, -rel]
∅ ←→ elsewhere

~~[-sa] ←→ [+pfv, -rel]~~
✓∅ ←→ elsewhere

Second, the reader will notice that there are two Vocabulary Items with the same feature specifications but different phonological strings: both [RED-] and [-k] are reflexes of the feature complex [+pfv, +rel]. Thus we have one morpheme (the Aspect terminal node, specified for [+pfv, +rel]) that corresponds to two Vocabulary Items ([RED-] and [-k]). This is easily explained by the process of *fission*, introduced by Noyer (1997), which creates additional Positions of Exponence (terminal node) from a single complex feature bundle. In instances of fission, the process of Vocabulary Insertion continues until every Vocabulary Item that is able to be inserted into the terminal node has been inserted. In this case, the Vocabulary Items [RED-] and [-k] are able to be inserted into the terminal node, but no other VI qualifies for insertion. Thus, these two VIs are inserted, and then Vocabulary Insertion moves on to the next terminal node. The only possible problem for this account is that the two pieces of inflection appear on either side of the verb root. This could be a problem if we assume that Fission affects the hierarchical structure (we would either have to re-project an Asp head inside the tree, or assume a ternary branching structure). However, since Fission happens after the syntax, if we assume (with Noyer) that it is triggered by the insertion of a Vocabulary Item into a position of exponence, we can say that when the first VI is inserted, it is not sufficient to fill the position of exponence, and a new one is created. This is where the second VI is inserted. Since the VIs are specified as prefixes or suffixes, linearization will result in the correct order of the pieces of inflection in the end.

5 Conclusion

The position class analysis presented here accounts for the decomposability and semantic compositionality of the pieces of tense and aspect inflection found in CAG, as well as their appearance (with the same semantics) outside the Indicative. Decomposing the Greek verb into its component pieces of inflection allows us to account for semantic isomorphism across different tenses, moods, and aspects—it is these pieces themselves that are carrying the semantic features, regardless of where they appear. In addition, this analysis allows us to answer the questions we had about the traditional characterizations of the data—some labels show up across moods while others don't because the former are labels of tense or aspect distinctions while the latter are merely names given to certain tense/aspect combinations (e.g., the Imperfect or the Pluperfect in the Indicative). The present analysis is supported by its consistency with the standard view of the hierarchy of functional projections above V.

Notes

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[1] When I have capitalized a term, I am using it as it is traditionally used in grammars, and not necessarily in a way that I feel to be theoretically significant.

[2] The form of this piece of inflection varies depending on the phonological form of the verb root. If the root begins with a consonant, the form is [ε-]. If the root begins with a short vowel or a diphthong containing a short vowel, the form is usually the lengthened form of that vowel (i.e. [ε-] becomes [ε:-], etc.). However, there are several exceptions to this pattern; for a full list see Groton, 2000, p. 60.

[3] The form of this piece also varies depending on the phonological form of the verb root. See Groton for a list of the forms (2000, p. 126).

[4] The thematic vowel is an epenthetic vowel inserted before the agreement suffix in this class of verbs in the indicative, subjunctive, and optative moods. As the focus of the present analysis is on the root and what immediately surrounds it (namely, inflections for tense and aspect), I do not include an analysis of the thematic vowel and its interactions with mood and agreement inflections here. For descriptions of this phenomenon and analyses thereof, see, e.g., Smyth (1920, p. 150 ff.), and Sommerstein (1973, p. 75 ff.).

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Quantified Questions and Event Semantics

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1 Introduction and Summary

We offer a new analysis of Pair List Readings (PLRs). We argue, first, that the three answer types available in quantified questions result from quantification over variables of different types: individual answers quantify over variables of type *d*; functional answers, type *f*; and event answers, type *v*. We show that, like quantified declaratives, quantified interrogatives permit both object- and event readings and, further, that the truth conditions of the answer to a PL question are those of the event reading. Second, we argue that PLRs result just in case the subject phrase is referential and plural (a sum individual). To account for these facts, we propose an algebraic semantics in which the question operator is analyzed as an adverbial quantifier. The advantages of this approach are: first, it straight-forwardly accounts for a range of empirical phenomena, including covariation, exhaustivity, and the subject-object asymmetry; second, it allows for a unified account of three "quirks" of quantified questions – PLRs, Weak Islands (WIs) and Intervention Effects (IEs);[i] and, third, it contributes to the unification of the semantics of the nominal and verbal domains.

2 Data

Questions with quantifiers can be ambiguous. (1), for example, admits three different kinds of responses – individual, functional and pair-list. In the first case, answers take the form of (2a) and name a single individual. In the second case, answers name a relation: they specify a function that associates each member of the subject set with some (possibly different) member of the object set, as in (2b). Finally, in the case of the pair-list reading, (2c), answers match members of the subject and object sets, enumerating them two-by-two.

(1) What did **every** girl see?

(2) a. Individual: "*Happy Together*."

b. Functional: "Her favorite film."
c. Pair-list: "Anne saw *Todo sobre mi madre*, Beatrice saw *Invasions barbares,* and Carmen saw *Woman of the dunes.*"

(3) Make a list of Q-many girls (or Q-proportion of some set of girls) & tell me what film they each saw.

(4) a. What film did **most/few/(more than) two** girls see?
b. **Few/most/(more than) two** girls saw their favorite film.
c. % Anne saw *Todo sobre mi madre*, Beatrice saw *Invasions barbares,* and Carmen saw *Woman of the dunes.*

We can understand the PL answer to questions like those in (2) as responding to a request of the form in (3). The principle puzzle with PLRs is why they have a more restricted distribution than do individual and functional readings. It is often argued that only *every* and *each* support a pair-list reading. It is not possible to put the elements of (4a) into the frame in (3): we cannot interpret (4a) as a request to draw up a list of most/few/more than two girls and name what film each saw. It is not that we cannot understand such requests. We can. Nor is it that they refer to impossible states of affairs. They don't. No logical or pragmatic constraint precludes understanding (4a) as a request for a pair-list. Nonetheless, the interpretation is unavailable. Human language doesn't go there.

3 Extant Analyses

(3) corresponds pleasingly to our intuitive understanding of the relevant meaning of (2a) and questions like it . The immediate problem is theory-internal. Quantification is defined for expressions that can be true and false, expressions of type <t>. Questions, however, are of type <s <st>>. (3) is inconsistent with the principle of compositionality, a theoretical primitive of formal semantics.

The list of those who have volunteered solutions to this puzzle includes Engdahl (1986), Higginbotham and May (1981), Karttunen (1977), Groenendijk and Stokhoff (1984), Chierchia (1991, 1993), Krifka (1999, 2001), Barss (2000), Dayal (2002), Szabolcsi (1996) and Lahiri (2000). Engdahl replaces quantification over questions with quantification over functions: A natural function question asks what relation links each member of the subject set with the relevant member of the answer set; a pair-list is the actual-world spell-out of the function. In our example, "her favorite film" names the function, and "Anne saw *Todo sobre mi madre*, Beatrice saw . . . " lists each member of the function domain with the element to which it is matched in the range. Groenendijk and Stokhoff suggest that PLRs involve quantification not directly over a question but over a subexpression of the proper type, <t>. It has also been suggested that

it would be possible to quantify over a super-expression of type <t> (Karttunen). For his part, Chierchia suggests that PLRs be analyzed as second-order (raised) questions: a PL question is actually a set of questions, and the subject of each question is a "Witness" of the general quantifier. Krifka suggests that PLRs spell out the conjunction of a series of speech acts. The PL question is embedded under a silent performative operator, something like: *I ask you what A saw and I ask you what B saw . . .*

4 Proposal: Empirical Claims

Quantified interrogatives can be ambiguous between an object- and an event-related reading; further, the truth conditions of the PL response to a quantified question are those of its event-related reading.

Krifka observes that quantified declaratives like *4000 ships passed through the lock last year* may be ambiguous between an individual reading and an event reading (Krifka 1990: 487). The most readily available reading is the object-related reading: there are 4000 different ships that passed though the lock. One or more of the ships may have passed through the lock several times, but it remains the case that 4000 ships passed though the lock. Also available is an event-related reading: there were 4000 passings of ships through the lock. On this reading, it is possible that there were far fewer than 4000 ships that passed through the lock: one or more ships may have gone through one or more times. The sentence is still true in the limit case where one ship passed through the lock 4000 times. The two readings do not have the same truth conditions.

To know the meaning of a declarative is to know what would have to be the case for it to be true. To know the meaning of a question is to know what would count as an answer to it (Groenendijk & Stokof 2003). In the case of declaratives we ask whether a sentence would be judged true given a certain state of affairs. In the case of questions, the test is whether a sentence would be accepted as an appropriate answer given a certain state of affairs. To persuade yourself that there may be distinct object and event answers to a question, consider a situation like the one in (5).

(5) Situation: There are three ships, A, B and C.
A and B each made one passage through the lock; C made two.
Their cargo was:

Ship A:	Plastic flip flops
Ship B:	Plastic flip flops
Ship C, voy. 1:	Plastic flip flops
Ship C, voy 2:	GM soybeans

a. What did every ship carry?
b. Every ship carried flip flops.
c. Every ship carried flip flops and one of them also carried genetically modified soybeans.
d. Ship A carried plastic flip flops; ship B carried plastic flip flops; and ship C carried plastic flip flops.
e. Ship A carried plastic flip flops; ship B carried plastic flip flops; ship C carried plastic flip flops and genetically modified soybeans.

(5b) is a complete answer to (5a): Every ship did indeed carry flip flops. (5d) conveys the exact same information PL-style: *Ship A carried plastic flip flops; ship B carried plastic flip flops; and ship C carried plastic flip flops*. (5d), however, is not a complete answer. A complete PL answer would include the information that ship C also carried GM soybeans, as in (5e). Interestingly, conjoining *and ship C also carried GM soybeans* to *Every ship carried flip flops*, as in (5c), does not make for a better answer. Such an answer would be, in fact, inappropriate. It is overinformative. In Gricean terms, it is uncooperative. This is because (5b) responds not to a question about events, but to a question about individuals (*viz., what x is such that it was carried by every ship?*). Our universe contains one relevant individual. A complete answer names it. *And ship C also carried GM soybeans* here is not germane. The PL answer, on the other hand, is a question about events in which A, B, and C are the agents. Our universe includes four relevant events. A complete answer identifies all four.

Now, to persuade yourself that the PL answer corresponds to the event answer, consider a situation like (6):

(6) Situation: "224 Sequoia" is a small, three-floor apartment complex with a common garden. The tenants all have their own individual vegetable plots, but the flower area is tended (or not) by all. This spring in the flower area, tenants planted various annuals: the third-floor tenants planted marigolds; the second-floor tenants planted pansies; (the first-floor tenants, for their part, just wrapped an ugly tapestry around the branches of the hawthorn tree that the third floor tenants had pruned with much pain and suffering). There are no other tenants.

a. What did the tenants plant?
b. "Marigolds and pansies"
c. "Annuals"
d. "The third-floor tenants planted marigolds and the second-floor tenants planted pansies."
e. "The third-floor tenants planted annuals and the second-floor tenants planted annuals."

What, given this state of affairs, are the possible answers to (6a), *What did the tenants plant?* "Marigolds and pansies" – (6b) -- is one possible answer. "Annuals" – (6c) -- is also a possible answer. Both are "thing(s) *x* such that the tenants planted *x*." Another possible answer is (6d), "The third-floor tenants planted marigolds and the second-floor tenants planted pansies." Critically, one answer that is not possible is (6e): "The third-floor tenants planted annuals and the second-floor tenants planted annuals." Our informants did not spontaneously volunteer this as a possible response given this state of affairs. The PL answer is a set of answers; the set has as many members as there are events. In this case we have two planting events: an event of planting marigolds and an event of planting pansies. The PL answer names them both. While it is true that, viewed synthetically, one might say that we have two annuals-planting events, the event question is not synthetic in this way.

There is some debate as to which quantifiers permit PLRs. All those to have investigated PL readings seem to agree that questions with universal terms – *every, each* – allow PLRs and that questions with *no* do not. There is no consensus with regard to other quantifiers. The status of plural definites and numerals, in particular, is a matter of debate. In G&S's catalogue, *the, the two, both* and *all the* figure with *every* and *each* -- all allow PLRs. *Any, few, many, most, two, at least two, at most two, exactly two* figure with *no* -- they do not allow PLRs. Krifka and Dayal, however, argue that plural definites, not being quantificational, do not undergo QR and thus cannot give rise to genuine PL readings. They argue that the "apparent" list reading of sentences like *Which movie(s) did the boys rent last night?*is just the spell-out of the cumulative reading of the question. We believe that the distinction between PL readings on the one hand and "overinformative" or "choice readings" on the other is motivated not by interpretive differences but by explanatory challenges. Krifka and Dayal make use of QR to derive PL readings. Our analysis circumvents this problem because it does not rely on QR.

Making abstraction of the universal quantifiers (*every, each*) for a moment, we observe, first, that in those cases in which a PL reading is available the QP is, arguably, referential and not genuinely quantificational. The quantifiers that permit PLRs pick out individuals in the actual world. In (7a), for example, *the* would not be felicitous if *two girls* did not have a common referent for both speaker and hearer. In (7a), as in (7b), we have not a Generalized Quantifier (GQ) over individuals, type <<dt><t>>, but a plural individual, type <d>.

(7) a. Who did **the two girls** see?
b. Who did **Maitri and Jayani** see?

(8) a. Who did **the committee** recommend?
b. A and B recommended Y, and C and D recommended Z.
c. Who did **the four members of the committee** recommend?

That said, not all referential DPs give rise to PLRs: plural individuals do; atomic individuals don't. Although the subject in (8a) is referential, no PLR is available: (8b) is not a possible answer to (8a). In (8a), unlike in (8c), the units in the entity to which the DP refers aren't visible or accessible. *The committee* is different from *the girls* in that the latter is plural (complex) and the former is atomic. It exists as an entity over and above the sum of its parts. In the vocabulary of Link (1983), *the committee* is a group; *the girls* is a sum.

5 Proposal: Formalities

Our approach is "Neo-Davidsonian": following Parsons (1990), we take verbs as one-place predicates of events with the participants in those events being introduced via event (theta) roles like "agent," "patient" or "theme." Like Chierchia (1993, 1996), Hagstrom (1998) and others, we take the pair-list question to correspond to a set of questions. Thus, if a question corresponds, formally, to a set of propositions, a PL question will correspond, formally, to a set of sets of propositions. We have argued that PLRs involve quantification over an event variable. This would mean that the PL question doesn't abstract (just) over an individual but over a (pair of an individual and) an event. The logical structure of the PL questions is something like *Which seeing event has one of the three girls as its agent?* Answers identify events by naming their themes: *(The event of seeing) a dolphin, (The event of seeing) a sea lion, ...* An event is uniquely associated with its participants. Thus, specifying the individuals that fulfill the roles associated with an event will effectively identify the event. If PL answers appear to quantify over individuals that is precisely because there is a one-one relation between events and individuals. A question like (9a), for example, is analyzed as paraphrased as in (9b). (10) gives a formalization.

(9) a. What did the three girls see?
b. What (event is such that its theme) was seen by the three girls?

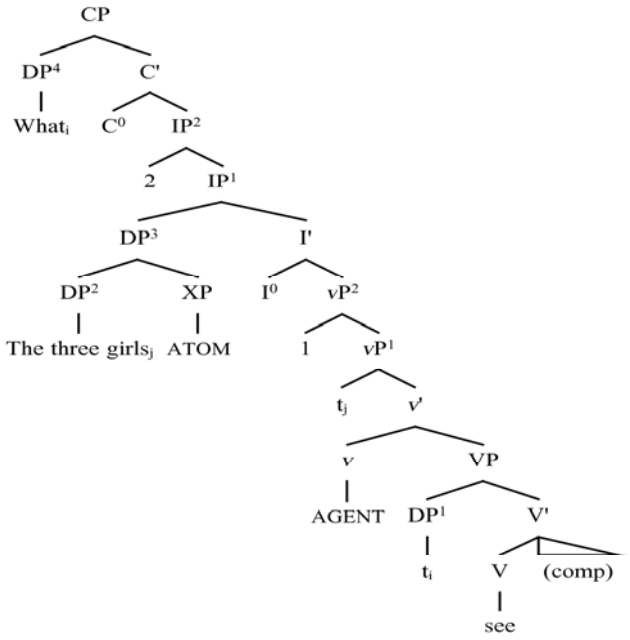
(10) $\lambda P.P(\lambda p \exists e \exists x \wedge p = \lambda w(^{*}\text{SEE}\ (e,x) \wedge {}^{*}\text{AGENT}\ (e) = \text{ATOM}(\textbf{the\_three\_girls}))(w)$

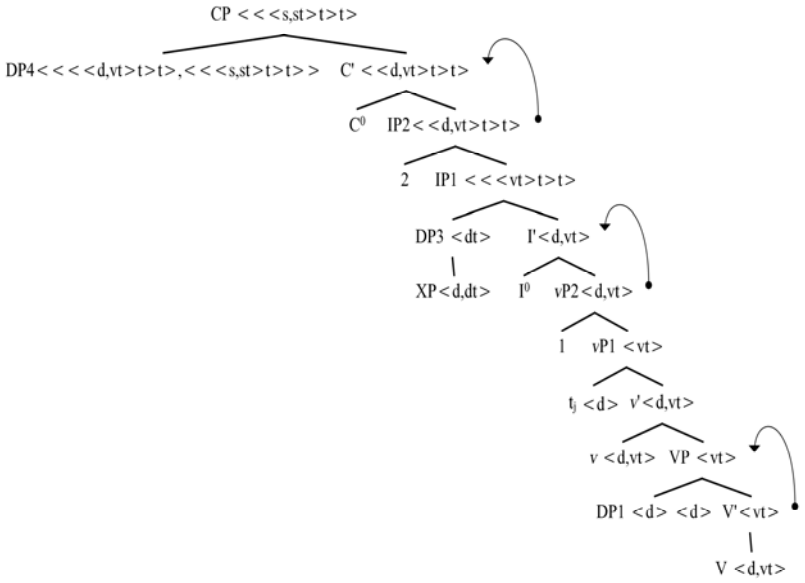
P is a variable over sets of questions, type <<s,st>t>>. ATOM is usually understood as asserting the atomicity of its argument. In what follows, I idiosyncratically define ATOM is a kind of a choice function applying to (possibly plural) elements of type <d>.[ii] We adopt the conventions for semantic interpretation in Heim and Kratzer (1998). We take logical representations to be expressions of an intensional typed λ-calculus with the basic types *t*

(propositions), *d* (entities), *v* (states, events), *s* (worlds). Variables from the end of the alphabet (*x, y, z*) range over singular and plural individuals, construed as mereological sums; *e, e'*, and *e''* range over singular and plural eventualities, also construed as mereological sums. If σ is a type and τ is a type, <σ,τ> is type, a function from the domain of σ to the domain of τ. A predicate is type <d,t> – it maps individuals to truth values. A proposition is represented as a set of possibilities ("possible worlds") in which the proposition is true. The semantic type of a proposition is <s,t> (the characteristic function of a set of possible worlds). Punctuation is omitted where this does not lead to confusion. *V* is a variable over sets of predicates of events (i.e. VPs), type <<vt>t>. *R* is a variable over sets of functions from individuals to predicates of events (i.e. unsaturated VPs), type <<d,vt>t>. *P* is a variable over sets of questions, type <<s,st>t>. We assume that semantic interpretation is compositionally derived from the structure provided by the syntax. The primary mechanism for combining elements is functional application: if γ is a syntactic node with daughters α and β, for all assignments *g* and worlds *w* $[[\gamma]]^{g,w} = [[\alpha]]^{g,w}([[\beta]]^{g,w})$ or $[[\beta]]^{g,w}([[\alpha]]^{g,w})$, whichever is defined.

The first tree in (11) represents the syntax we assume for *What did the three girls see?* The second give the semantic type of the elements at each node.

(11)





Below, we assign a meaning to each node in the tree.

1. V^0	[[see]] = $\lambda x_d \lambda e_v$.*SEE(x,e) by definition	<d,vt>
2. DP	[[t_i]] = i by traces and pronouns	<d>
3. V'	[[1]]([[2]]) = λe_v.* SEE (i,e) by functional application	<vt>
4. VP	= [[3]]	
5. v^0	[[agent]] = $\lambda x_d \lambda e_v$. AGENT (e) = x by definition	<d,vt>
6. v'	[[5]]([[4]]) = $\lambda x_d \lambda e_v$. AGENT (e) = $x \wedge$ *see'(i,e) by event identification	<d,vt>
7. spec, v'[1]	[[t_j]] = j by traces and pronouns	<d>
8. vP[1]	[[6]]([[7]]) = λe_v. AGENT (e) = $j \wedge$ * SEE (i,e) by functional application	<vt>
9. vP[2]	$\lambda x_d . \lambda e_v$. AGENT ($e$) = $x \wedge$ * SEE (i,e) by lambda abstraction	<d,vt>
10. I'	= [[9]]	
11. DP[2]	[[the three girls]] = **the_three_girls**	<d>

by definition

12. XP [[atom]] = $\lambda x_d.x' \leq x$ <d,dt>

by definition

13. DP[3] [[12]]([[11]]) = $\{x': x' \leq \mathbf{the\_3\_girls}\}^A$ <dt>

by functional application

14. IP[1] [[10]]([[13]]) = <<<vt>t>t>

$\{\lambda e_v$. AGENT $(e) = \mathbf{g^1} \wedge *$ SEE (i,e)

λe_v. AGENT $(e) = \mathbf{g^2} \wedge *$ SEE (i,e)

λe_v. AGENT $(e) = \mathbf{g^3} \wedge *$ SEE $(i,e)\}$ =

$\lambda V_{<<vt>t>}.V(\lambda e_v$. AGENT $(e) =$ ATOM$(\mathbf{t_3_g}) \wedge *$ SEE $(i,e))$

by pointwise functional application

15. IP[2] $\{\lambda x_d \lambda e_v$. AGENT $(e) = \mathbf{g^1} \wedge *$ SEE (x,e), <d,vt>t>t>

$\lambda x_d.\lambda e_v$. AGENT $(e) = \mathbf{g^2} \wedge *$ SEE (x,e),

$\lambda x_d.\lambda e_v$. AGENT $(e) = \mathbf{g^3} \wedge *$ SEE $(x,e)\}$=

$\lambda R.R(\lambda x_d \lambda e_v$. AGENT $(e) =$ ATOM $(\mathbf{t\_3\_g}) \wedge *$ SEE $(x,e))$

by pointwise λ-abstraction

16. CP [[what$_i$] = <<<d,vt>t>t>,<<<s,st>t>t>>

[[what]]([[15]]) = <<s,st>t>t>

$\{\lambda p.\exists x_d \exists e_v \wedge p = \lambda w$. AGENT $(e) = \mathbf{g^1} \wedge *$ SEE (x,e) in w

$\lambda p.\exists x_d \exists e_v \wedge p = \lambda w$. AGENT $(e) = \mathbf{g^2} \wedge *$ SEE (x,e) in w

$\lambda p.\exists x_d \exists e_v \wedge p = \lambda w$. AGENT $(e) = \mathbf{g^3} \wedge *$ SEE (x,e) in $w\}$ =

$\lambda P_{<<s<st>t>>}.P(\lambda p.\exists x_d \exists e_v \wedge p = \lambda w$. AGENT $(e) =$

ATOM $(\mathbf{t_3_g}) \wedge *$SEE (x,e) in $w)$

by point-wise functional application[iii]

6 Explaining the data

Our approach lends itself to a simple, natural account of the three principal empirical puzzles associated with PLRs: their distribution (the fact that they are available with only certain quantifiers), the subject-object asymmetry (the fact that questions with quantifiers in subject position may lend themselves to PLRs but those with quantifiers in object position do not), and exhaustivity (the fact that PLRs are strongly exhaustive -- a partial PL answer is not felicitous).

6.1 Distribution

If quantifiers, as we argued, cannot figure as arguments in event role predicates, questions like *What did every girl see?* should not solicit PL answers, contrary to fact. Like *few girls* and *many geraniums*, *every girl* and *each geranium* are generalized quantifiers. Yet, while QPs with other quantifiers do not lend themselves to PLRs, QPs headed by universal quantifiers do. We suggest is that

universals are "hybrids": potentially referential quantifiers. Syntactically they sort with the quantifiers, in that, for example, they are subject to QR. Semantically, too, they sort with quantifiers -- they are predicates of sets or sets of sets (Portner 2005). That said, in extensional contexts, universals do what referential terms do – they pick out a unique set.

Universal QPs function much like "descriptive" terms. Linguistic philosophers point out that "Socrates" (a name) and "the greatest philosopher in the Western tradition" (a description) have a common referent (Socrates). This, however, is contingently, not necessarily, the case. "Socrates" refers to Socrates in all worlds (it "rigidly designates" him in Kripke's (1973) terms) while "the greatest philosopher in the Western tradition" might have refered to someone else. In Frege's terms the two have the same *reference* but not the same *sense*. In possible worlds semantics "Socrates" is said to refer to Socrates in all worlds, while the descriptive phrase "the greatest philosopher in the Western tradition" is said to refer to Socrates in the actual world, but not necessarily in all others.

Much like descriptive terms, we argue, universal QPs refer contingently. Although they might pick out different individuals in different worlds, in any given world (or situation or event) they pick out a unique plural individual. That individual is the mereological sum of all the individuals in the denotation of the common noun restriction on the quantifier. So, in a world/situation/event in which there are eight geraniums, *few geraniums* and *most geraniums* do not pick out unique sets. Different sets of three or fewer or five or more geraniums might "fit the bill." In contrast, *every geranium* does indeed pick out a unique set. In this situation designates a plural individual, a sum of eight geraniums.

6.2 Exhaustivity

PLRs are "exhaustive." Consider (13). The functional answer, *Every girl invited her best friend,* does not preclude any girl from inviting someone else in addition. Even if, say, Jan also invited a girl she met last Thursday at the climbing gym, *Every girl invited her best friend* remains a true and complete answer. In contrast, the PL answer, *Jayani invited Sam, and Sue invited Ashley,* is not a true and complete answer if Jan invited the girl from the climbing gym, too. The issue of exhaustivity has most often been discussed with reference to examples like the one in (14) (cf. Heim 1994).

(13) a. Who did every girl invite?
b. Every girl invited her best friend.
c. Jayani invited Sam and Sue invited Ashley.

(14) Situation: There are four ships.
Three carried plastic flip flops and one carried nothing.
Jane believes that the first three ships are the only ships to have passed

through the lock. She knows that all three carried plastic flip flops.

(15) Jane knows what the ships carried.

Under these circumstances how are we to evaluate the claim in (15)? In the sets-of-propositions approach to constituent questions developed in Karttunen (1977), (15) would be judged true: Jane believes the conjunction of all the true answers to the question *What did the ships carry?* (Sharvit 2002:100). According to Groenendijk and Stokhof (1984), Karttunen's question semantics is weakly exhaustive: it doesn't account for the fact that when we know the answer to a question like *Who is a vampire?* we know of the vampires that they are vampires and of the non-vampires that they are non-vampires. Someone who knows who is a vampire should be able to divide the domain, identifying the vampires and the non-vampires. The Jane of our ship scenario would not group the fourth ship with the non-flip flop-carriers. (15), thus, would be judged false. In the semantics for questions developed in G&S, the basic denotation of a constituent question is not a function from worlds to sets of propositions, but from worlds to (simple) propositions. The result is a strongly exhaustive question semantics. According to G&S, strong exhaustivity and *de dicto* interpretations go hand in hand. Karttunen's weakly exhaustive semantics, argue G&S, produces *de re* readings exclusively. On the *de re* interpretation, statements like (15) are true; on the *de dicto* interpretation, they are false.

We would rather suggest that the exhaustive/*de dicto* and non-exhaustive/*de re* answers are in fact responses to two different questions, one asks about events, the other about individuals. From this perspective, in the scenario in (14), *Jane knows what the ships carried* is both true and false – it is true on its individual reading and false on its event reading. This predicts that this kind of ambiguity should not obtain in cases in which the embedded question contains a genuine quantifier. Consider the scenario in (16).

(16) Scenario: There are three cargo ships, A, B and C. A and B made one voyage each. C made three. Their cargo was:

A:	MP3 players
B:	plastic flip flops
C, voyages 1, 2 and 3:	coffee

a. Information state 1: C carried coffee three times.
b. Information state 2: A carried MP3s, B carried plastic flip flops.
c. Jane knows what most ships carried.

If Jane is in information state 1, (16c) is judged false: Jane does not in fact know what most ships carried. (16c) is judged true, however, if Jane is in

information state 2. It is no use pointing out that in the first case Jane has information about more than half of the relevant transporting-events, while in the second, she doesn't. *Most ships* is genuinely quantificational. This, we argued, means that event quantification is not available. (16c) is unambiguous.

The correlation between exhaustive answers and *de re* interpretations simply follows from the facts that answers that quantify over events are exhaustive and that they are possible only with referential subjects.

6.3 The subject-object (non)asymmetry

It is argued that while sentences with quantified subject DPs can give rise to PLRs, the same quantifiers in object position do not give rise to PLRs. (17b), for example, is said to be infelicitous as a response to (17a). We have not been able to reproduce this result: our informants accept (17b). Be that as it may, the subject-object asymmetry is not attested in the case of definites. (18a), with a quantificational definite object, readily admits a PL response.

(17) a. Who saw every girl?
b. ?%A saw g1, B saw g2, and C saw g3.

(18) a. Who saw the three girls?
b. A saw g1, B saw g2, and C saw g3.

(19) ?e [SEE(e) $\wedge$ AGENT(e,x)]
[SEE(e) $\wedge$ AGENT(e,x) $\wedge$ THEME(e, ATOM'(**the_three_girls**)]

From our perspective this is not surprising. We argued that it is quantification over events that produces the PLR. Critically, the semantics we assigned to questions makes use of the function ATOM. There is no reason to suppose that event quantification only occurs where the subject is questioned. Nor is there any reason to suppose that ATOM can only be applied to a quantificational definite subject. In the case of (18), something like (19) would generate a PLR.

Notes

i.In Shimelman (2008), we offer a unified account of PLRs, WIs, and IEs. We argue that two parameters are at issue: the domain being quantified over (events or individuals, E or D) and the type of the subject phrase (referential or quantificational, <d> or <<dt>t>).

ii.Bernhard Schwartz (p.c) points out that, if we understand ATOM not as a choice function but, as is more common, as asserting the atomicity of its argument, this would be translated as: $\lambda P.\exists y[$ ATOM (y) & $y \leq a+b+c$ & $P=\lambda p \exists e \exists x[p=\lambda w. \ldots]$. We argue, however, that the_three_girls is referential. There is no need, therefore, to assert the existence of the unit. One doesn't assert the existence of a

referential element. That would be like ∃*x*.John(*x*). Nor is there any need to engineer its WS – being referential, it simply has WS. ATOM, as we define it, applies only to atoms. If the_three_girls is not atomic, type-mismatch ensues, and ATOM simply won't do its work.

iii.Step 1. *see* is a two-place predicate taking an event argument and a theme argument.
Step 2. *what* raises, leaving a bound variable (trace) in its base position.
Step 3. The trace is of type <d>, the right type to combine with our predicate, SEE. This reduces the addicity of the predicate, making it a one-place predicate of events, type <vt>.
Step 4. No operation takes place; the meaning of a node is simply "passed up" to the node immediately dominating it.
Step 5. We assume a certain asymmetry between internal and external arguments, adopting a Kratzerian denotation for *see*: λ*x*λ*e*. SEE (*x*,*e*) The head that introduces the external argument is interpreted as the thematic relation that holds between the individual that is merged into its specifier position and the event described by its complement (Pilkkaanen 1999:164).
Step 6. AGENT combines with its sister by Event Identification
Step 7. *The three girls* raises.
Step 8. Functional application combines [[6]] and [[7]]. *j* saturates one argument in the function in (6). The result is a predicate of events.
Step 9. The moved constituent forms a chain with its trace. This is indicated by coindexation. The meaning of the index is, essentially, the instruction to abstract over its scope.
Step 10. No operation takes place. The meaning of the node is passed up.
Step 11. *the three girls* is referential and entered just as a proper name would be.
Step 12. ATOM creates a "Hamblin alternative set" in the sense of Kratzer and Shimoyama (2002): it "breaks up" a complex atom and gathers the atomic elements that compose it into an A(lternative)-set. These elements thus become "visible" for the purposes of functional application.
Step 13. The application of ATOM to **the_three_girls** yields an A-set with three alternatives. For a variation on this approach see Ekhardt (2007).
Step 14. The composition of an A-set with its sister proceeds "pointwise."
Step 15. λ-abstraction is applied point-wise, yielding a set of unsaturated propositions, each of which requires an event and an individual.

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So-inversion as Polarity Focus[1]

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1 Introduction

So-inversion, exemplified in (1a), is superficially similar to *neither*-inversion (1b).

(1) a. John plays guitar and so do I.
b. John doesn't play guitar and neither do I.

In this paper, I propose that *so*-inversion is best analyzed as parallel to *neither*-inversion. Both constructions are examples of polarity-focus. *So* in *so*-inversion is an affirmative polarity marker, accompanied by the focus particle *too*. However, *too* is not always pronounced.

1.1 Additivity

So-inversion clearly means something like 'also'. It is only felicitous in circumstances where *also*, *too*, or *as well* are also felicitous. I will refer to this property as 'additivity'. Thus, (2a-b) are additive while (2c) is not. *So*-inversion is also additive.

(2) a. I also play guitar.
b. I play guitar too.
c. I play guitar.

1.2 So and Polarity

So-inversion interacts with polarity in important ways. *So*-inversion generally requires an affirmative antecedent (Klima 1964), unlike other additive constructions (3c).

(3) a. * John does not play guitar and so do I not (play guitar).
b. * John doesn't play guitar and so do I.
c. John does not play guitar and I also do not (play guitar).

So-inversion itself must be affirmative (4a), unlike other additive constructions (4c).

(4) a. * John plays guitar but so don't I.[2]
b. * John plays guitar but so do I not.
c. John plays guitar but I don't <also> play guitar <also>.

Conversely, *neither*-inversion requires a negative antecedent.

(5) a. John doesn't play guitar and neither do I.
b. * John plays guitar and neither do I (play guitar).

Neither itself must be negative, just as *so* must be affirmative.

1.3 *So* and *too*

As mentioned above, *so*-inversion clearly has additive meaning. The focus particle *too* also induces additive meaning (2b). But interestingly, *too* can be added to *so*-inversion without any extra additive meaning.

(6) a. John plays guitar, but so too does Mary.
= John plays guitar, but so does Mary.
b. Just as some children ignore their parents, so too do some parents ignore their children.
= Just as some children ignore their parents, so do some parents ignore their children.

Although they co-occur in the preposed position, additive-*too* and additive-*so* are in an interesting kind of complementary distribution.

(7) a. So do I.
b. * Too do I.

(8) a. I do too.
b. * I do so. (*ungrammatical on relevant reading*)

Additive-*too* cannot occur alone in the preposed position, unlike *so* (7). Additive-*so* can only occur in the preposed position (8).

1.4 *So* and *N-either*

I claim that *so*-inversion and *neither*-inversion have strongly similar syntactic derivations. Huddleston & Pullum (2002:1539) claim that there are two crucial differences between *so*-inversion and *neither*-inversion. The first is that *so* must

contrast subjects, but *neither* need not do so. This seems to be incorrect: *so* does not have to contrast the subject.[3] Example (9d) comes from President Barack Obama's nomination acceptance speech at the Democratic National Convention in 2008.

(9) a. **The Druze** will continue as individuals to play their policing role, but so will **they** continue as a group to protest it indirectly through democratic channels.

b. For this divorced father, as **women** demand equality in the work-place, so too must **they** demand equality in child support.[4]

c. As **we** uncover the mysteries of the body, so too must **we** unravel the harmonies of the soul.

d. Just as **we** keep our promise to the next generation here at home, so must **we** keep America's promise abroad.

Their claim is on the difference between (10a-b) and (10c-d).

(10) a. * He can play the piano, and so can he sing.

b. * She has invited Max, and so does she intend to invite Paul.

c. He can't play the piano, and neither can he sing.

d. She hasn't invited Max, and neither does she intend to invite Paul.

However, the examples in (10) are much, if not completely, improved if *and* is changed to *but* and *too* is added.

(11) a. He can play the piano, but so too can he sing.

b. She has invited Max, but so too does she intend to invite Paul.

Thus, this does not seem to be a clear difference between *so*-inversion and *neither*-inversion.

The second claimed difference is that *so* can occur with *too*, but *neither* stands alone. One cannot, for example, insert *not/nor/either* with *neither*-inversion.

(12) a. John plays guitar, but so (too) does Mary.

b. John doesn't play guitar, but neither (*not/*nor/*either) does Jim.

I would like to claim that this difference stems from a decomposition of *neither* in to at least *n-* + *either*.

(13)

	Polarity Marker	Focus Particle	
Affirmative	so	too	*so too*
Negative	n-	either	*neither*

The reason *neither* cannot co-occur with a focus particle, then, is that it is *n-* that always occurs with a focus particle, namely, *either*. This is analogous to analyzing *so*-inversion as involving *so* + *TOO*.

2 What do we have to account for?

Any analysis of *so*-inversion should explain: (a) why it induces subject-aux inversion, (b) its obligatory affirmative polarity, and antecedent polarity matching, (c) its co-occurrence with *too*, (d) the similarities with *neither*-inversion, and (e) its additive meaning. In the next section, I show how my analysis accounts for these properties.

2.1 Polarity Focus Constructions (PFCs)

'Polarity Focus' refers to focus on the affirmative or negative polarity of the sentence. At first glance, PFCs seem to vary greatly across languages. Recent work on many languages, however, seem to converge on the idea that they involve a polarity focus projection, ΣP, which dominates the inflectional domain (e.g. TP).

There have been two conceptions of ΣP in the literature. The first, originally introduced by Laka (1990), is that ΣP is a Polarity Phrase which can be Affirmative, Negative or Emphatic. In the second, used by Holmberg (2001) and others, ΣP is a Polarity Focus Phrase, which either attracts the Pol(arity)P to its specifier or generates a focus particle there. Liptak (2003) and van Craenenbroeck (2004) call this projection VFocP, for Verum Focus Phrase. Here, this is understood as ΣP, following the second conception of ΣP. Below is a brief summary of how ΣP has been exploited in the analysis of various languages.

Table 1

Oevdalian	Σ is realized as subject-doubling in the presence of a finite set of adverbials when polarity is focused (Rosenkvist 2007).
Russian	Σ licenses ellipsis with additive *tozhe* 'also' only when Σ bears contrastive focus (Laleko 2006).
Basque	Σ is a unified polarity projection with three possible settings: affirmative, negative, and emphatic (Laka 1990).
Finnish	Σ is a polarity focus projection which attracts Pol(arity)P to its specifier and licenses ellipsis in Yes-No answers (Holmberg 2001).
Hungarian	Σ/VFoc involves contrastive sentential emphasis, with a strong role for *is* 'also' and *igenis* (Liptak 2003).
Dutch	Σ/VFoc hosts emphatic polarity particle *toch*, which is followed by *wel* 'AFFIRMATIVE' or *nie* 'not' (van Craenenbroeck 2004).

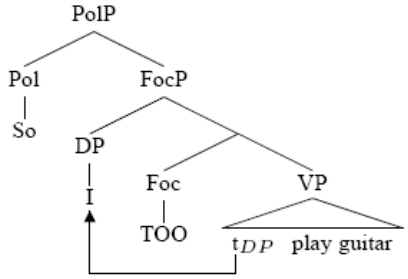
A parametric difference between various analyses of Σ is (a) Σ is in complementary distribution with polarity markers, as in Russian, Basque, Finnish, (and English), and (b) Σ is realized by a separate polarity focus particle, and is not in complementary distribution with polarity markers, as in Dutch, Hungarian, Oevdalian. A possible account of this variation, which I do not pursue in detail here, would to take the first set to involve movement of PolP (AffP/NegP) to ΣP to focus polarity, and the second set to involve ΣP being realized by a separate lexical item. *So*-inversion falls under the first category.

2.2 So-inversion as Polarity Focus

The general framework assumed here is the Minimalist Program (Chomsky 1995, 2008, Collins 1997), assuming Antisymmetry (Kayne 1994) and no covert movement (Kayne 1998).

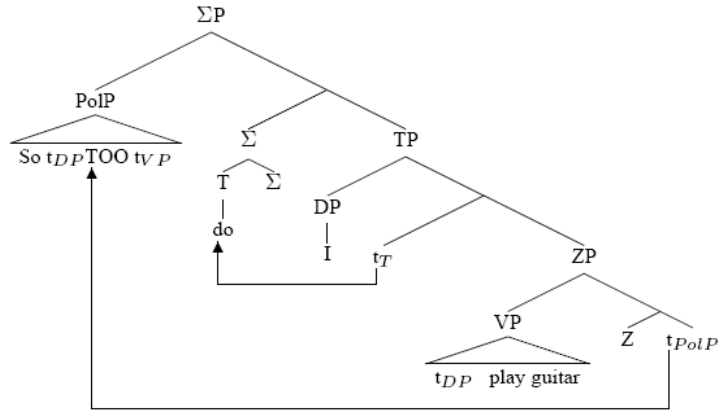
Too, as a focus particle, is a focus head which merges in the left periphery of the extended VP.[5] This is in line with Kayne's (1998) analysis of focus particles, including *too*. It attracts the focused constituent to its specifier (14).

(14)



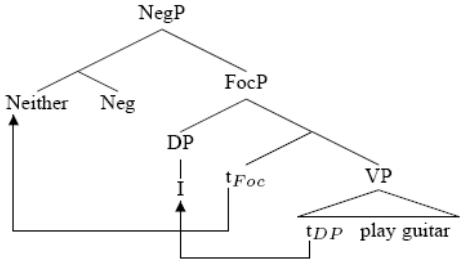
Next, the affirmative polarity particle *so* merges with FocP, creating AffP.[6] The derivation proceeds normally from here, until Σ merges with TP and attracts PolP to its specifier after VP has evacuated it (15).[7]

(15)

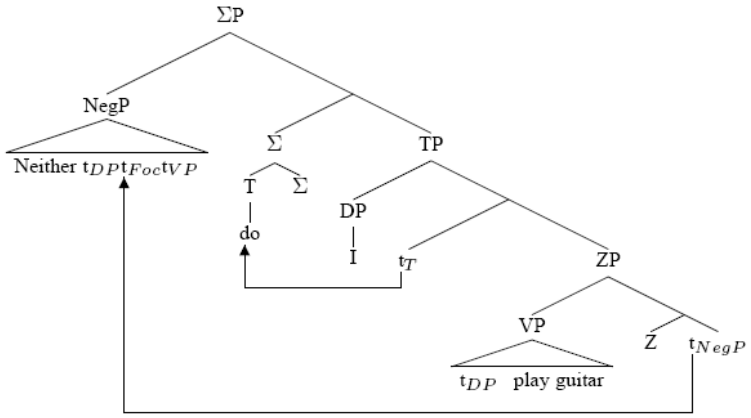


Now consider *neither*-inversion. The key to accounting for the differences between *so* and *neither* is the decomposition of *neither* into *n-*+ *either*. The one 'word' *neither* does the work of the two words *so too* (16).[8] The rest proceeds the same (17).

(16)



(17)



2.3 Polarity Focus and the Facts of So-inversion

How does this account for the properties of *so*-inversion discussed above? Subject-aux inversion is a general property of polarity focus. Whatever the account of (18) is, this will extend to *so-*/*neither*-inversion.[9]

(18) Never have I seen such a hideously ugly car.

Polarity restrictions follow directly. If *so* is an affirmative polarity particle, it should not be compatible with negative polarity. Additive meaning comes from the (sometimes silent) focus particle *too*, or (the always present) *either*. The latter cannot be silent because it forms a prosodic word with *n-*. *Too* and *either* are focus particles, and are tightly connected with polarity focus. This connection seems cross-linguistically ubiquitous. Finally, *so*-inversion in this analysis is di-

rectly analogous to *neither*-inversion. The differences stem from decomposition of *neither* into *n-+ either*.

3 Previous Analyses

I now consider some previous analysis of *so*-inversion, and show that they fail to capture the properties outlined above. Further, they make incorrect predictions of their own.

3.1 So as a pro-form

In a recent analysis Toda (2007) argues that *so* is a pro-form that replaces a preposed VP. This is very similar to the analysis of *so*-inversion in Chomsky (1957:65-6). This has intuitive appeal, since VP-ellipsis is very common with *so*-inversion: if *so* replaces the VP, this is explained.

However, such an analysis has several drawbacks. First, subject-aux inversion must be stipulated. Second, there is no reason to expect a polarity restriction. Third, there is no obvious relationship with *too* or *neither*. Fourth, the additive meaning of the construction actually has to be denied (Toda 2007:fn6). While Toda's analysis gets many facts right for a few examples, it doesn't extend, within the language, beyond the construction itself.

I will not criticize Toda's proposal directly, but wish to point out a more general problem with any "*so* as proform" approach: the verb phrase material still seems to be there, either overtly or as ellipsis. This is most clearly shown in the sentences like (6b) and (9).

Even when ellided, though, the VP can still be shown to be present. Compare the behavior of *so*-inversion with a more clear verbal pro-form *do so*.[10] In *so*-inversion, *wh*-echo can be recovered, unlike with *do so*.

(19) ***Context:*** *Matt knows John has never met Mary.*
Matt: Fred visited Mary yesterday.

a. i. **Fred**: So did John.
ii. **Matt**: So did John what?
iii. **Matt**: So did John visit who?

b. i. **Fred**: John did so too.
ii. * **Matt**: John did so what too?
iii. * **Matt**: John did so visit who too?
iv. **Matt**: John did what too?

Similarly, *so*-inversion can co-occur with a Hanging Topic (Cinque 1977): [11]

(20) **Mary**: I never kill animals.
Fred: Really? I kill bugs.

a. **Mary**: Oh bugs, so do I, but I never kill anything furry.

b. * **Mary**: Oh, bugs, I do so too, but I never kill anything furry.

If *so* were a pro-form, we would not expect (19a-ii), (19a-iii), or (20a) to be grammatical, since *so* would replace the constituent containing *what* in (19a-ii), *who* in (19a-iii), and *bugs* in (20a).

3.2 So as an adjunct

So is taken to be a "connective" adjunct in Huddleston & Pullum (2002) and an "additive adverb" in Quirk et al. (1985). I discuss these in turn.

A connective adjunct establishes a relationship between two sentences. Examples include *moreover*, *nevertheless*, etc. However, most connective adjuncts do not induce subject-aux inversion (21b), nor do they exhibit polarity restrictions (21c). The relationship between *so*-inversion and *too* and *neither* could be explained by calling them connective adjuncts too, but **Too do I* would not be explained. Additive meaning would seem to be partially explained on this hypothesis.[12]

(21) a. He likes dogs. Moreover, his whole family likes dogs.
b. * He likes dogs. Moreover does his whole family.
c. They (don't) like gerbils. Moreover, I (don't) like gerbils.

Further, most connective adjuncts can appear in multiple places throughout the phrase, unlike *so* in *so*-inversion.

(22) a. <Moreover> The committee <moreover> disagrees <moreover> with his opinion <moreover>.
b. *(So) does (*so) the committee (*so).

An additive adjunct is an adverbial which is additive in the sense defined above. Examples include *also, as well*, and *too*. This is closer to the present analysis, since here there is an additive element present (i.e. *too*). However, most additive adjuncts do not induce subject-aux inversion (23).[13] Polarity restrictions also would not be expected (24). The relationship with *so* and *too* might be expected, though the co-occurrence of *so too* might be expected to be odd.

(23) a. * Also do I.
b. * As well do I.
c. * Too do I.

(24) a. * John does not play guitar and so do I not (play guitar).
b. John does not play guitar and I also do not (play guitar).
c. * John doesn't play guitar and so do I.
d. * John plays guitar but so don't I/so do I not.
e. John plays guitar but I don't < also > play guitar < also >.

Thus, neither the adjunct nor pro-form approach to *so*-inversion capture the facts of the construction.

4 New England *so don't I*

In most of Eastern New England, there exists a construction usually referred to as the *so don't I* construction.[14] It is important to note that *so don't I* is **affirmative**. Some naturally occurring examples from Google are shown below.[15]

(25) a. Went here the other night with a girlfriend. Sure it's trendy, but **so aren't most NYC clubs**.
b. I so agree - we do need to let go and laugh and live. And we so need our gal pals - hubbys and kids and other family are essential for most of us, but **so aren't the gals in our lives**.
c. Yes, the "Somalis" should be treated with respect but **so shouldn't the Americans**.
d. National healthcare would be great, but **so wouldn't everybody actually paying taxes**.

No similar construction exists for the negative (26a), it is obligatorily affirmative and cannot take a negative antecedent (26b), and there is no non-inverted version (26c). The *n't* does not license NPIs (27).

(26) a. * He can('t) touch the ceiling, and neither can't I.
b. * He can't touch the ceiling, but so can't I.[16]
c. * Bill is going to school, and Harry isn't too.

(27) a. * I play guitar, but so doesn't John at all.
b. * I play guitar, but so doesn't anybody else.
c. * I play guitar, but so doesn't John ever.

Unlike standard *so*-inversion, *so don't I* does not allow an optional *too* (28). In addition, for no speaker is an unreduced negative *not* allowed (29).

(28) a. He plays guitar, but so (*too) don't I.
b. He plays guitar, but so too do I.
c. Just as some parents ignore their children, so (*too) don't some children ignore their parents.
d. Just as some parents ignore their children, so (too) do some children ignore their parents.

(29) a. * He plays guitar, but so do not I.
b. * He plays guitar, but so do I not.

The pragmatic force of *so don't I* is one of implicature canceling. That is, (30a) is only pragmatically felicitous when there exists an implicature like (30b).

(30) a. He plays guitar, but so don't I.
b. It is not the case that I play guitar too. *a cancels b*

Why is (26a) ungrammatical? While I do not have the space to go into the details, I would like to argue that this implicature cancelation is syntactically represented by an abstract negation morpheme, which constituent negates the verb phrase. Thus, *so don't I* is similar to double negation (31b), which is possible in ellipsis contexts (32).

(31) a. **Mary**: I didn't know that you played guitar too!
b. **Fred**: Well, I don't really play guitar too, but I don't not play guitar too.

(32) I don't not pay attention in class, but some people certainly do Δ.
Δ = not pay attention in class.

If this is on the right track, then the impossibility of *neither can't I* in New England English would relate to the impossibility of *neither* as constituent negation in double negation sentences (33).

(33) * I don't not pay attention in class, and John doesn't pay attention in class neither.
Intended reading: John doesn't not pay attention in class either.

Since *neither* must move to the clausal negation position (16), bypassing *not*, we predict that *not* can be the constituent negator, and *neither* the clause negator, but this would preclude *n't*. This prediction is borne out:

(34) I don't not pay attention in class, and neither does John Δ.
Δ = not pay attention in class.

The ungrammaticality of (33) and (26a) are then related: *neither* must be the clausal negator, at the expense of *n't*. In *so don't I*, the lower polarity operator *so* is not negative, allowing merger of *n't* but with scope only over the lower implicature similar to metalinguistic negation (Carston 1996).

5 Conclusion

So-inversion involves polarity focus, where *so* is best understood as an affirmative polarity particle. The properties of *so*-inversion, which extensively differentiate it from pro-forms and adjuncts, are very similar to *neither*-inversion specifically, and polarity focus in general. The differences between *so* and *neither* can be shown to follow from the fact that *neither* is composed of (at least) two morphemes, *n-* and *either*. Dividing the functions of polarity and additivity into two separate elements allows for a clearer understanding microparametric variation in New England *so don't I*. Finally, analyzing *so*-inversion as polarity focus invites interesting connections with polarity-focus constructions cross-linguistically, which very often involve additive particles like *too* or *also*, as well as a high polarity focus position.

Notes

[1]I am utterly indebted to the following people for inspiring discussion of the material here: Mark Baltin, Inna Livitz, Jeroen van Craenenbroeck, Richard Kayne, Tricia Irwin, Oksana Laleko and Sara Schmelzer, as well as others I can't think of at the moment. In addition, a huge thanks to Melinda Kaye Wilson for extensive discussion of the *so don't I* data.
[2]Though see below on *so don't I*.
[3]Examples (9a-c) are from the Contemporary Corpus of American English (COCA; Davies 2008). Many more can be found.
[4]The object of the preposition for in (b), *this divorced father*, appears to be the speaker, a phenomenon discussed in detail by Collins & Postal (2008).
[5]I assume more VP structure than is shown here. See Alexiadou & Anagnostopoulou (2004), Collins (2005), and Baltin (to appear).
[6]More generally, PolP; see Culicover 1991. Alternatively, there may be reasons to believe that *so* is in Spec,PolP. See Haddican (2004).
[7]Here I show VP moving to SpecZP, the latter adopted from Baltin (2006). See also Kayne (2005) and Bentzen (2005) for the possibility of a position between T and Pol to which VP moves.
[8]Here I show this as a result of movement – the idea is that negative constituents like *neither* must move to NegP to establish clausal negation (see Kayne 1998, den Dikken 2006). Another possibility is that nothing moves and *n-* realizes Neg.
[9]See Haegeman (2000) for discussion. It is not clear how this would extend to the system in Sobin (2003).

[10]See Baltin (to appear) and Haddican (2007) on *do so* as a pro-form. It is worth noting that Toda (2007:fn3) explicitly argues that his pro-form *so* has nothing to do with the pro-form *do so*. This doesn't affect the arguments here, though: pro-forms usually don't occur with the constituents they supposedly replace, and in Toda's analysis, the VP is swallowed up whole, derivationally, by the pro-formalization process.
[11]The important thing here is the contrast. Thank you to van Craenenbroek (p.c.) for pointing out some reasons to believe that this is something like Hanging Topic, rather than Topicalization or Left Dislocation.
[12]That is, connective adjuncts seem to be additive in the clausal sense. For example, *moreover* could be replaced by *also* in many cases. Usually, though, *so* focuses a specific sub-constituent of the clause, such as the subject, and not the clause itself. It seems much harder to get *moreover* to do this.
[13]An exception is the very interesting case of *as do I* and *nor do I*, which also arguably involve polarity in some important way. See Potts (2002) for some discussion.
[14]See Lawler (1974), Labov (1972), Pappas (2004), Freeman (2004), Horn (1978, 2008), and Gilman (1989).
[15]These examples are from the following websites, in order:
http://www.yelp.com/biz/runway-new-york-3
http://stampinangeljenn.blogspot.com/2008/06/girls-daynight.html
http://www.sunjournal.com/story/258000-3/LewistonAuburn/Students_grades_to_go_online/
http://www.boston.com/news/politics/politicalintelligence/2008/07/mccain_sharpens.html
[16]In some dialects, sentences of this kind are acceptable and negative. Speakers who judge these as acceptable are not hard to find, nor are examples on the internet. Unfortunately, I do not have time to discuss such speakers here. Importantly, they are ungrammatical for speakers of the dialect in question. All of my informants unequivocally rejected such sentences, often asking what such an expression could possibly mean.

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Animacy Effects in Chinese Relative Clause Processing

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1. Introduction

Previous studies on relative clauses (henceforth RCs) have shown a correlation between RC type and head noun animacy. That is, subject-extracted RCs frequently occur with animate head nouns (1a), and object-extracted RCs tend to occur with inanimate head nouns (1b):

(1a) [the journalist] who _ bypassed the boulder (subject-extracted RC)

(1b) [the boulder] that the journalist bypassed _ (object-extracted RC)

This correlation pattern has been replicated in sentence completion tasks (Gennari and MacDonald, 2008), and in corpus analyses of different languages, including Dutch and German (Mak, Vonk, & Schriefers, 2002, 2006), English (Roland, Dick, & Elman, 2007), and Chinese (Pu, 2007).

Research on the processing of RCs has found differences between subject-extracted and object-extracted RCs, as well as effects of head-noun animacy. It has been reported that subject-extracted RCs are easier to process than object-extracted RCs in languages with head-initial RCs (e.g., in English: Just & Carpenter, 1992; Ford, 1983; King & Just, 1991; King & Kutas, 1995; in French: Frauenfelder, Segui, & Mehler, 1980; Holmes & O'Regan, 1981; in German: Schriefers, Friederici, & Kuhn, 1995, inter alia). Furthermore, existing research has found that object-extracted RCs with animate heads are harder to process than object-extracted RCs with inanimate heads (e.g., Traxler, Morris, & Seely, 2002, 2005; Gennari & MacDonald, 2008 on English and Mak et al., 2002, 2006 on Dutch). These findings suggest an interaction between 1) syntactic complexity arising from extraction type and 2) head animacy in head-initial RCs.

This paper aims to investigate whether such an interaction also affects the processing of Mandarin RCs. Mandarin RCs are head-final: The head noun occurs at the very end of the RC, preceded by the relativizer (RC marker) DE. However, other phrasal categories in Mandarin are head-initial, and thus clauses have basic subject-verb-object word order. The Chinese versions of (1a-b) are given in (2a-b) below.

(2a) [e_i raokai jushi] de jizhe$_i$ (subject-extracted)
[bypass boulder] DE journalist
'the journalist who _ bypassed the boulder'

(2b) [jizhe raokai e_i] de jushi$_i$ (object-extracted RC)
[journalist bypass] DE boulder
'the boulder that the journalist bypassed _'

In contrast to research on head-initial languages which has shown that subject-extracted RCs are easier to process overall than object-extracted RCs, the findings for Mandarin are more mixed. Some researchers have found that subject-extracted RCs are easier to process (e.g. Lin & Bever, 2006; Lin, 2006; Kuo & Vasishth, submitted), whereas others have found the opposite (Hsiao & Gibson, 2003; B. Lin & Garnsey, 2008; Wu & Gibson, 2008; Chen, Ning, Bi, & Dunlap, 2008). It is worth noting that nearly all existing experiment-based studies on Chinese used RCs that had a human head noun as well as a human embedded noun inside the RC. However, this configuration is rare in natural language corpora. For instance, Hsiao's 2003 analysis of the Chinese Treebank 3.0 corpus found only 6 RCs with two animate NPs (out of 882 RCs). Similarly, Kuo and Vasishth's analysis of the Taiwan Sinica Corpus 3.0 revealed only 16 RCs with two animate NPs (out of 164 RCs). It is further worth noting that RCs with two animate NPs may potentially induce similarity-based interference (e.g., Gordon, Hendrick & Johnson, 2001, 2004; Vasishth & Lewis, 2006).

Given the correlations between animacy and RC type found in existing corpus work, most existing psycholinguistic research on Chinese RCs has not adequately explored the effect of animacy. To investigate this issue more closely, in this paper we examine (1) the frequency of different animacy configurations in Chinese RCs in a corpus; and (2) the contribution of different animacy configurations to real-time processing of subject- and object-extracted RCs in Chinese. We first present the results of our corpus study, followed by three self-paced reading experiments.

2. Corpus Study

A total of 331 RCs with transitive action verbs were extracted from the Chinese Treebank 5.0 corpus (Palmer, Chiou, Xue & Xia, 2005). The head noun and the

embedded noun were coded for two animacy categories: animate and inanimate. Nouns categorized as *animate* included humans, institutions and organizations (e.g., the Pentagon, WTO, Washington), and animals. Following the standard notation, we examined the animacy patterns for the four RC types, defined on the basis of the grammatical role of the head in the matrix clause and the extraction site in the relative clause itself: (i) subject-modifying, subject-extracted RCs (SS), (ii) object-modifying, object-extracted RCs (SO); (iii) object-modifying, subject-extracted RCs (OS), and (iv) object-modifying, object-extracted RCs (OO).

Let us first consider the results for head noun animacy. Of the 148 animate head nouns in the corpus, 88.51% (131/148) are in subject-extracted RCs (SS and OS). In contrast, among the 183 inanimate heads in the corpus, 60.65% (111/183) occur in object-extracted RCs (SO and OO). This result replicates the findings of prior studies: (1) animate heads generally tend to occur in subject-gapped RCs, and (2) inanimate heads tend to occur in object-extracted RCs.

When we looked at the animacy of *both the head noun and the embedded nouns* (Figure 1), we observed a striking pattern: RCs with two non-contrastive NPs (i.e., two animates or two inanimates; black bars and grey bars in Figure 1) occur only rarely, except for OS RCs. This suggests that RCs in general tend not to have two NPs with identical animacy.

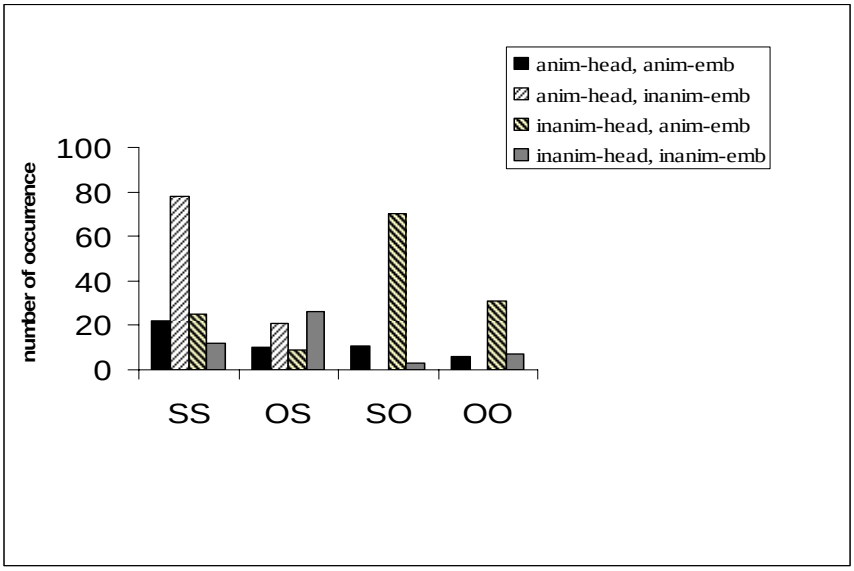

Figure 1: Animacy distribution of head nouns and embedded nouns across four types of RCs.

RCs with NPs which contrast in animacy also exhibit an asymmetrical distribution. Object-extracted RCs (SO and OO) tend to have inanimate head nouns *and* animate embedded nouns (101/128, 78.91%). In contrast, SS RCs tend to have animate head nouns and inanimate embedded nouns (78/137, 56.93%). OS RCs do not show a clear preference for a specific animacy pattern.

On the basis of these corpus patterns and existing work, the following animacy preference constraints can be formulated: (i) head nouns that are RC-subjects tend to be animate; (ii) head nouns that are RC-objects tend to be inanimate; (iii) in both cases, the animacy of the head tends to contrast with the animacy of the embedded noun.

We tested these animacy constraints in three self-paced reading experiments, using subject-modifying RCs. We aimed to address the following questions: Are these animacy preference patterns reflected in the ease of processing subject-extracted and object-extracted RCs? If we take these animacy patterns into account, will that help to resolve the controversy regarding subject- vs. object-gapped RCs in Chinese?

3. Experiment 1

In the first self-paced reading study, we examined the real-time processing of subject-gapped, subject-modifying RCs (SS RCs) by testing 36 Mandarin native speakers. The experiment contained 20 target items and 46 filler items. The crucial manipulation was the animacy of the RC-object (i.e., the embedded noun) and the animacy of the RC-subject (i.e., the head), resulting in 4 animacy configurations: (i) Oi-Sa = inanimate RC-object and animate RC-subject/head, (ii) Oa-Sa = animate RC-object, animate RC-subject/head, (iii) Oa-Si = animate RC-object, inanimate RC-subject/head, (iv) Oi-Si = inanimate RC-object, inanimate RC-subject/head. Thus, by crossing the animacy of the RC-object and RC-subject (head), we created two *contrastive* configurations, one being *preferred* (animate head ‘journalist’ // inanimate embedded noun ‘gate’), the other being *reversed* (inanimate head ‘egg’ // animate embedded ‘guard’), as well as two *matched* configurations (two animate nouns ‘journalist’/‘guard’; two inanimate nouns ‘egg’/ ‘gate’). An example of the preferred animacy configuration (animate head, inanimate embedded noun, Oi-Sa) is given in (3). We predicted that (i) SS RCs with animate RC-subjects (i.e., head nouns) would be read faster than SS RCs with inanimate RC-subjects; and that (ii) SS RCs with the preferred contrastive animacy configuration would be processed faster than the other three RC types.

(3) SS RCs with animate head and inanimate embedded noun
e_i raokai damen de jizhe chenggongde liule jinqu
circumvent gate DE journalist successfully slip-ASP inside
‘The **journalist** that __ circumvented the **gate** slipped in successfully.’

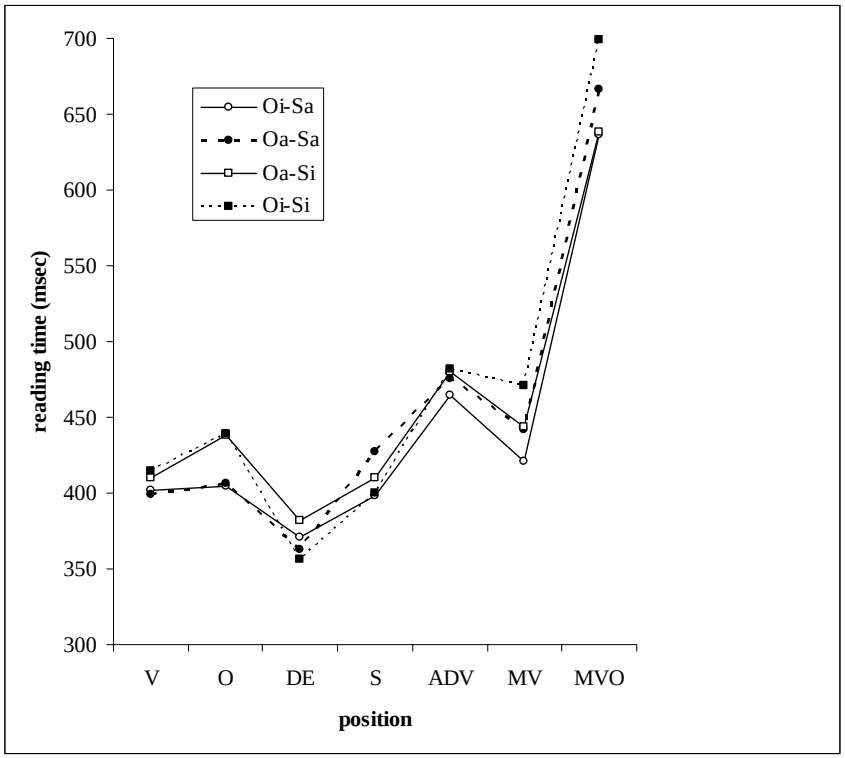

Fig 1. Mean reading times per word position in Experiment 1 (on SS RCs)

We focus on seven positions, starting with the RC-internal verb (position 1): the RC-internal object (position 2), the relativizer DE (position 3), the head of the RC (position 4), the post-head adverb (position 5), the matrix verb (position 6) and the postverbal matrix object (position 7).

As can be seen in Figure 1, participants' RTs show a main effect of subject animacy at the embedded noun position (the RC-object 'gate', denoted with 'O' on the x-axis): RC-objects following *verbs* that signal an upcoming animate subject ('journalist) are read faster than those following verbs signaling an inanimate subject ('egg'). An interaction was also found at the relativizer DE: DE was read faster in sentences that contained inanimate RC-objects than in sentences that contained animate RC-objects; and in sentences with animate subjects (RC heads), DE was read faster than in sentences with inanimate subjects (RC heads). At the last two word regions, there was a marginal interaction: at the main verb, conditions with animate subjects were read faster than conditions with inanimate subjects; at the main object, inanimate subjects

were read slower than animate objects. In addition, these two regions also showed a contrastive animacy effect, that is, *contrastive* animacy configurations were read faster than *matched* animacy configurations.

Overall, the results of Experiment 1 provide evidence for the animacy preference constraints: in subject-extracted RCs, head nouns that are animate RC-subjects are easy to process, and processing is also facilitated when the animacy of the head contrasts with the animacy of the embedded noun.

4. Experiment 2

Interestingly, Experiment 1 did not find facilitatory effects for inanimate objects (except at the DE region), perhaps because the objects nouns were not the heads of the RCs. Experiment 2 used object-extracted RCs (SO RCs) to test whether object head nouns that are inanimate are easier to process than object heads that are animate. Except for extraction site, the logic of the design is the same as in Experiment 1, with the same animacy manipulation and the same predictions. But now the head noun is the RC-object, and the embedded noun is the RC-subject. A new set of native speakers of Mandarin (n=36) participated in the experiment. The experiment contained 18 critical items and 46 fillers. An example of target items in the preferred animacy configuration is provided in (4).

(4) SO RC with inanimate head and animate embedded noun
jizhe raokai e_i de damen yaoyande shuazhe hongqi
journalist circumvent DE gate glaringly paint-ASP red-paint
'The **gate** that the **journalist** circumvented __ was painted glaringly red.'

The reading time patterns are shown in Figure 2 (below). Again as in Experiment 1, we focus on seven positions, starting with the RC-internal subject (position 1), and also including, the RC-internal verb (position 2), the relativizer DE (position 3), the head of the RC (position 4), the post-head adverb (position 5), the matrix verb (position 6) and the postverbal matrix object (position 7).

We found no main effects of object (head) animacy, except for an interaction between subject animacy and object animacy at the main verb region (e.g. 'paint' in ex.(4)). The interaction suggests that the [object=inanimate] preference has less of a facilitation effect than the [subject=animate] preference, and an animate object also has a less disruptive effect than an inanimate subject. Although we found no main effect of object animacy, there was a pervasive effect of RC-subject animacy across all seven regions. In addition, there was a delayed contrastive animacy effect at the matrix object (e.g. 'red paint' in (4)): the matched animacy conditions were read slower than the contrastive animacy conditions.

The results of Experiment 2 replicated the subject-animacy preference effects and the delayed contrastive animacy effect that were observed in Experiment 1.

However, we again found no clear evidence for an [object=inanimate] preference.

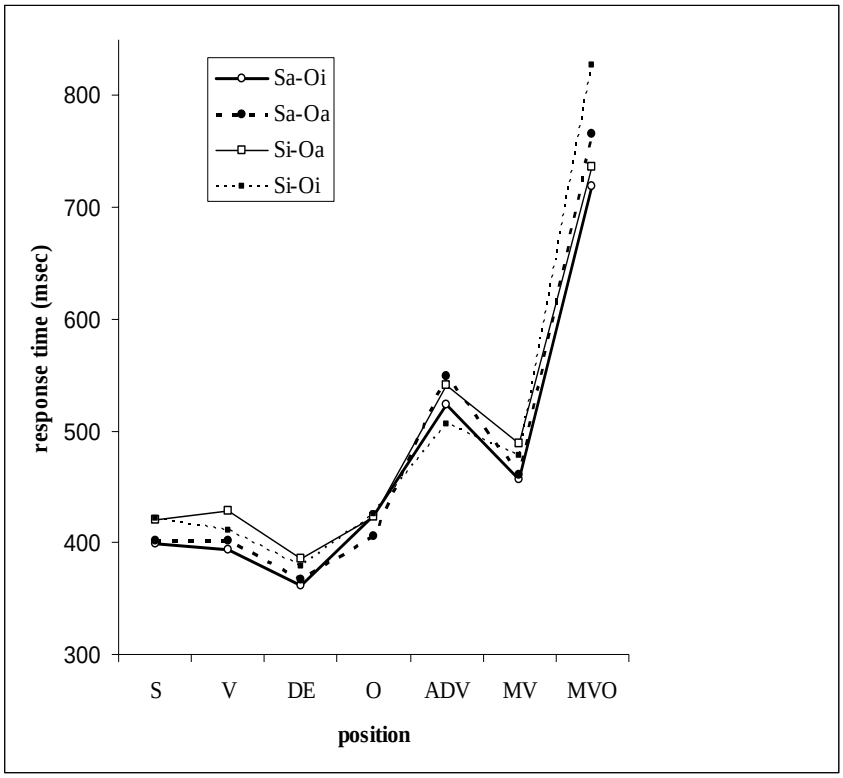

Fig 2. Mean reading times per word position in Experiment 2 (SO RCs)

To summarize, both experiments show that processing of RCs where the two nouns contrast in animacy is easier than processing of RCs where the two nouns match in animacy. This finding fits with previous work in other domains on similarity-based interference (Gordon et al., 2001; 2006). Crucially, in addition to showing facilitatory effects of dissimilar animacy, our results also indicate that this 'mismatch preference' interacts with the well-known observation that subjects tend to be animate and objects tend to be inanimate (also see Traxler et al. (2002) for a similar line of reasoning).

5. Experiment 3

The findings from the first two experiments laid the foundation for the third experiment. Experiment 3 aimed to further test whether distinct animacy status,

mapped onto the appropriate syntactic position, facilitates online processing of RCs. In Experiment 3, we compared subject-extracted and object-extracted RCs (SS vs. SO RCs). The two NPs always differed in animacy, but the animacy configuration was either *preferred* (animate subject, inanimate object) or *reversed* (inanimate subject, animate object). If contrastive animacy is kept constant, we predict that if RC-subject animacy and extraction type are manipulated, we should find that RCs with preferred animacy configurations are processed faster than RCs with reversed animacy configurations. Crucially, if we find a difference in the ease of processing subject-extracted vs. object-extracted RCs even when the animacy configurations for both are of the preferred type, that could help clarify the controversy regarding the processing asymmetry in Mandarin RCs.

We tested 40 new native speakers of Mandarin. The experiment contained 24 critical items and 46 fillers. We manipulated extraction type (subject-extracted, object-extracted) and animacy of RC-subject (animate, inanimate), yielding four conditions as in (5).

(5) a. **SS RC, Animate RC-Subject (***preferred* **Oi-Sa)**
e_i raokai jushi de jizhe$_i$ jingtide huangu sizhou
circumvent boulder DE journalist vigilantly look-about surrounding
'The journalist that __ circumvented the boulder cautiously looked about his surroundings.'

b. **SS RC, Inanimate RC-Subject (***reversed* **Oa-Si)**
e_i zaizhong jizhe de jushi$_i$ mimide zhangzhe qingtai
pound journalist DE boulder thickly grow-ASP moss
'The boulder that __ pounded upon the journalist thickly grew moss.'

c. **SO RC, Animate RC-Subject (***preferred* **Sa-Oi)**
jizhe raokai e_i de jushi$_i$ mimide zhangzhe qingtai
journalist circumvent DE boulder thickly grow-ASP moss
'The boulder that the journalist circumvented __ thickly grew moss.'

d. **SO RC, Inanimate RC-Subject (***reversed* **Si-Oa)**
jushi zaizhong e_i de jizhe$_i$ jingtige huangu sizhou
boulder pound DE journalist vigilantly look-about surrounding
'The journalist that the boulder pounded upon __ cautiously looked about his surroundings.'

The reading time patterns are shown in Figure 3 (below). At the second word position (RC-object 'boulder' for SS RCs and RC-verb 'circumvent' for SO RCs), reading times in SS RCs with inanimate subjects (reversed *Oa-Si*) were significantly slower than in the other three types of RCs.

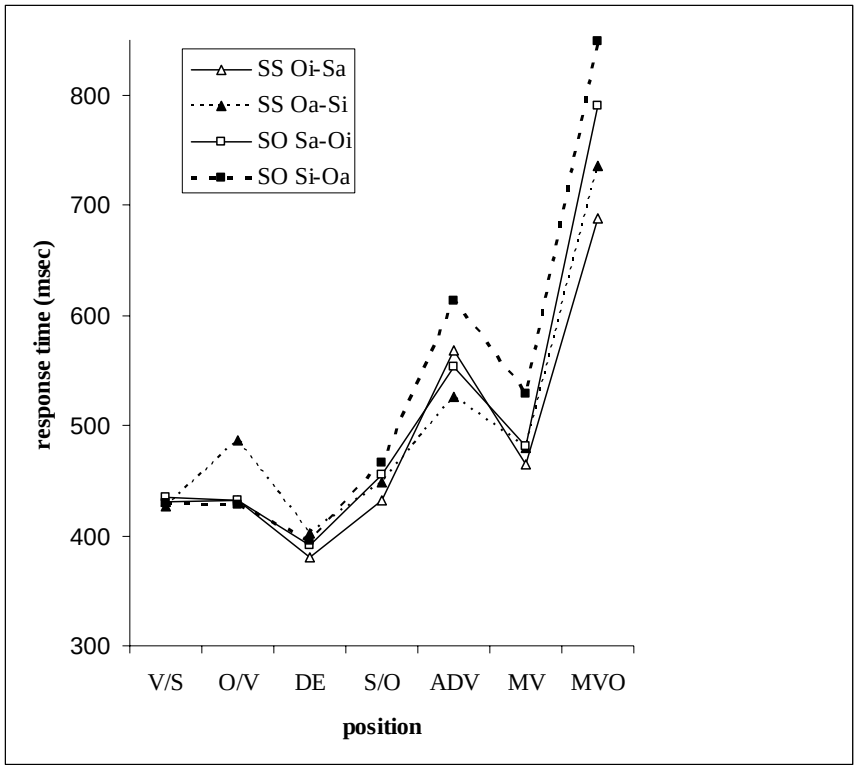

Fig. 3 Mean reading times per word position in Experiment 3

At the relativizer DE region, SS RCs with reversed animacy (*Oa-Si*) were significantly slower than SS RCs with preferred animacy (*Oi-Sa*). At the head noun region, SS RCs with preferred animacy (SS *Oi-Sa*) were processed faster than SO RCs with reversed animacy (SO *Si-Oa*). At the adverb region, SS RCs were read faster than SO RCs; in addition, SO RCs with preferred animacy were read faster than SO RCs with reversed animacy. At the main verb region, SO RCs with preferred animacy were read faster than SO RCs with reversed animacy. At the main object region, both kinds of SS RCs were read faster than SO RCs with reversed animacy.

The results of Experiment 3 confirm that preferred animacy configurations (animate RC subjects, inanimate RC objects) are indeed processed faster than reversed animacy configurations. Crucially, the results showed an overall processing advantage for subject-extracted RCs over object-extracted RCs, modulated by the animacy configuration. That is, subject-extracted RCs with the preferred animacy configuration (*SS Oi-Sa*) were processed significantly faster than object-extracted RCs with the non-preferred animacy configuration (*SO Si-*

Oa). When RCs of both extraction types satisfied the preferred animacy configurations (*SS Oi-Sa*, *SO Sa-Oi*), sentences were equally easy to process, although numerically subject-extracted RCs (i.e., *SS Oi-Sa*) were processed faster than object-extracted RCs (i.e., *SO Sa-Oi*). When RCs of both extraction types had the reversed animacy configurations (*SS Oa-Si*, *SO Si-Oa*), a processing advantage associated with subject-extracted RCs emerged: reading times in the *SS Oa-Si* condition were faster than in the *SO Si-Oa* conditions in all post RC-head regions.

6. Conclusions

In this paper, we presented a corpus study and three experiments that investigated the role of animacy on the processing of head-final relative clauses in Mandarin. The first two self-paced reading experiments manipulated the animacy (animate/inanimate) of the head-noun and the embedded noun. The results show that RCs with animate subjects are easier to process than RCs with inanimate subjects, but that the animacy of the object is not as important – regardless of whether we are dealing with subject-extracted or object-extracted RCs. We also found a late facilitatory effect of contrastive animacy. Also, subject-extracted RCs are processed fastest when the head (RC-subject) is animate and the embedded noun (RC-internal object) inanimate, whereas object-extracted RCs are processed fastest when the head (RC-object) is inanimate and the embedded noun (RC-internal subject) is animate. This facilitatory effect of contrastive animacy correlates with the frequency patterns observed in the corpus.

To clarify whether contrastive animacy alone facilitates RC processing, and to shed light on the controversy regarding the processing asymmetry of subject- versus object-extracted RCs in Chinese, Experiment 3 investigated effects of extraction site in RCs with preferred and dispreferred animacy configurations. Our results show that when RCs had animate subjects and inanimate objects (i.e., the preferred animacy configuration), subject-extracted and object-extracted RCs were equally easy to process. However, when RCs had the reversed animacy configuration, object-extracted RCs were more difficult than subject-extracted RCs.

In all three experiments, we found a consistent facilitatory effect for animate subjects (main effect of subject animacy), but no facilitation for inanimate objects (no main effect of object (in)animacy), except at the DE region in Experiment 2). We offer two possible reasons as to why the animacy of subject is more important than the (in)animacy of the object. First, there is a closer association between Subject and the [+animate] feature than between Object and the [-animate] feature. It has been a long-standing observation that human referents tend to be realized in subject position (e.g., Croft, 1990; Givon, 1983;

See also Gennari and MacDonald, 2008; Traxler et al., 2002; Clifton et al., 2003; Just and Carpenter, 1992).

The second possible reason for why subject animacy is so important has to do with the fact that information about subject animacy is available to the language comprehension system earlier than information about object animacy in Chinese. In Mandarin object-extracted RCs, the subject is the first element inside the RC and thus information about its animacy is available before information about the object's (head's) animacy. Even in subject-extracted RCs, information about the subject's animacy is available early: the sentence-initial verb provides information about the animacy of its upcoming subject. In contrast, information about object animacy only becomes available post-verbally when the object itself is encountered. In general, the object's animacy is less dependent on the verb than the subject's animacy; the computation of object animacy needs to take into consideration the information about both the subject and the verb.

As a whole, the results presented here highlight the important role of animacy in RC processing, and suggest that the relation between the animacy of the head noun and that of the embedded noun plays an important role in modulating the processing ease of subject-extracted vs. object-extracted RCs in Mandarin Chinese.

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The Effect of Classifiers in Predicting Chinese Relative Clauses

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1. Introduction

Chinese is a typologically unique language with a combination of SVO word order and the N-final property (Dryer, 1992). It is also a classifier language in that each noun can be modified by a particular classifier depending on the semantic congruity between them. For instance, the classifier *tiao* can only modify a long, thin, and non-human entity. Thus it can modify a noun such as *shengzi* 'string', but not a human referent such as *laoshi* 'teacher'.

In Chinese relative clauses (henceforth RC), there is a relativizer DE that occurs at the end of the RC, immediately preceding the head noun. This means that a comprehender may not identify an RC structure until very late. For example, a temporary ambiguity may arise in object-gapped RCs (as in (1)), because until encountering DE, the comprehender may initially interpret the initial noun and verb as constituting a matrix subject and matrix verb:

(1) [$_{RC}$ laoshi tuijian t_i de] shu_i
teacher recommend t DE book

However, if the RC is preceded by the head noun's classifier (e.g., the classifier *ben* for the upcoming noun *shu* 'book', as in (2a) below, and if this classifier is semantically incongruent with the immediately following noun *laoshi* 'teacher', then the presence of such a mismatching pre-RC classifier can provide a cue for the upcoming RC, which may facilitate the real-time parsing of head-final RCs. One way to test this is to compare reading times at the head noun region in a classifier mismatch condition (2a) to reading times at the same region in a classifier match condition (2b), where the classifier *wei* can modify a human referent (*laoshi* 'teacher') but not an inanimate entity (*shu* 'book'). Faster reading times in the classifier mismatch condition would indicate facilitatory effects.

(2) a. **yi-ben** [$_{RC}$ laoshi tuijian t_i de] shu_i
one-CL$_{book}$ teacher recommend t DE book

b. [$_{RC}$ **yi-wei** laoshi tuijian t_i de] shu_i
one-CL$_{human}$ teacher recommend t DE book

Reading time studies on the use of classifier mismatch as a cue in Chinese RC construction have not found a facilitatory effect in isolated sentences (Hsu, Phillips & Yoshida, 2005; Hsu, 2006). Instead, these studies found that mismatch conditions exhibited a slowdown at the local noun region (i.e., *laoshi* 'teacher'). The classifier mismatch (*ben* in Ex. 2a), with its long-distance dependency relationship with the head noun ('shu'), appears to disrupt lexical access to the immediately adjacent RC-internal noun. In contrast, classifier mismatch was found to facilitate RC processing when the target stimuli were presented in supportive discourse contexts, i.e., contexts where the existence of two previously-mentioned referents (e.g. two books) created the need to distinguish between them by means of an RC (Wu, Haskell & Andersen, 2006; Hsu, Hurewitz & Phillips, 2006). However, it is not clear how much of this RC-facilitation effect is due to discourse contexts which may have biased comprehenders towards an RC reading, and how much of the effect is due to classifier mismatch (Wu et al., 2006; Hsu et al., 2006).

All prior studies used classifiers that preceded the RCs (pre-RC classifiers). However, classifiers that modify the head noun can also occur after the RC, i.e., in a post-RC position, immediately before the head noun. Note that in order to provide a potentially useful cue for signaling an upcoming RC, the head noun's classifier must occur in the pre-RC position, i.e., in a position that is dislocated from the noun it modifies. To find out how frequent such dislocated structures are in naturally-occurring language, we carried out a corpus study looking at the distribution of classifiers in pre-RC versus post-RC position. Based on these results, we designed two self-paced reading experiments to better investigate whether classifier positioning affects RC processing.

2. Corpus Study of Classifier Positioning

A total of 392 RCs that contain transitive action verbs subcategorizing two NP arguments were extracted from the Chinese Treebank 5.0 corpus. The RCs were then coded for 1) presence or absence of classifiers; and 2) the position of the head noun's classifier (pre-RC or post-RC). We found that most Chinese sentences with RCs do not contain classifiers. This finding seems to suggest that classifiers as a functional category have a relatively special status in Chinese. This is perhaps not surprising since the most commonly used classifier in Chinese is the generic *ge*, which can refer to both a human referent and a

nonhuman entity, and is therefore usually dropped because it does not contribute much to the semantic content of the overall sentence meaning. Classifiers are, however, necessitated by the presence of a numeral or a demonstrative. Thus the use of classifiers is subject to special discourse contexts (such as previous mention) or referential events that specify number. Nevertheless, given the strict semantic congruence between a classifier and the noun it modifies, the presence of a classifier can potentially provide useful information for the language processing system.

Relevant to the issue of classifier positioning, Figure 1 illustrates the number of RCs of different syntactic types in which the head noun's classifier occurred in pre-RC or in post-RC position in the corpus.

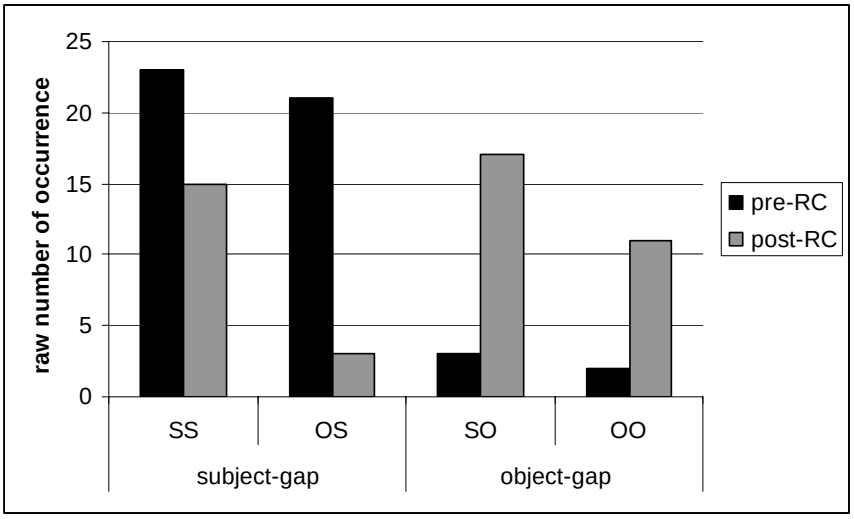

Figure 1: Distribution of pre-RC versus post-RC classifiers in four types of RCs

As shown in Figure 1, there is a mirror asymmetry for object-gapped and subject-gapped RCs: For object-gapped RCs (subject-modifying object-gapped, i.e., SO and object-modifying object-gapped, i.e., OO), classifiers appear mostly in post-RC position (84.85%, or 28/33), with only 5 instances (15.15%, or 5/33) in pre-RC position. Interestingly, this asymmetry is reversed for the subject-gapped RCs (subject-modifying subject-gapped, i.e., SS and object-modifying subject-gapped, i.e., OS). For OS RCs, pre-RC classifiers occur more frequently than post-RC classifiers: out of the 24 OS RCs with classifiers, 21 (87.5%) have pre-RC classifiers, and only 3 (12.5%) have post-RC classifiers. For SS RCs, the asymmetry between pre-RC and post-RC classifiers is less dramatic: Out of the 38 SS RCs with classifiers, 23 (60.53%) have pre-RC classifiers and 15 (39.47%) have post-RC classifiers.

We posit two processing-driven principles to account for the asymmetrical distribution of classifiers: (i) the *Early Occurrence Strategy* and (ii) the *Semantic Clash Avoidance Principle*. The Early Occurrence Strategy states that classifiers prefer to occur as early as possible. This strategy fits with the growing body of research on anticipatory and expectation-based processing (e.g., Altmann and Kamide, 2004; Levy, 2007). This strategy can explain the pre-RC preference for subject-gapped RCs. But what about the post-RC preference that we see for object-gapped RCs? The Semantic Clash Avoidance Principle states that classifier positioning should avoid disrupting lexical access to the following noun. Since classifiers are adjacent to the 'wrong' noun (i.e., the embedded RC-subject) in object-gapped RCs, pre-RC classifiers are therefore dispreferred in this context. That is, object-gapped RCs prefer post-RC classifiers. To further test these two principles, we conducted two self-paced reading experiments.

3. Experiment 1

Experiment 1 was designed to test the Early Occurrence Strategy. We hypothesized that if pre-RC classifiers have a facilitatory effect on RC structure-building, their presence should result in faster reading times at the head noun region than when there is no classifier. Furthermore, given that pre-RC classifiers are adjacent to the wrong noun in object-gapped RCs, which violates the Semantic Clash Avoidance Principle, our expectation was that pre-RC classifiers should be more helpful predictors in subject-gapped RCs than in object-gapped RCs. We therefore predicted that when pre-RC classifiers are present, we should see faster reading times at the head noun region in subject-gapped RCs than in object-gapped RCs.

Forty native speakers of Mandarin Chinese participated. We manipulated extraction type (subject- vs. object-gapped) and classifier (absent vs. present), with stimuli consisting of 24 sets of targets in four conditions and 44 fillers. An example set of the four conditions is given in (3).

(3) a. **Subject-gapped RCs without classifiers**
e_i zaizhong jizhe de jushi$_i$ mimide zhangzhe qingtai
hit journalist DE boulder thickly grow moss
'The boulder that __ hit the journalist is thickly covered with moss'.

b. **Subject-gapped RCs with classifiers**
na-kuai e_i zaizhong jizhe de jushi$_i$ mimide zhangzhe qingtai
that-$CL_{boulder}$ hit journalist DE boulder thickly grow moss
'The boulder that __ hit the journalist is thickly covered with moss'.

c. **Object-gapped RCs without classifiers**

jushi zaizhong e_i de jizhe$_i$ jingtide huangu sizhou.
boulder hit DE journalist cautiously look-about surroundings
'The journalist that the boulder hit __ looked about his surroundings cautiously.'

d. **Object-gapped RCs with classifiers**

na-wei jushi zaizhong e_i de jizhe$_i$ jingtide huangu sizhou.
that-CL_{human} boulder hit DE journalist cautiously look-about surroundings
'The journalist that the boulder hit __ looked about his surroundings cautiously.'

3.1 Results and discussion

Since the classifier-absent conditions in two types of RCs did not contain the sentence-initial Dem+CL sequence, their first word positions were aligned with the second word positions in the classifier-present conditions. The analyses focused on the seven words following the Dem+CL sequence (pos1): The RC-internal verb (V) or the RC-internal subject (S, pos2), the RC-internal object (O) or the RC-internal verb (V, pos3), the relativizer DE (pos4), the head of the RC (S or O, pos5), the post-head adverb (ADV, pos6), the matrix verb (MV, pos7), and the postverbal matrix object (MVO, pos8). Figure 2 presents mean reading times for these eight positions in the target stimuli for the four conditions.

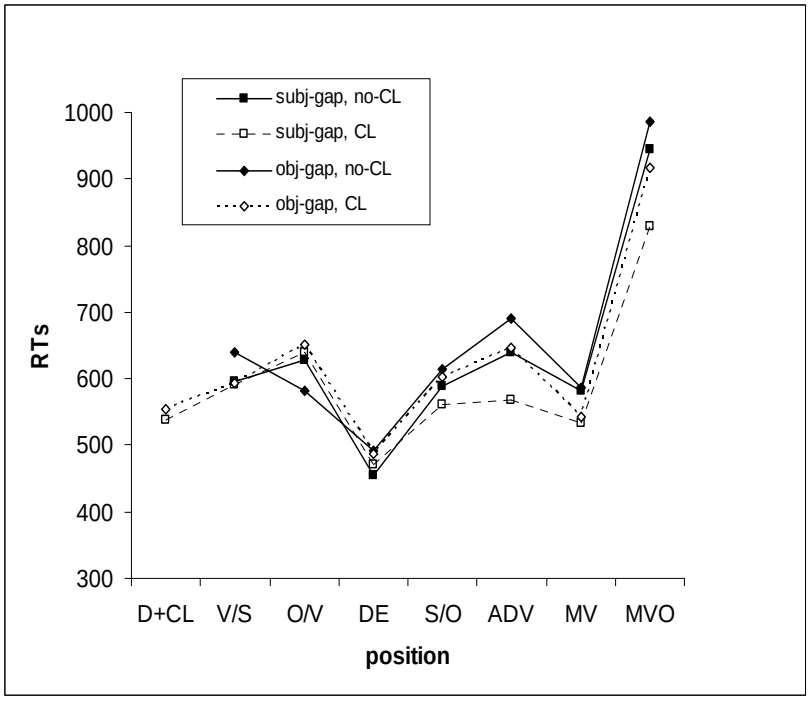

Figure 2: Mean reading times per word position in Experiment 1. Reading times (RTs) are in milliseconds.

As shown in Figure 2, at word position 2 (i.e., the RC-internal object *jizhe* 'journalist' in subject-gapped RCs or the RC-verb *zaizhong* 'hit' in object-gapped RCs), there was a classifier disruption effect in object-gapped RCs, but not in subject-gapped RCs: SO RCs with classifiers were read significantly slower than SO RCs without classifiers; there was no difference between the classifier-present and the classifier-absent conditions in subject-gapped RCs.

At the Adverb (position 6), there was a classifier facilitation effect in subject-gapped RCs, but not in object-gapped RCs: Reading times in SS RCs without classifiers were significantly slower than SS RCs with classifiers. In addition, object-gapped RCs were read significantly slower than subject-gapped RCs.

At the main verb (position 7), the facilitatory effect of classifier was found in both subject-gapped and object-gapped RCs: Reading times in classifier-absent conditions were slower than reading times in classifier-present conditions.

At the main object (position 8), SS RCs without classifiers were slower than SS RCs with classifiers.

Thus the results showed classifier disruption effects in object-gapped RCs at the embedded noun region, replicating the lexical disruption effects found in prior work and predicted by the Semantic Clash Avoidance Principle. But later in the sentence (from the adverb region to the sentence-final region), we found facilitatory effects of classifier for both subject-gapped RCs and object-gapped RCs. This supports the Early Occurrence Strategy. Also, the reading time differences in subject-gapped RCs were numerically bigger than those in object-gapped RCs, indicating that the facilitatory effects of pre-RC classifiers as RC-predictors are greater in subject-gapped RCs than in object-gapped RCs.

In sum, the outcome of Experiment 1 showed that, as predicted by the Early Occurrence Strategy, pre-RC classifier-present conditions were read faster than classifier-absent conditions.

4. Experiment 2

The results of Experiment 1 suggest that the facilitatory effect of pre-RC classifiers may be weaker for object-gapped RCs than for subject-gapped RCs. This may be due to the lexical disruption effect incurred early in object-gapped RCs; that is, the classifier mismatch caused such great difficulty in accessing the following noun that it adversely affected the overall parsing processes of RC structure building. Experiment 2 was conducted to further test potential effects of pre-RC classifiers as cues in object-gapped RCs. Thus, this experiment investigates issues related to the Semantic Clash Avoidance Principle, focusing solely on object-gapped RCs. A control condition was needed to facilitate the

comparison between the classifier-present and classifier-absent conditions. The passive BEI sentences were chosen to fulfill this purpose.

BEI in Chinese is a passive morpheme. In passive constructions with this marker, BEI is preceded by a noun that denotes the patient and may be followed by an optional noun that denotes the agent. For instance, in the object-gapped RC fragment *nashan zuqiu dasui de huaping* 'that-CL football break DE window' (the window that the football broke), the passive marker BEI can be added in front of the embedded RC-subject *zuqiu* 'football' to clearly mark it as the agent of the breaking event. Crucially, BEI intervenes between the classifier *shan* and the local noun *zuqiu* 'football', i.e., right where the semantic clash due to classifier mismatch would otherwise occur. Furthermore, since the noun following BEI (*zuqui* football) naturally forms a constituent indicative of the agent of a certain event (i.e., 'break') that is suggestive to an anticipatory parser of a recipient or a patient that undergoes the event, there is no other way to continue the sentence except with an RC. Thus, with BEI, we can create sentences that are clearly RCs but have the same word order as RCs without BEI.

In Experiment 2, we use the BEI construction as a control condition, and compare the processing consequences of BEI with those of classifier mismatch. According to the Semantic Clash Avoidance Principle, a pre-RC classifier mismatch anchored at the left periphery may cause a semantic clash in object-gapped RCs. However, we hypothesize that the presence of BEI may render semantic clash effects vacuous, because BEI provides clear evidence of an RC and thus indicates that the subsequent noun is not associated with the pre-RC classifier. We therefore predict that pre-RC classifiers are a weaker cue for RC structure building than the syntactic cue provided by BEI in object-gapped RCs.

We tested 32 native speakers of Chinese. The critical items crossed classifier (presence vs. absence) and BEI (presence vs. absence), yielding four conditions (as in (3)). Experiment 2 contained 24 critical items and 48 filler items.

(3) a. **no-CL, no-BEI**
jushi zaizhong e_i de jizhe$_i$ jingtide huangu sizhou.
boulder hit DE journalist cautiously look-about surroundings
'The journalist that the boulder hit _ cautiously looked about his surroundings.'

b. **CL, no-BEI**
na-wei jushi zaizhong e_i de jizhe$_i$ jingtide huangu sizhou.
that-CL$_{human}$ boulder hit DE journalist cautiously look-about surroundings
'The journalist that the boulder hit cautiously looked about his surroundings.'

c. **no-CL, BEI**
e_i bei jushi zaizhong de jizhe$_i$ jingtide huangu sizhou
BEI boulder hit DE journalist cautiously look-about surroundings

'The journalist that _ was hit by the boulder cautiously looked about his surroundings.'

d. **CL, BEI**
na-wei e_i bei jushi zaizhong de jizhe$_i$ jingtide huangu sizhou
that-CL_{human} BEI boulder hit DE journalist cautiously look-about surroundings
'The journalist that _ was hit by the boulder cautiously looked about his surroundings.'

4.1 Results and discussion

Since the four conditions differed in whether the classifier and BEI were present or absent, word positions were aligned by syntactic categories across conditions, resulting in the common word beginning at the third position, the RC-internal subject. The analyses focused on the seven words following the Dem+CL sequence (pos1) and BEI (pos2): the RC-internal subject (S, pos3), the RC-internal verb (V, pos4), the relativizer DE (pos5), the head of the RC (O, pos6), the post-head adverb (ADV, pos7), the matrix verb (MV, pos8), and the postverbal matrix object (MVO, pos9). Figure 3 presents mean reading times for each of the seven word positions of the target stimuli in the four conditions.

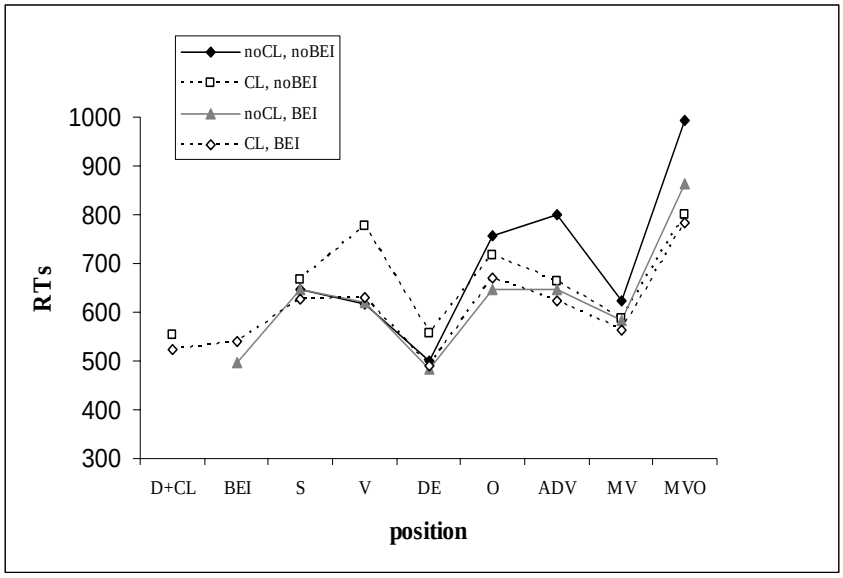

Figure 3: Mean reading times per word position in Experiment 2. RTs are in milliseconds.

As shown in Figure 3, at both the RC-verb region (pos4) and the relativizer DE region (pos5), reading times in the *classifier, no-BEI* condition were significantly slower than the other three conditions, which fits with the idea that classifier mismatch results in processing difficulty due to semantic clash.

At the RC head-noun region (pos6), reading times in the BEI-absent conditions were significantly slower than reading times in the BEI-present conditions, suggesting a facilitatory effect of BEI.

At the adverb region (pos7), there was again a facilitatory effect of classifier: Reading times in the *no-classifier, no-BEI* condition were slower than reading times in the *classifier, no-BEI* condition. At the adverb region, there was also a facilitatory effect of BEI. In fact, no reading time differences were found between the *classifier, BEI* condition, the *classifier, no-BEI* condition, and the no-*classifier, BEI* condition, presumably because the presence of a cue—be it a classifier or a BEI, facilitates processing towards the end of sentence.

These facilitatory effects of classifier and BEI continued throughout the main verb region (pos8) and the main object region (pos9).

In sum, Experiment 2 replicated the classifier facilitatory effect. The classifier-absent, BEI-absent condition was read slowest. Reading times also provide further evidence for the Semantic Clash Avoidance principle, as the classifier-present, BEI-absent condition was slowest when followed by the incongruent embedded noun (at positions 4 and 5). We also found evidence that BEI is a more effective cue for an upcoming RC than classifier mismatch; Bei seems to prevent any semantic clash between the mismatching classifier and the local noun: Sentences with BEI were read faster overall regardless of whether a classifier was present; when both BEI and a classifier were present, the sentences were read fastest.

5. Conclusions

In this paper, we reported the results of a corpus study and two experiments on the effect of classifiers on RC processing in Chinese. The corpus analysis revealed an asymmetrical distribution pattern for classifiers in RCs of different extraction types. Two hypotheses were formulated to account for this asymmetry: the Early Occurrence Strategy and the Semantic Clash Avoidance Principle. The behavioral data from the two self-paced reading experiments support these two hypotheses. Overall, we found that processing of RCs in Chinese is facilitated if there is a classifier cue; and that pre-RC classifiers are more helpful in subject-gapped RCs than in object-gapped RCs. This study provides evidence for classifier mismatch serving as a RC-predictor, even in the absence of preceding discourse context.

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Bilingual Communities in China: Evidence for English as a Lingua Franca of Practice

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1 Globalization

Due to new technologies that facilitate worldwide communication, transportation, and capital transfer, we have been undergoing transnationalism and globalization. We are deterritorialized (Appadurai, 1996) and experiencing interaction and exchange in one single field to some extent. We build a social field that crosses geographic and cultural borders (King, 2007) and hold a perspective beyond the personal, local and national (Xanthopoulos, 2007).

With transnationalism and globalization comes the spread of English, as Fishman (1996) states, "the international world…is linguistically dominated by English almost everywhere, regardless of how well established and well-protected local cultures, languages and identities may otherwise be" (p. 628). Crystal (2000) estimates that approximately one billion people speak English as a second language at varying levels of competence. Eighty-five percent of international organizations officially use English; eighty percent of world's electronic information is conveyed in English; ninety-nine percent of pop music groups work mostly in English; English is widely used in international tourism and film market (Crystal, 1997). Even in a monolingual society like Columbia, Argentina, Egypt, and Sweden, where English has no official status and its functional range is restricted, the spread of English is going through an unprecedented boom (Velez-Rendon, 2003; Nielsen, 2003; Schaub, 2000; Berg, Hult & King, 2001). In the near future, there will probably be more than two billion people learning English across the world (Graddol, 2006).

Mainland China may exemplify a country developing at an amazing pace owing to globalization. In late1970s, economic reforms were launched to restructure and accelerate China's economy. An Open Policy has been enforced to lead China to join the trend of globalization. Opening up China to international markets have caused unprecedented economic, social, cultural, and ideological changes in Chinese society. Foreign investment and advanced technology from other countries have been introduced into China (Zhang, 2001).

With an open mind and a young heart, China is emerging as a world power. Because of the economic reforms and the Open Policy, and because of the status of English as "the language of international business, commerce and finance" (Kachru & Smith, 2009, p. 2), the Chinese Ministry of Education enthroned English as the most prestigious foreign language in Mainland China and triggered a great boom in English education across the country. Educators and linguists have conducted research on English language policy (Evans, 2000; Lam, 2002; Hu, 2008), English in higher education (Chang, 2006), language attitudes (He & Li, 2009) and linguistic features of English used in China (Kirkpatrick & Xu, 2002). Different from previous research, this study investigates the discourse-level interactional features of the variety of English spoken by Chinese native speakers in natural conversations in the Chinese-dominated society.

2 Varieties of English

The role of English has shown increasing significance to the world. Quirk (1962) was one of the earliest scholars to describe varieties of English from eclectic descriptive and historical perspectives. Smith (1976), asserting that English can become denationalized, contends that English functions as an international language used by people from different cultures to communicate with one another rather than to internalize the cultural norms of native speakers. Kachru (1990) portrays the role of English in three concentric circles: the Inner Circle where English is the primary language of a country; the Outer Circle where English is an institutionalized second language of a multilingual country; the Expanding Circle where English is widely studied as a foreign language. Kachru (1992) used the term World English to describe two ways of interaction between English and other cultures such as nativisation and acculturation. For one thing, English takes local linguistic features. For another, English is given distinct local cultural identity. Outer and Expanding Circles have changed the English norms provided by the Inner Circle and developed their own new norms. These "innovations and creative impulses" have kept World Englishes flourishing (Kachru & Smith, 2009, p. 9).

To capture the changing nature of English, McKay (2002) proposed English as an International Language in a global sense and in a local sense. In a global sense, English is not connected with the culture of any inner circle country. It is used for international communication between countries. In a local sense, English is embedded in the culture of a country and serves wider communication between multilingual societies. As a result, there appear some changes in lexical, phonological, and grammatical standards as well as in pragmatic or rhetorical patterns (McKay, 2002). It is not surprising to see that local varieties of English continue to emerge even in local dictionaries. Moreover, interaction in English

between speakers who do not have a grasp of standard grammar or recognized norm might expedite the process of "internationalisation and destandardization" (Seidlhofer, 2004. p. 4).

In addition to *World English* and *English as an International Language*, more terms have been coined in response to the rapid development of English in the world. Crystal (2003) preferred *English as a Global Language* since roughly one out of every four users of English in the world is a native speaker of the language. Following UNESCO's (1953) definition of a *lingua franca*, Seidlhofer (2001, 2004, 2005) chose the term *English as a Lingua Franca* (ELF) to suggest "any lingual medium of communication between people of different mother tongues, for whom it is a second language (Samarin, 1987, p. 371). Pickering (2006) agreed with Seidlhofer and defined ELF as "talk comprising expanding circle speaker-listeners, also described as nonnative speakers (NNSs), competent L2 speakers" (p. 2). The message that a lingua franca has no native speakers was further reinforced in Firth's (1996) description of English as "a contact language between persons who share neither a common native tongue nor a common (national) culture, and for whom English is the chosen foreign language of communication" (p. 240). In Dewey's (2007) words, ELF

> "is fundamentally different [from American English/British English] for the fluid nature of the communities of practice that use it, and for the flexibility displayed in the use of linguistic resources" (p. 349).

Even though Seidlhofer (2004) argued that the narrow definition of ELF should be revised because "ELF interactions often also include interlocutors from the Inner and Outer Circles" in varying settings (p. 3), ELF interactions are generally understood as interactions "between members of two or more different lingua cultures in English, for none of whom English is the mother tongue" (House, 1999, p. 74). ELF researchers (e.g. Firth, 1996) have revealed some characteristics of ELF interaction: (1) ELF interlocutors do not run into miscommunication breakdowns very often; when misunderstanding happens, they tend to change topic and occasionally use communication strategies such as rephrasing and repetition; (2) interlocutors hardly transfer L1 norms into ELF interaction; (3) interlocutors may share the *let-it-pass* principle and overtly show consensus and cooperation. ELF interaction differs from foreigner talk, interlanguage talk or learner interaction because the former involves unprejudiced description, it takes a pluricentric view based on local norms, and it is not reduced but relatively stable in its own norms (Davies, 1989). By contrast, the latter indicates linguistic/pragmatic incompetence, it takes a monocentric view based on native English norms, and it changes along the interlanguage continuum towards target norms. ELF interactional features strongly suggest that speakers of ELF are language users in their own right and they follow certain norms independent of either their own native language or English as a native language. It is not appropriate to stigmatize ELF speakers as

failed native speakers (Cook, 1999) or deficient nonnative speakers of English (Thomas, 1983) any more. ELF, just like other language varieties, is not an interlanguage (Davies, 1989) but an effective means of communication.

3 English in China

Even though native speakers of English intuitively feel the ownership of English, those who speak ELF might have the power to determine its world future due to globalization and increasing varieties of English. “For the first time in history, a language has reached truly global dimensions, and as a consequence, is being shaped, in its international uses, at least as much by its nonnative speakers as its native speakers” (Seidlhofer, 2004, p. 3). Graddol (2006) posits that nonnative speakers have come to outnumber native speakers and that most interactions in English take place in the absence of nonnative speakers. This can be partially attributed to nonnative teachers who work in a wide range of settings to teach English as a second/foreign language (Bolton, 2005). According to Bolton (2003), the number of secondary school teachers of English in China alone now totals around 500,000.

English keeps its supremacy in foreign language education in Mainland China. The amazing pace at which English education has been growing can be demonstrated by the completion of transition from English as a mandatory course only in secondary and tertiary education to English as a mandatory course at all levels of education. According to *The Ministry of Education Guidelines for Vigorously Promoting the Teaching of English in Primary Schools* issued on January 18, 2001 (Ministry of Education 2001), students are required to take English classes at and above the third grade of elementary school. Therefore, most people, after their college education, will normally have had an admirable history of studying English for at least ten years. Unfortunately, having studied English in the classroom setting for a decade does not ensure that learners can communicate in English fluently because in the Chinese-dominated environment, there is not much reinforcement such as English newspapers, English TV programs, and native speakers of English.

Despite little exposure to authentic native English, macroacquisition of English (Brutt-Griffler, 2002) is happening in Mainland China. After China joined the World Trade Organization and held the Olympic Games in 2008, English seems to have reached a new peak with educationalists and ordinary Chinese people. Many taxi drivers, businessmen, and those who work in international corporations in modernized cities have been studying English. An increasing number of English users frequent what Chinese people call English Corners, mini English environments where English users in China with varied proficiency practice speaking English. The mini English environments could be any natural settings, somewhere in a park or at school, indoors or outdoors. These English

users have learned classroom English mostly from nonnative English teachers. For lack of the need for speaking English in everyday life in the Chinese-dominated society, they automatically join the communities of practice (Wenger, 1998) at English Corners on weekends or at night to negotiate their identities, establish common objectives, and build shared repertoire while practicing speaking English. In this process, they can choose to shift between passive peripheral members and active central members. They might also develop linguistic norms and interactional norms that differ from either Chinese or Standard English. What is important is they have mutual understanding and keep conversation going smoothly.

4 English as a Lingua Franca of Practice

These English-Corner participants compose what I call *bilingual communities of practice* who speak Mandarin Chinese as their first language and English as a second language and who meet to talk in English at English Corners for various purposes. In addition to the main goal of improving their communication skills in English, these community members might come to socialize, share their worldviews, seek information, advertise their English tutoring centers, or simply kill time. Actively engaged in conversations in English, they practice to enhance English proficiency, they practice to make sense of the outside world, and they practice to build their own distinctive repertoire and establish their own enterprise, just like other types of communities of practice. It is important to notice that the bilingual communities of practice under investigation share a native language and common culture but choose English as the means of communication at English Corners. This differs from the initial restrictive definition of ELF whose speakers share neither a common native tongue nor a common culture. Therefore, *English as a Lingua Franca of Practice* (ELFP) is here proposed as a more appropriate term to describe the English-Corner phenomenon and capture the central feature of communities of practice as well.

Research (e.g., Jenkins, 2000; Firth, 1996) has shown the linguistic and interactional features of ELF. Firth (1996) contends that even though ELF speakers have grammatical, phraseologicial, phonological and prosodic infelicities, they do not seem to have many misunderstandings or much L1 transfer. They take orderly turns and show overt consensus. They neither correct others' mistakes nor complete others' thoughts. They do not code switch most probably because they do not speak the same language. Do these features apply to natural conversations in ELFP?

To examine the features of ELFP, I videotaped, transcribed and analyzed fifteen-hour natural conversations in English among randomly picked fifteen participants (Table 1) at two English Corners of a southeastern city in China. As is shown in the following table, participants ranged from 20 to 46 years old,

seven of whom were female. By the time of data collection, they either were working towards a bachelor's degree or had earned a bachelor's degree. Their good education background matches their amazingly long history of studying English, which resulted from the policy in China making English a mandatory course at all levels of education. However, many of them had never been to English-speaking countries. They visited English Corners in the hope of improving their spoken English. Two participants felt lucky to have been in an English-speaking country for a short time period. Another one stayed in America working on his post-doc research for four years. The last two were pursuing a Ph.D. degree in an American university. They went to English Corners during their short visit to their families in that city. These participants claimed that they were either strangers when they met at the time of data collection or acquaintances who met a few times at English Corners. They did not socialize with one another outside English Corners. Most of them knew one another by their English names; only a few knew each other's Chinese names and make contact a couple of times after their English-Corner time.

Table 1 Fifteen English-Corner Participants

Name	Gender	Age	Highest Degree[1]	Occupation	Years of studying English	Experience in English-speaking countries	Frequency of visiting English Corners
Jia	F	25	B.A.	Clerk	15	0	3 / week
Wan	M	24	B.S.	English Tutor	11	0	2 / week
Gen	M	26	C.C.	Unemployed	8	0	1 / week
Zhang	M	27	M.S.	Engineer	15	2 months	1 / week
Jun	F	40	M.A.	English Teacher	30	3 months	1 / year
Mei	F	26	H.S.	College Student	8	0	3 / week
Zhen	M	25	B.A.	Master Student	10	0	2 / week
Liang	M	46	M.A	Journalist	31	0	1 / week
Meng	F	20	H.S.	College Student	8	0	4 / week
Qin	F	26	B.S.	Master Student	10	0	4 / week
Ping	M	38	B.A.	Unemployed	23	0	2 / week

Le	F	21	B.A.	Unemploy-ed	10	0	3 / week
Nong	M	39	Ph.D	Research-er	28	4 years	2 / week
Wu	F	36	M.A	Ph.D. Student	26	6 years	N/A
Xiao	M	28	M.S.	Ph.D. Student	12	2 years	N/A

Interactional sociolinguistics was employed to investigate the discourse-level interactional features of these ELFP conversations. This approach looks at human behavior, marked with contextualization cues (Gumperz, 1992), within natural contexts where researchers would minimally affect participants' normal behavior. It is a "methodological approach to interactional analysis using video-taped data and taking into account non-verbal behavior such as facial gestures, postural shifts, and proxemics" in addition to verbal features of interaction (Boxer, 2002, p. 13).

Not surprisingly, some features of ELF that were described by Firth (1996) also appeared in these ELFP conversations. Above all, participants made nonnative but nonfatal errors such as mispronouncing unimportant words, applying nonstandard intonation, missing articles, tense markers, aspect markers and plural markers, using wrong verb, adjective, preposition and noun forms, and favoring topic-prominent structures. Their conversation partners did not repair these errors since these errors did not cause misunderstandings. Obviously, the let-it-pass principle came into play and ensured the flow of conversations. Secondly, a lot of repetition occurred in these conversations, most of which seemed to emerge more at the beginning of an utterance. Thirdly, the delay marker *uh* was overused by participants to gain some time in search for words or ideas. Fourthly, there was a lot of laughter in the conversations suggesting that participants enjoyed chatting with each other.

Interestingly, non-typical ELF features emerged in the ELFP data. In addition to using *uh* as a delay marker, some participants relied heavily on *Yeah* as a delay marker in the middle of their utterances when they were thinking. For example, one participant said

> "Yeah, I think yeah after a few uh when you get more expe- uh experience and then you can get a right payment. So that is that is my plan. My plan is get work work for four three or four years and then @@[2] and then when I was experienced uh" (June 2008).

The two *Yeah*'s in the first utterance have different functions. The first one at the beginning of the utterance serves as a confirmation marker whereas the second one in the middle of the utterance is a delay marker.

In contrast with ELF speakers who use very few candidate completions (Firth, 1996), ELFP speakers in the data showed their preference for completing others' thoughts as in the following examples[2].

E.g. 1.	Xiao:	(31)	Oh. You you can have another choice. That is to apply the apply the major of your _ [elect-]
	Wu:	(32)	[Elect]rical engineering?
E.g. 2.	Nong:	(41)	I have been been working in two _ [universities].
	Liang:	(42)	[Two schools]. Ok.

In the first example, when Xiao was searching for the word *electrical*, Wu offered to help without hesitation. In the second example, when Nong paused after the word *two*, Liang made a good guess and tried to complete Nong's thoughts by saying *two schools*. This behavior prevails in the collected ELFP data which has led to a great number of overlaps.

In addition to assisting each other with incomplete thoughts, participants sought help from their native language—Mandarin Chinese—and switched from English into Chinese when they had trouble finding the exact words in English. This would not work for ELF speakers who do not share a common language but worked well for ELFP speakers to keep their conversations flow because they share one common language

Different from ELF speakers who take orderly turns to speak, ELFP speakers in the collected data did not seem to like waiting for their turn. In fact, they often talked over each other, trying to maintain their turn or wrest the floor. This resulted in a lot of overlaps and interruptions. Overlaps differ from interruptions in that overlaps refer to misfires (Zimmerman & West, 1975) that occur in balanced, solidarity building communication (Tannen, 1994), whereas interruptions are violations of the turn taking system (Zimmerman & West, 1975) that occur in asymmetrical, power-laden communication (Tannen, 1994). Take a look at the following example.

E.g. 3.	Wan:	(262)	You see, if I get into the a famous university in China for the post graduate study, then I can find some part-time job. That means I can have the teaching experience.
	Wu:	(263)	[[Yes]].
	Xiao:	(264)	[[Yes]].
	Wan:	(265)	But if I work now, it's very hard for me to to study.
	Wu:	(266)	That's true.
	Wan:	(267)	[[So]]
	Wu:	(268)	[[But]]you have teaching experience [now, right?]=
	Wan:	(269)	[I know that.]

Wu:	(270)	=You work now. You are not a student.
Wan:	(271)	Yeah. I'm not a student now. So compare with these two ways, I think [to study first is a better one].
Xiao:	(272)	[Uuuh do you know do you] know the basic thing for application is recommend letter and PS, personal statement, or purpose of study, and things about the score of GRE and TOEFL. These three thing is the basic thing for the requirement of the university in the United States. But actually
Wan:	(273)	Yeah. If I work
Xiao:	(274)	But actually the most important I think is the PS.
Wu:	(275)	Uhum.
Xiao:	(276)	Yeah. It all depends on what you say. Actually, [even even]
Wan:	(277)	[You mean] how you write
Xiao:	(278)	Yeah. How you write yourself, how you write how you introduce yourself, how you write yourself, how you impress the professor of the United States. Yeah. Even you (the thing you already do is not high) enough you can you can write as as as good as possible, you know.
Wu:	(279)	Right. Personal statement is very important. [It's difficult to] write. Yeah.
Xiao:	(280)	[Very important].

The above conversation seems to flow well from Wan's plan to get teaching experience to Xiao's lecture about how to apply to American graduate schools. However, if examined closely, disorderly turn taking, overlaps and interruptions rise to the surface. Overlaps happened from lines 262 to 271 where Wan and Wu discussed the necessity for Wan to get teaching experience before he applied to a graduate school in China. Wan lost his turn in line 267 and tried to get it back in line 271 when Xiao cut in, wrested the floor and kept the floor in lines 272, 274, 276 and 278 very well. Wan fought for his turn in lines 273 and 277, but he did not even succeed in finishing his utterances. Wan was interrupted so many times that he turned into a passive listener later, simply nodding, smiling/ laughing and making brief comments to show he was paying attention. Interestingly, despite disorderly turn taking, overlaps and interruptions, this conversation continued for about two hours and none of the participants looked unhappy.

What would make native speakers of English unhappy and a conversation an unpleasant experience is strong, direct disagreement which is not preceded by partial agreement, concessions or hedges. Pomerantz (1984) proposed the agreement-plus-disagreement pattern, which is considered a polite, less offensive way to express disagreement. This also matches Brown & Levinson's (1978, 1987) theory about the correlation between directness and impoliteness. Nevertheless, ELFP speakers in this study tended to use direct disagreement and still enjoyed talking and interacting with one another at English Corners. In other words, they did not often use partial agreement, concessions or hedges before they expressed disagreement, but their conversation partners did not show a sign of unhappiness. This can be seen in the following example.

E.g. 4.

Xiao:	(327)	Yeah. It's just the first step. You came to come to US is the first step. Then you can choose what you will do in the future.
Nong:	(328)	Because if you want to apply for nonrelated major from China right now, it's very it's impossible. It's impossible. ⌐
Wu:	(329)	⌙Yeah. That's why he said he would like to get a master's degree first in education before he go to he goes to the United States.
Nong:	(330)	But then people will que- question him why uh uh what what's your background related to_ [education].
Wu:	(331)	[Education]?
Xiao:	(332)	But I think I think uh the experience for the master in the master degree = ⌐
Wu:	(333)	⌙[Right.] ⌐
Xiao:	(334)	⌙=[for] majoring in engineering is ok. Since since they it's very common phenomena for someone change his interest to some other place if ⌐
Nong:	(335)	⌙ That's common. But maybe you are very competitive with other applicants, right?
Wu:	(336)	[[It's true]].
Nong:	(337)	[[So they]] will choose one who have a education background.
Wu:	(338)	But I think if he has a master's degree in education, he's also competitive.
Xiao:	(339)	Yeah.

This example showed that in lines 330, 332, and 338, *but* was used to express direct disagreement. No partial agreement, concession or hedges precede the expression of disagreement. Without any partial agreement, the recipients of

direct disagreement did not felt offended at all and their conversation continued as normal. Even though participants Nong, Wu, and Xiao had been in America for at least two years and were supposedly exposed to the Agreement-plus-Disagreement Pattern, they did not seem to consciously, strictly follow this indirect, polite pattern when they spoke English. It is true that Nong provided partial agreement in line 335 before he returned to argue his own point again. Unfortunately, this pattern did not emerge as often as it should have in the collected data. Most expressions of disagreement came out without softeners.

5 Implications

Considering the rising power of China in the world and the changing role of English in the age of globalization, it is important for applied linguists to study the variety of English used in China—the largest Expanding Circle country (Berns, 2005). It might be safe to say that in the Chinese-dominated society, English has been nativized especially by users who have never been exposed to the authentic cultural and pragmatic norms of Inner and Outer Circle countries. An investigation of how bilingual communities of practice at English Corners interact in this variety of English in natural settings can enrich the current literature most of which focuses on sentence-level linguistic features of English in China. To capture the discourse-level interactional features of the variety of English used by the fluid communities of practice at English Corners who share one common language and culture, English as a Lingua Franca of Practice is proposed in this paper. Although a close examination of ELFP demonstrated some commonalities between ELFP and ELF, it also led to interesting findings that disconfirm Firth's (1996) orderly turn-taking pattern, Pomerantz' (1984) Agreement-plus-Disagreement pattern, and Brown & Levinson's (1987) Politeness Theory. These findings indicate a huge difference between ELFP, a variety of English in its own right, and English in Inner and Outer Circle countries in terms of interaction manners and pragmatic norms. Awareness of this is essential for us to avoid cross-cultural miscommunication and teach non-Inner-Circle-based World Englishes.

Notes

1 B.A.: Bachelor of Arts; B.S.: Bachelor of Science; M.A.: Master of Arts; M.S.: Master of Science; C.C.: Community College; H.S.: High School

2 Transcription Conventions (Schiffrin, 1987)

Speaker turn start	:
Simultaneous utterances	[[ ]]
Overlapping utterances	[ ]
Contiguous utterances after an interruption	=

A short untimed pause	_
Laughter	@
Emphasis	*italics*
Items in doubt	( )
No pause between different speakers' utterances	Z

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Classroom Interaction: What Happens to Reticent Students?

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1 Introduction

What happens to reticent students? This question might occur to English teachers who have students sitting in the classroom quietly, taking notes occasionally, but never responding to teacher-initiated questions. When talking with her English writing teacher of an American university, Lili, a shy, quiet female student from an Asian country, said, "I want to interact with other students. But when I'm ready to talk, there is always someone who speaks out what's on my mind." Many language teachers in the US feel frustrated with reticent students who appear disinterested in classroom activities. However, what they have not noticed is silent students' frustration and motivation disguised by this appearance.

Seeking good methods to involve both active and reticent students into classroom interaction, the researcher and teacher of an English writing class took actions to change her classroom dynamic. Various means were employed to facilitate either teacher-centered or student-centered classroom interaction. Most of the measures, however, did not successfully engage every one of the students into classroom interaction and increase learner autonomy, until reticent students were paired appropriately and provided with explicit instruction. In brief, this paper investigates how students interact in an English writing class and how language teachers can help and motivate reticent students to participate in classroom interaction.

2 Theoretical Background

The role of interaction in second language acquisition was first put forward by Evelyn Hatch (1978) who called for a brand-new approach to research. She urged researchers to focus on how the communicative use of a second language may lead to the learning of second language structure. According to her,

interaction has not only social function, but also linguistic and cognitive function. A specific type of interaction, negotiation, may occur when learners try to restructure their language use to convey their message, just as Pica (1994) states “As [learners] negotiate, they work linguistically to achieve the needed comprehensibility, whether repeating a message verbatim, adjusting its syntax, changing its words, or modifying its form and meaning in a host of other ways” (p.494).

Long (1981) also claims that negotiated interaction is especially important because, during interaction, learners have opportunities to solve communication problems by means of conversational modifications such as repeating, segmenting and rewording a message. This has developed into the Interaction Hypothesis which describes a more direct relationship between negotiated interaction and comprehension (Pica et al.,1987). Language learners, especially beginners, are often unable to express their meaning in comprehensible, appropriate, and correct terms. This may give rise to processes of negotiation in terms of meaning, form, and content (Van den Branden, 1997). Negotiated interaction may offer learners assistance with comprehension of second language input and thus provide input for learning (Pica, 1994). As a source of feedback to learners and a context for their modification of output, negotiated interaction may push language learners to reconsider their interlanguage hypotheses, experiment with new structures and forms, and test out new hypotheses (Van den Branden, 1997).

The benefits of negotiated interaction have been further demonstrated by many researchers in their studies involving Non-Native Speakers. Long (1980) investigated the social discourse of NNSs and their NS interlocutors, and identified their conversational discourse. He found that the interlocutors took advantage of interactional features such as clarification requests, confirmation checks, and comprehension checks to keep their conversations going. Schmidt and Frota (1986) did a case study of an adult learner of Portuguese. They also found the conversations between the learner and native Portuguese full of interactional features. In addition, the learner’s conversational behavior moved from simple repetition in his early stage of studying Portuguese to more statements as did native Portuguese. More importantly, this study suggests that a learner might accelerate his/her acquisition of a second language by interacting with native speakers rather than by receiving deductive classroom instruction.

Long (1981) also indicates that features of negotiated interaction are abundant among NS-NNS, even more so during NNS-NNS interaction. Mackey, Oliver and Leeman (2003) investigated the effects of interlocutor type on the provision and incorporation of feedback in task-based interaction and found that nonnative adult learners of English produced more modified output through negotiated interaction between themselves than with native speakers of English. Likewise, interactionally modified input was found to lead to better comprehension and more new words being acquired by high-school students of English in Japan

(Ellis and Tanaka, 1994). Similarly, learner-learner interaction helped the recall and retention of new vocabulary based on the study on twenty-four ESL students in Western Australia done by Dobinson (2001). Donato (1994) found that American learners of French, in social interactions in the classroom, often gave feedback and offered assistance to each other, and eventually achieved the appropriation of French linguistic knowledge.

However, some research has also revealed that interaction may not play a positive role as it is intended to. Pica (1994) discussed the reasons why negotiated interaction was not taken greater advantage of. For example, negotiation might not lead to the internalization of target-like forms despite messages conveyed. Negotiation tends to work on lexical items and larger syntactic units instead of grammatical morphology. Negotiation might not be helpful because of learner variables or discourse constraints probably because learners might not attend to negotiated language points. Too much negotiation might annoy interlocutors, especially the more proficient ones. The impact of negotiation on second language development is difficult to measure since it is only one of many types of interaction that learners might be involved in language learning.

Some other types of interaction might not as well be conducive to second language development. Take teacher-led discussion in class as an example. Despite involving students into discussion, it follows the pattern of teacher initiation, student response and teacher evaluation, and places students in a passive role. This pattern limits students' participation and focuses their attention on the teacher's interpretation rather than enable them to construct meaning for themselves (Smagorinsky and Fly, 1993). It fails to give students enough space and time in class, thus discouraging them from creating their own opportunities and taking their own responsibility for learning (Garton, 2002). Therefore, education practitioners argue for shifting to student-centered, collaborative classroom learning and allowing students a voice and choices in class. This encourages students to participate in more problem-solving talk and more complete understanding of a lesson (Maloch, 1999).

Nevertheless, it is not easy to effectively shift the teacher-led discussion pattern to the student-led discussion pattern. Maloch (1999) found that students tended to fall back into previous norms in teacher-led discussions and looked to the teacher to help solve problems. Some students did not participate in discussion. Some might only use one-word answers with long pauses in the midst of discussions, not knowing how to work through confusing details. Other students might dominate all discussions which, though, were assumed to be democratic contexts where all students' voices would be heard and valued (Evans, 1996). This last pattern of student-led discussion suggests the recreation of some inequitable relationships within a discussion group (Maloch, 1999) or the replication of the teacher-led discussion pattern (Evans, 1996).

Hence, simply assigning students to work in groups or pairs will not necessarily create conditions contributing to learning. Bruner (1975) proposed the notion of instructional scaffolding which refers to the initial support that a teacher should provide for students in learning and that the teacher may gradually withdraw with the development of the students' performance. While arguing for this notion, Smagorinsky and Fly (1993) further demonstrate the more favorable instructional approach that shows students how to interpret through a constructive interaction and how to elaborate their own responses and analyses. Without this indispensable teacher support to prepare students for their critical thinking and collaborative communication, group discussions may turn out short, unelaborated, and unfruitful.

Storch (2002) discovered four patterns of student-led discussion: the collaborative pattern with high equality and mutuality; the dominant/dominant pattern with high equality and low mutuality; the dominant/passive pattern with low equality and low mutuality; and the expert/novice pattern with low equality and high mutuality. Both the collaborative pattern and the expert/novice pattern reflect the viewpoint of scaffolding, which refers to the assistance offered by a more proficient language learner to a less proficient learner in their interaction. This has been proved helpful to both learners (Ohta, 1995). In both patterns, students take each other's feedback and build an interaction upon each other's previous knowledge or original ideas for the purpose of fulfilling a task together. But the dominant/dominant pattern and the dominant/passive pattern cannot promote language development because learners in the former case refuse to consider each other's response and the dominant learner in the latter case deprives the passive learner of learning opportunities.

The failure to conduct effective student-led discussions may also be attributed to other variables such as the nature of tasks and the cultural backgrounds of students. According to Vygotsky (1978), learning occurs in interaction when learners extend their actual developmental level and discover their potential developmental level. Learners might not be able to discover their potential developmental level if a task is too easy and oriented at their actual developmental level. Nor can they discover their potential developmental level if the task goes far beyond that level. Moreover, group-work or peer-work communication tasks lack direct teacher intervention, which might result in classroom pidgins (Sheen, 1994). Samuda (2001) points out the lack of predictability of the task behaviors. Because of this, learners might avoid using some features of a target language and stick to those more frequently used and simple features. Fotos (1998) found that the subjects who completed tasks in groups on grammar points were outperformed by those who received teacher-fronted one-way instruction on the same points. These recent studies have shown that tasks might not necessarily be beneficial to all learners.

A task is by nature a cultural, social activity rather than an experimental task. The task negotiated is under development in the process of language interaction

(Mohan and Smith, 1992). Learners tend to bring their native culture into the context of interaction. Flowerdew (1998) argued that those learners who grew up in Chinese culture could work well in groups because they had Confucian values such as co-operating with each other in a non-stressful environment. In contrast, Carson and Nelson (1996) found that this assumption could be wrong. They videotaped classroom interaction and audio-taped their interviews with student participants. The analysis of their data indicated that Chinese students' native culture might negatively affect the nature and types of their interaction in group discussion, because they were very likely to withhold comments that they thought might hurt other group members, which was not expected in order to improve individual writing.

To summarize, research has shown the positive role of interaction in second language acquisition. When interacting with teachers or peers, students may notice constructive feedback; they may offer assistance to each other to improve comprehension and keep conversations going; they may also take advantage of any opportunity emerging in interaction to experiment with new linguistic knowledge with the aid of interactional techniques such as clarification requests. However, negotiated interaction might have some limitations. It might not be easy to shift between teacher-led discussions and student-led discussions. Some patterns of student-led discussions might not benefit all students due to student variables, the nature of tasks, or cultural background. Not much research has been done on how reticent students may be engaged in negotiated interaction in the classroom. Therefore, this study was conducted to answer the following research questions:

1) How do students interact with their teacher and peers in an English writing class?
2) How can a teacher help and encourage silent students to participate in classroom interaction?

3 Methods

3.1 Participants

Twelve undergraduate students, seven male and five female, from diverse academic departments of an American University, participated in this study. During the study, they were taking an English composition class designed for international students. They came from eight different cultural backgrounds including Turkey, Egypt, Mexico, Saudi Arabia, Puerto Rico, Korea, Japan, and China (Table 1).

Table 1 Participants

Name	Ethnicity	Gender	Age	Duration of US Residence
T	Turkey	Male	23	2 years
E	Egypt	Male	25	3 years
M1	Mexico	Male	22	2 years
M2	Mexico	Male	24	3 years
M3	Mexico	Male	22	4 years
P	Puerto Rico	F	23	23 years
K	Korea	F	23	2 years
J1	Japan	F	24	3 years
J2	Japan	F	22	1 year
J3	Japan	M	26	2 years
S	Saudi Arabic	M	25	2 years
C	China	F	22	1 year

3.2 Data

Before any action taken, nine class periods were videotaped to decode interaction patterns in this writing class and reveal problems hindering learning. Afterwards, six class periods were videotaped when actions were carried out to improve teaching techniques and effectuate classroom interaction. Two of these were also audio-taped in order to get a better sound quality. All the videotaped or audio-taped data were played back in the evening of the day of data collection. Relevant data were transcribed and analyzed to examine any change in classroom interaction and improvement in the language output of the students, especially the reticent ones. Also, after each class, a teaching diary was written to evaluate teaching techniques used for that day in retrospect.

4 Results

The first nine class periods witnessed the prevalence of teacher-led discussion. The teacher dominated most of the classroom talk and did not give students opportunities, time, space, and responsibility to explore alternatives. Although she tried both directed questions and non directed questions to involve the students, she assumed so much authority and exerted so much control over classroom interaction that the students did not show high motivation and active participation. Consequently, the students tended to wait for answers instead of posing questions, proposing solutions or making comments. Most students might not say even one word throughout a class period. This teaching pattern

failed to encourage the students to develop critical thinking ability and improve autonomy.

Having realized this problem, the teacher started taking actions and trying different techniques to change classroom dynamic and improve teaching quality. She decided to leave more responsibility to her students and stimulate learner autonomy, meaning that the students would have more time, space, and opportunities to practice problem-solving skills and experiment with new language use by working with peers. Putting the students into culturally or linguistically heterogeneous groups of four seemed to have resulted in positive effects. Six students, relaxed and talkative, actively led group discussion and contributed to classroom dynamic. In contrast, the other six students remained passive and distant, because group discussion was dominated by active students according to the Asian student Lili.

Since student-led group discussion does not necessarily mean involving every student into classroom interaction, the teacher deliberately paired an active student with another active student and a silent student with another silent student, in the hope that the silent students would have more opportunities, time and space to interact with their partners and notice the importance of this responsibility because their partners alone could not compose a thought-provoking discussion and successfully fulfill a task. Without considering the nature of a task and providing guidelines about how to negotiate in discussion, the teacher's first try with the silent students failed. For the following attempts, the teacher gave the students tasks that required much talking and interacting, and clear instructions about how to get peers involved into interaction, what to do when communication breakdowns happened and how to take each other's feedback and work together towards an answer or a solution. This seemed to work out very well when silent students who did not speak more than a couple of sentences in previous group discussions became amazingly engaged and talkative. Two of them, one from China and the other from Japan, even took sixty-one turns to negotiate about the pronunciation and the meaning of words and solutions to problems in one discussion.

5 Discussion

Shifting from teacher-led discussion to student-led discussion and from the dominant/passive pattern to the passive/passive pattern, the teacher evidenced the importance of being flexible and responsible, suggesting that teachers in general should intervene in various ways to help ESL students develop interpretative, interpersonal, and interactional skills. When a pattern or a teaching technique fails to be effective, teachers need to try other means. Furthermore, teachers should monitor on-task behaviors and provide linguistic guidance to ESL students before they work in groups or pairs because without

guidance, they might revert to the teacher-led discussion pattern or the dominant/passive pattern, diverge from a supposed task, or transfer incorrect knowledge to individual performance. In other words, a teacher's role in the classroom should change over time in response to student needs and her evaluation of student work. She may facilitate and support her students' growth in three broad areas: how to fulfill tasks, how to interact with peers, and how to deal with communication breakdowns (Maloch, 1999).

Additionally, this study has other pedagogical implications. First of all, reticent students in particular might need their peers or teacher to scaffold or tell them how to scaffold classroom interaction before they can become part of it. Their lack of the expertise needed in a new participation structure often results in unfocused, unproductive conversations. However, their passivity does not necessarily signal low motivation to study and low language proficiency. They need more time, space, chances, and guidance to take their responsibility and thus contribute to interaction.

Secondly, students from seemingly quiet cultures such as China and Japan may conduct fruitful discussions even though they might be influenced by the ideology of their cultures such as making mistakes indicating the loss of face. Their fear can be overridden by their motivation to make progress in studying English. Their sense of responsibility can be aroused to a higher level in pair work where they encounter another reticent student and thus have to participate in order to finish a task than in group work where active students automatically take most responsibility for task fulfillment.

Thirdly, the nature of a task might influence classroom interaction. Appropriately used, a task can encourage collaborative classroom activity (Bruton, 2002). However, a task, designed more for writing than for speaking, more for individual work than for collaborative work, might not be able to elicit spoken language use and promote classroom interaction. Also, students approach a task differently and will benefit differentially from the collaborative activities implemented in classrooms (Swain and Lapkin, 1998).

6 Concluding Remarks

Vygotsky's theory (1978) about the importance of the expert assisting the novice in interaction promotes linguists' understanding of the role of negotiated interaction especially in second language development. Some studies have demonstrated how language learners benefit from interaction with equally or more capable language speakers in terms of learning new words or corrected pronunciation. Other studies have been conducted to illustrate how language learners manage to keep conversational interactions going with some communication strategies such as repetition and recast. These interactional

features exist especially among NNS-NNS conversations which, though, may fall into diverse patterns and result in different effects.

This study examined interaction patterns that emerged in an English writing class of an American university. It described the process of the teacher turning the teacher-led discussion pattern into the student-led discussion pattern. Actions were taken on the basis of evaluation of previous class work in the teacher's retrospection, while abiding by one principle—students from the same cultural backgrounds should work in different groups or pairs. All four patterns proposed by Storch (2002) were tried in this action research, only to find the last passive-passive pair work pattern to be effective on the conditions of appropriate tasks and meaningful instructions. This finding also suggests that silence does not mean low motivation and that silent students can be highly motivated. The study demonstrated the importance of scaffolding instruction and flexible teacher role especially in involving passive, reticent students into classroom interaction. It also shows the necessity of conducting action research to inform pedagogy.

However, if the teacher/researcher had had more time, this study would have had more data to show how reticent students interact in ESL and how, if any, those interactions might promote their acquisition of English. Moreover, would reticent students interact with and learn from dominant students, had dominant students received instructions about how to scaffold interaction and involve passive students? With the knowledge of scaffolding, how would dominant and high-proficiency ESL students benefit from classroom interaction? These are questions that remain to be answered.

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