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In: Cahiers de linguistique - Asie orientale, vol. 25 n°1, 1996. pp. 3-34.

Résumé

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Abstract

This paper investigates the claim that the binding relation between an operator and a variable is part of the innate language faculty, in accord with a theory of Universal Grammar. We present results of a study of the acquisition of VP ellipsis structures in Mandarin Chinese. Children from 3 years, 5 months to 6 years, 11 months show early knowledge of the ambiguity in sloppy identity structures and of operator-variable binding. Results are compared to those from an earlier parallel study in English (Foley, Nunez del and 1992a,b,c).

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Guo Fangfang, Foley Claire, Chien Yu-Chin, Chiang Chi-Pang, Lust Barbara. Operator-variable binding in the initial state: A cross-linguistic study of VP ellipsis structures in Chinese and English. In: Cahiers de linguistique - Asie orientale, vol. 25 n°1, 1996. pp. 3-34.

doi : 10.3406/clao.1996.1490

http://www.persee.fr/web/revues/home/prescript/article/clao_0153-3320_1996_num_25_1_1490

Operator-variable binding in the initial state: A cross-linguistic study of VP ellipsis structures in Chinese and English*

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CHIANG Chi-Pang and Barbara LUST

This paper investigates the claim that the binding relation between an operator and a variable is part of the innate language faculty, in accord with a theory of Universal Grammar. We present results of a study of the acquisition of VP ellipsis structures in Mandarin Chinese. Children from 3 years, 5 months to 6 years, 11 months show early knowledge of the ambiguity in sloppy identity structures and of operator-variable binding. Results are compared to those from an earlier parallel study in English (Foley, Núñez del Prado, Barbier, and Lust, 1992a,b,c).

Key words: Mandarin Chinese : first language acquisition - operator-variable binding - VP ellipsis - sloppy identity.

Lors d'une étude sur l'acquisition du langage, nous avons testé l'hypothèse que les relations d'opérateur-variable caractérisent la compétence intrinsèque de l'enfant. Nous présentons ici les résultats d'une étude sur l'acquisition des structures de l'ellipse du groupe verbal en chinois. Les enfants de 3 ans, 5 mois à 6 ans, 11 mois montrent la capacité de représenter l'ambiguïté de ces structures dans leurs grammaires.

Mots-clés : chinois mandarin : acquisition du langage - relation opérateur-variable - ellipse du GV - identité oblique.

* This research was supported by a Taiwan National Science Council Grant (NSC 80-0301-H004-27-Y) to Chi-Pang Chiang. We gratefully acknowledge the help of Richard Darlington, James Gair, Chuck Henderson, C.-T. James Huang, Yafei Li, Y.-H. Audrey Li, Waltraud Paul and Qing Xie. For their comments at the ICCL/NACCL conference in Madison in June, 1995, we thank Marie-Claude Paris, Claudia Ross and all members of the audience.

Cahiers de Linguistique - Asie Orientale 25(1): 3-34 (1996)
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0153-3320/96/025-003

1. INTRODUCTION

In this paper, we are concerned with evidence that Chinese yields in support of several claims about the nature of Universal Grammar, and in particular, UG as a model of the initial state of the mind.

We investigate the claim that operator-variable binding, an essential component of representation at the level of Logical Form, characterizes the initial state as part of Universal Grammar. This claim implies that the capacity for operator-variable binding is innate, and therefore is not learned as part of specific language grammar. We predict that from the earliest stages of language acquisition, knowledge of operator-variable binding exists independent from language-specific knowledge about syntax. In particular, we will investigate a syntactic structure in Chinese where knowledge of cross-linguistic lexical and syntactic variable can be dissociated from knowledge of abstract operator-variable relations.

Here we will examine VP ellipsis structures. We argue that these structures reflect variable binding without either an overt WH operator or quantifier. Our argument will support a view put forth by Huang (1987, 1994) regarding these structures in Chinese. Under this view, certain Chinese coordinate structures which have been previously analyzed as "empty object" structures are in fact VP ellipsis structures and involve verb raising.

We will present the results of an experimental study of Chinese-speaking children's acquisition of VP ellipsis structures confirming these proposals.

Before we turn to our Chinese study, we will present a brief overview of our earlier studies of VP ellipsis in English (Foley et al., 1992 a,b,c).

2. BACKGROUND

(1) Oscar bites his banana and Bert does too.

Interpretations:

- | | | |
|----|--|--------------|
| a. | <i>O bites O's banana and B bites B's banana.</i> | <i>ii jj</i> |
| b. | <i>O bites O's banana and B bites O's banana.</i> | <i>ii ji</i> |
| c. | <i>O bites B's banana and B bites B's banana.</i> | <i>ij jj</i> |
| d. | <i>O bites E's banana and B bites E's banana.</i> | <i>ik jk</i> |
| e. | <i>*O bites O's banana and B bites E's banana.</i> | <i>ii jk</i> |
| f. | <i>*O bites B's banana and B bites O's banana.</i> | <i>ij ji</i> |
| g. | <i>*O bites B's banana and B bites E's banana.</i> | <i>ij jk</i> |
| h. | <i>*O bites E's banana and B bites O's banana.</i> | <i>ik ji</i> |
| i. | <i>*O bites E's banana and B bites B's banana.</i> | <i>ik jj</i> |

The structures in (1) show English VP ellipsis structures with possessive pronouns. These sentences are ambiguous. For example, (1) can have the meaning in (1a), where Oscar and Bert each bite their own banana. This reading has been termed a *sloppy* reading. (1) can also have the reading in (1b), where Oscar and Bert each bite Oscar's banana. This reading has been termed a *strict* reading.

Any reading which involves a single object is a possible strict reading, as shown in (b-d). The sloppy reading in (1a) is the only two-object reading which is grammatical for these structures. There are five other logically possible two-object combinations, but none of them yield possible interpretations of the sentence in (1), as shown in (e-i). For instance, an interpretation where Oscar bites Oscar's banana and Bert bites Ernie's banana is ungrammatical, as shown in (e).

The explanation of these facts has long challenged linguistic theory. The theory must somehow explain the four grammatical possibilities in (a-d) and rule out the five ungrammatical readings in (e-i). Previous research by Williams (1977), Sag (1976), Reinhart (1986), Fiengo & May (1994) and

many others, has addressed this problem. Most of this previous work has proposed a difference in the nature of the Verb Phrase which is reconstructed or copied in the second clause for the two types of readings (sloppy and strict). For simplicity, we have included a brief sketch of the analysis proposed by Williams (1977) in (2).

(2) (a) Sloppy reading

Oscar [$\text{VP } \lambda x$ (x bites x's banana)] and

Bert [$\text{VP } \lambda x$ (x bites x's banana)] too.

(b) Strict reading

Oscar [$\text{VP } \lambda x$ (x bites his_(r) banana)] and

Bert [$\text{VP } \lambda x$ (x bites his_(r) banana)] too.

While this analysis accounts for the range of readings which are possible, it poses several problems. A central problem with previous analyses is that they require a different series of rules for each reading, and they require that pronouns be assigned reference at different points in the derivation for each reading. The work cited in (3) proposes a new analysis which overcomes these problems. The central points of this new analysis are listed in (3a-d). These points can be more clearly explained with the help of the trees in (4).

(3) Foley, Núñez del Prado, Barbier and Lust (1992a,b,c);
Lust (1994)

(a) The proper representations are LF-representations.

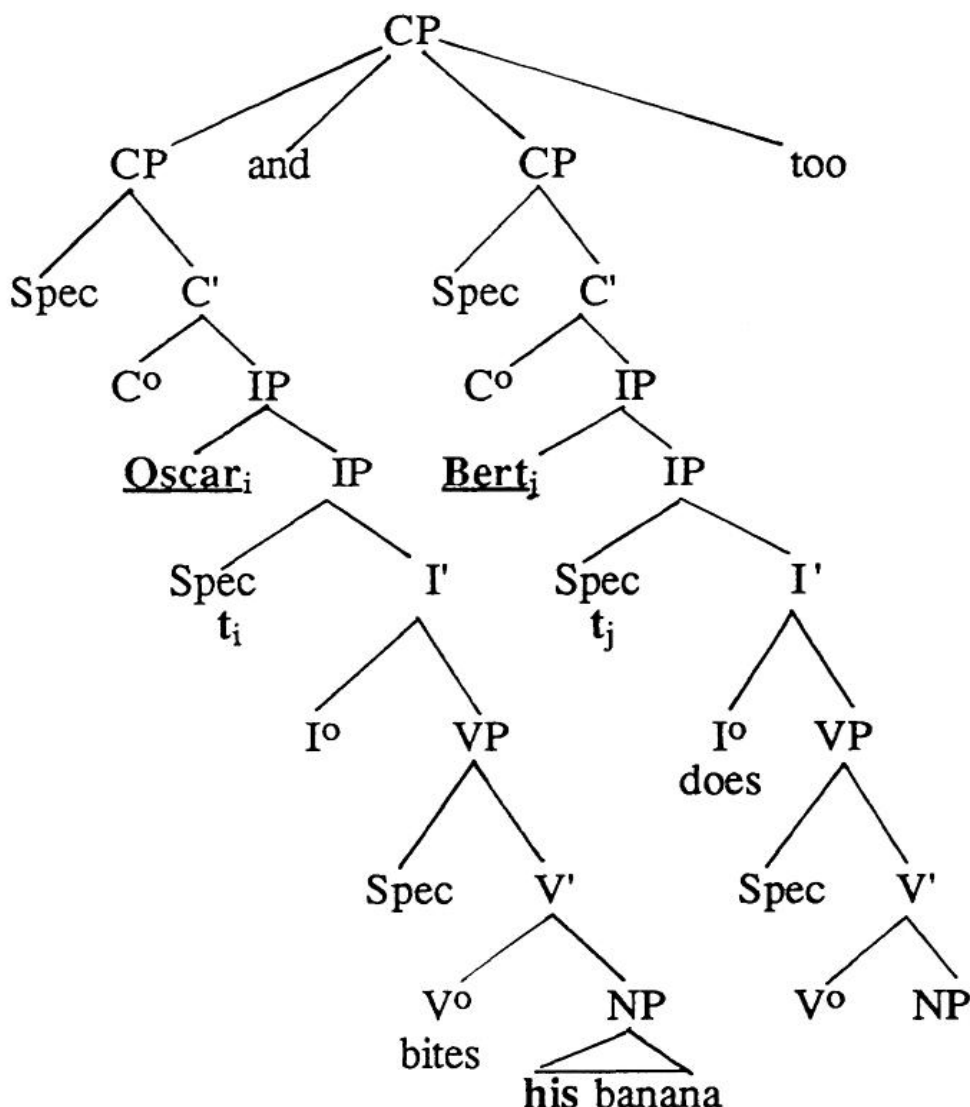
(b) Both sloppy and strict readings involve variable binding, ie.: the pronominals in both derivations are A-bar bound. In particular, contrary to previous proposals, the so-called strict "referential" reading is in fact a bound-variable reading.

(c) The two types of readings differ in the type of A-bar binding they involve. The sloppy type involves local QR; the strict type involves QP-raising to an A'-position with scope over the two conjoined clauses.

- (d) The across-the-board raising in the strict reading is motivated by pragmatic (contrastive or emphatic) focus.

The trees in (4a) and (4b) illustrate Foley et al.'s (1992c) analysis of the ambiguity in these VP ellipsis structures. In this analysis, both sloppy and strict readings involve variable binding (cf. Reinhart, 1986). The sloppy reading is illustrated in (4a). Here, the pronoun in each object NP phrase is locally bound by the subject, which has raised to an IP-adjoined position. This A-bar position is an operator position, and we suggest that the subject binds the pronominal variable in each clause. The strict type reading is illustrated in (4b). In this reading, we suggest that the object NP in each verb phrase raises in an across-the-board fashion to the highest CP-adjoined position. This is also an A-bar position. From this position, the object trace in each clause is bound, giving the unique object interpretation: whichever banana it is that Oscar bites, Bert also bites. We suggest that while the local subject raising is an unmarked option, the long-distance across-the-board raising in (4b) requires pragmatic motivation. When reference to an appropriate pragmatic context causes a single object to be contrastively or emphatically focused in the given set of objects, this raising occurs. When no such context provokes this focus, local subject raising yields the sloppy reading. Under this analysis, there is no way to derive the ungrammatical readings; these readings are therefore ruled out. This analysis makes certain predictions for learnability across languages, which we will discuss shortly.

(4a) Sloppy:



(4a') Oscar bites his banana and Bert does [_{VP} e [_{NP} [e] e]] too.

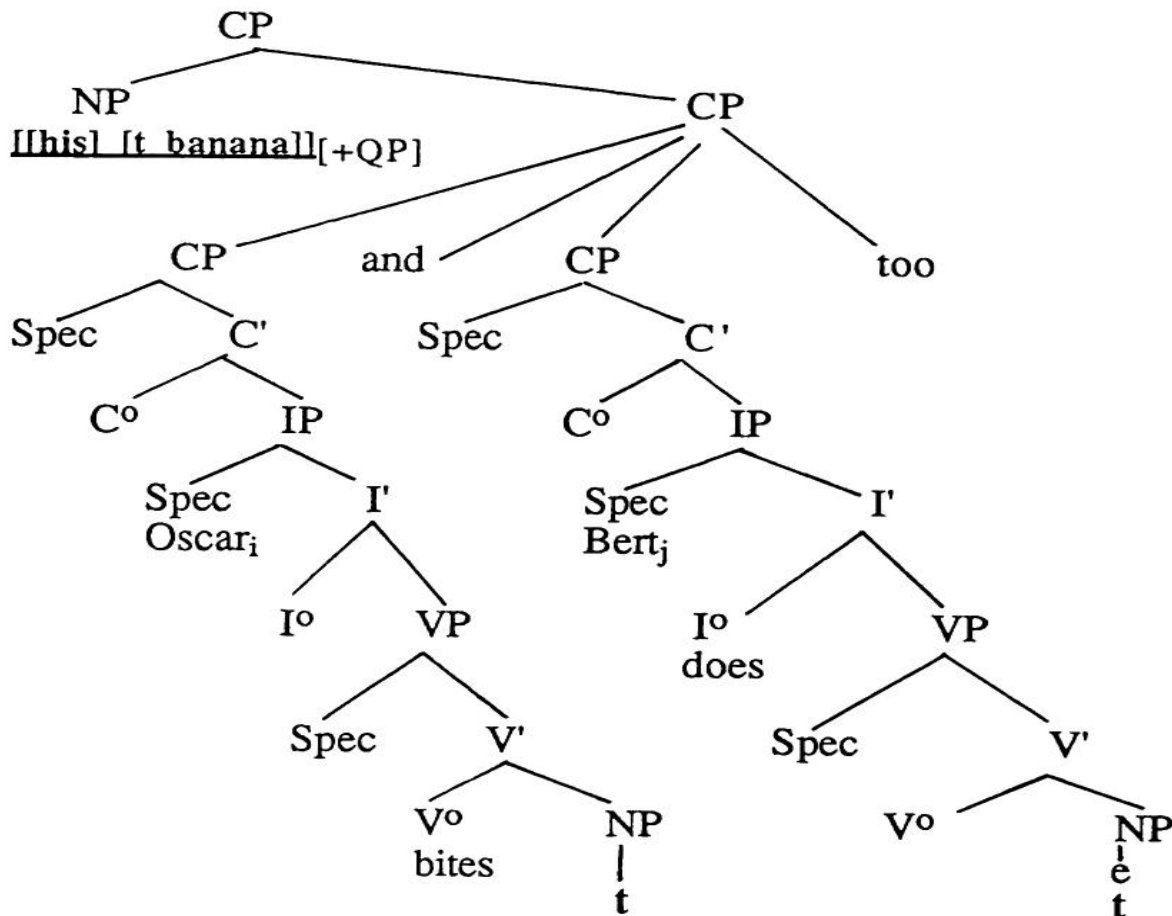
Local QR of the subject NP:

[Oscar] [t bites [his banana]]] and [Bert][t does [e [[e] e]]] too.

Local Operator-binding of a pronominal:

[Oscar_i] [t_i bites[p_i banana]]] and[Bert_j][t_j does[e[[p_j] e]]] too.

(4a'') Every boy eats his apple and every man does too.

(4b) **Strict:**(4b') Oscar bites his banana and Bert does [_{VP} e [_{NP} [e]e]] tooLong Distance Operator Raising to the Discourse-linked position:

[[his] banana]] [[Oscar bites [t]] and [Bert does [e [t]]] too

Long Distance Operator-variable binding of a pronominal:[[his] banana] [[Oscar bites [t]] and [Bert does [e [[t]]]] too
X= Oscar, Bert, Ernie, ...

(4b'') Whichever banana it is that Oscar bites, Bert also bites.

3. RATIONALE FOR CHINESE STUDY

Next, we will consider VP ellipsis structures in Chinese and assimilate them to the theory above. Consider the sentence in (5). Chinese shows the same ambiguity in this structure, and the same constraints on possible readings, as English. At the same time, Chinese differs from English in several respects. As can be seen in (5), Chinese VP ellipsis structures include a lexical verb in the second clause. There are two types of hypotheses possible for this structure, as shown in (5a) and (5b).

- (5) GF *tian-yi-xia ta-de bing-bang*, NT *ye tian-yi-xia*.
 GF lick-1-time his ice-bar, NT also lick-1-time.
 'GF licks his ice-bar and NT does too.'

Hypotheses:

- (a) GF *tian-yi-xia ta-de bing-bang*,
 NT *ye* [IP *tian-yi-xia* [NP *e*]]
- (b) GF *tian-yi-xia ta-de bing-bang*,
 NT *ye* [IP *tian-yi-xia* [VP [NP *e*] *t_v*]]

First, it would be possible to analyze these structures as simply involving an empty category in object position, as in (5a), which involves a surface analysis of the second clause where the object is null (see Hoji 1995). However, as Huang (1987) points out, if the structure in (5a) is correct, then the ungrammatical readings (cf. (1e-i)) would be predicted to be available for this sentence. On the other hand, if the structure in (5b) is correct, then only the sloppy and strict readings are available. In (5b), we assume the lexical verb has raised; for the purposes of this paper, we assume that *yi-xia* has incorporated into the verb.

Our proposal for Chinese follows Huang's (1987) analysis. As in English, our analysis in Chinese allows both the sloppy reading, where the trace in both clauses is bound by a local subject, and the strict reading, where the trace in each clause is bound across the board by the object raised to the highest CP-adjoined position.¹ The tree in (6) shows the syntactic structure for this type of sentence.²

¹ In Chinese, this may be the topic position; see Gasde and Paul (1996) for discussion. See also Huang (1984). We assume that the possessive pronoun raises out of the raised object; see Foley et al. (1992c) and Lust, Chien, Chiang, and Eisele (1996) for discussion.

² In our analysis of the Chinese structure, as in English, the sloppy reading is unmarked. Our adult control subjects confirm this for our experimental sentences.

Waltraud Paul (pc.) observes that for (i) and (ii), some native speakers found the strict reading to be the only possible reading or the more natural reading:

- (i) Zhangsan hen xihuan ta(-de) meimei, Lisi ye hen xihuan.
 Zhangsan very like his sister Lisi also very like
 'Zhangsan likes his sister and Lisi does too.'
- (ii) Zhangsan kan-le ta-de laoshi, Lisi ye kan-le.
 Zhangsan see-PERF his teacher Lisi also see-PERF
 'Zhangsan saw his teacher and Lisi did too.'

Variation in pragmatic context may be implicated here. In our study, as we discuss below, we provide subjects with a pragmatic context which makes all readings equally pragmatically possible. It may be the case, for example, that speakers hearing (i) would judge the sloppy reading to be natural in a context where Zhangsan and Lisi each clearly had a sister.

(6a) Lexical Verb (deriving Sloppy Reading):

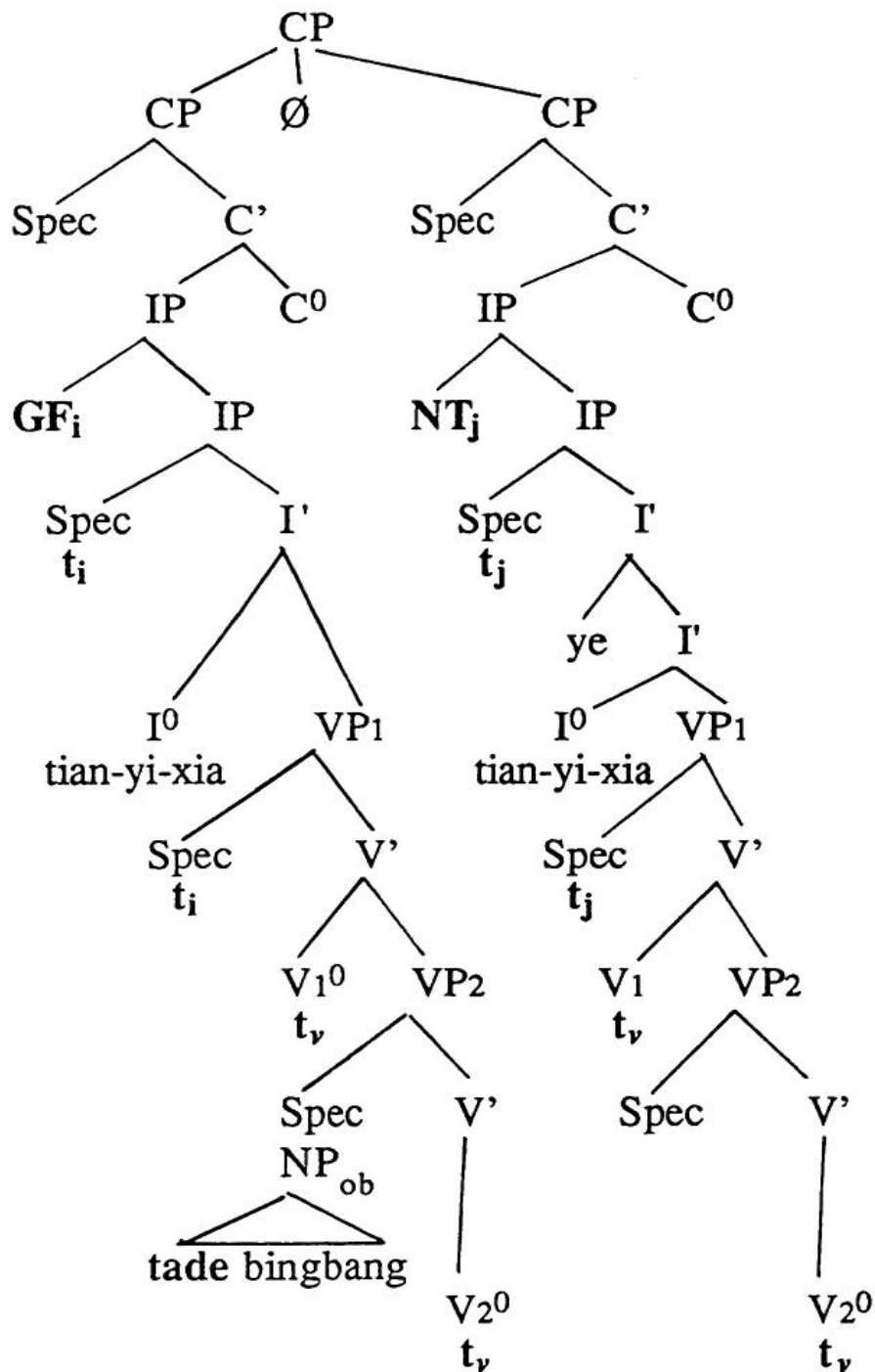
GF tian-yi-xia ta-de bing-bang,

GF lick-1-time his ice-bar,

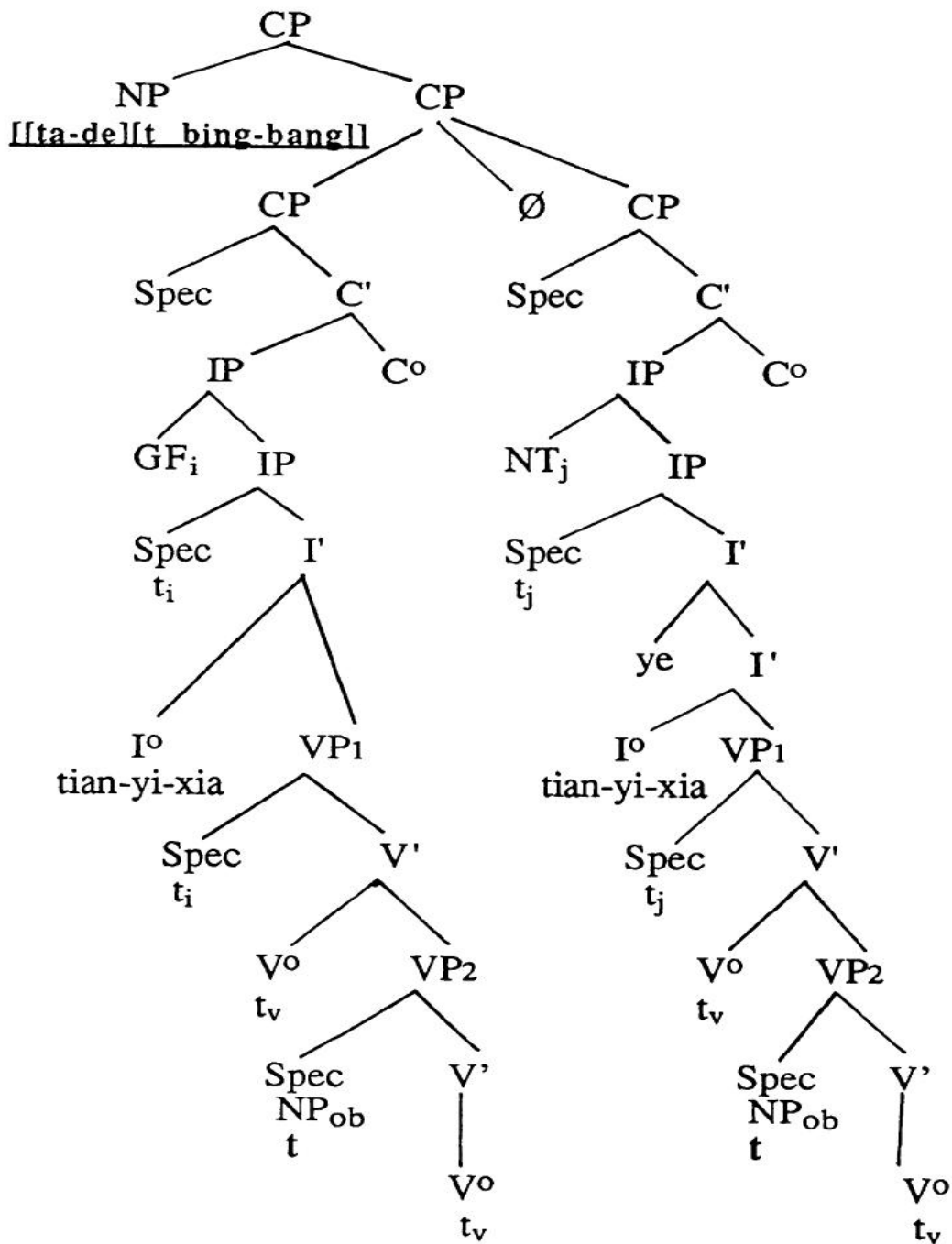
NT ye [IP tian-yi-xia VP[[NP e]t_v]]

NT also lick-1-time.

'GF licks his ice bar and NT does too.'



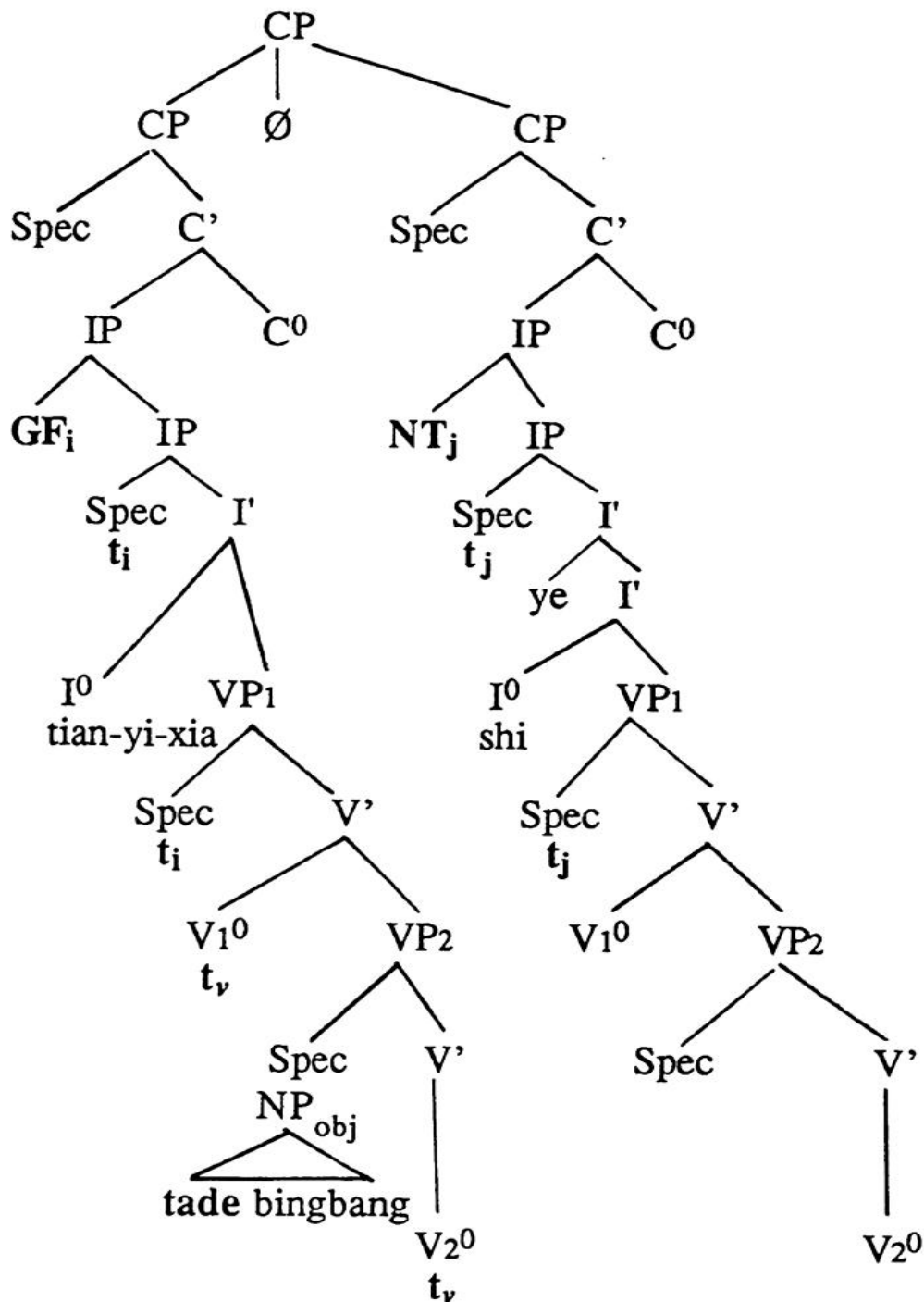
(6b) Lexical verb (deriving Strict Reading):

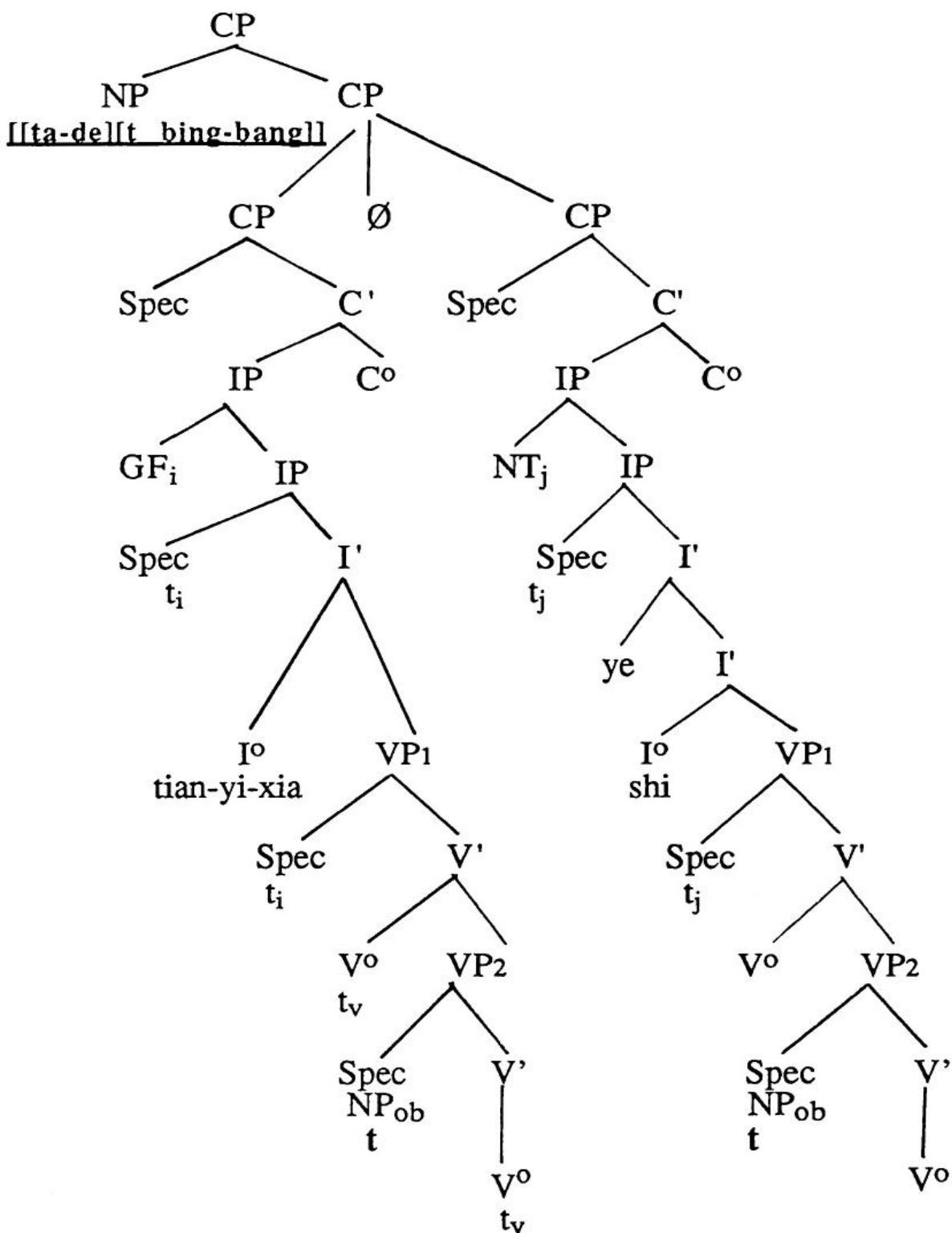


In Chinese, there is another type of VP-ellipsis sentence which involves the verb *shi* 'be' in the second clause. This verb lacks the semantic content of a lexical verb. The contrast in Chinese between a lexical verb and *shi* 'be' does not exist in English sloppy identity structures. Moreover, we assume here that in contrast to the lexical verb shown in (6a) and (6b), *shi* must be generated in I°. While open questions remain about the analysis of this structure, what is important here is that this structure closely parallels the English VP-ellipsis structure. We predict that if both the *shi* 'be' structure and the lexical verb structure truly involve VP-ellipsis, there should be no difference in children's success at representing the ambiguity in these structures. Chinese thus allows a test which would have been impossible in English alone: we can test the prediction that surface lexical content should not affect children's representation of the ambiguity in these structures. Results from both of these structures should converge with English.

(7a) *Shi* 'be' (deriving Sloppy Reading):

GF *tian-yi-xia ta-de bing-bang*, NT *ye* [IP *shi* [VP[NP *e*]]
 GF *lick-1-time his ice-bar* NT *also be*
 'GF licks his ice bar and NT does too.'



(7b) *Shi* 'be' (deriving Strict Reading):

A summary of the central points of our Chinese theoretical analysis is given in (8).

- (8) Summary of Chinese theoretical analysis
- (a) Chinese coordinate structures with repeated lexical verbs such as those in (6) above involve verb-raising and VP ellipsis rather than empty objects, in accord with Huang's (1987) analysis.
- (b) We make the above proposal for structures with either *shi* 'be' or a lexical verb in the second clause, giving similar LF representations for the two structures. Under our analysis, the *shi* structure and the lexical verb structure do not differ in the degree to which they rule out the ungrammatical readings.³
- (c) Variable binding is involved in both readings. The across-the-board raising in the strict reading requires pragmatic motivation.

Now we turn to the predictions for first language acquisition made by our analysis. First, we predict that across languages, both the sloppy and the strict readings should be available to children from the beginning of language acquisition. This is because our analysis predicts that both readings involve operator-variable binding, and if this relation is given by UG, then the competence for it should be innate. It should appear in Chinese as well as English.

Second, we predict that in Chinese as well as English, the sloppy reading should be unmarked, because it requires no independent trigger to motivate raising to the highest SpecCP position. Local binding is always available in UG.

³ Among native speakers, there is some disagreement over the status of these two structures. Our first informants found that the lexical verb and the *shi* 'be' structures yielded the same readings. More recently, Waltraud Paul noted that some informants find the sloppy reading more accessible for the *shi* 'be' structures. This observation was confirmed by our adult control subjects (see Appendix).

Third, in Chinese as well as English, ungrammatical readings should be ruled out from the beginning.

Fourth, in Chinese, under our analysis, both the sloppy and strict readings should be available, and the ungrammatical readings ruled out, whether the second clause contains a lexical verb or *shi*. In particular, if both verbal types truly involve VP ellipsis, and not "empty objects," then the same grammatical constraints should hold for both. If children interpret these structures at LF, then language-specific lexical and syntactic aspects of the second clause verb should not affect their competence to interpret the sentences as operator-variable binding structures.

Finally, if pragmatic effects play a role in motivating the strict reading, then when the pragmatic context is varied, choice of the strict reading over the unmarked sloppy reading should also vary. However, the predictions above should continue to hold even if there are such pragmatic effects, because under our analysis, pragmatics interacts with, but does not determine or override, the syntactic constraints on the possible readings.

4. EXPERIMENT AND RESULTS

We now turn to the experiment in which we tested the above predictions. Our data were collected by experimenters in Taiwan under the direction of Professor Chi-Pang Chiang, working with Professor Yu-Chin Chien. Our method was an act-out test of comprehension, where children were presented with a group of dolls and toys, and then asked to show what the sentence means. Our experiment first allowed children to choose among sloppy and strict interpretations of the sentence, where each type of reading was equally pragmatically plausible in terms of general context. In addition, it varied pragmatic plausibility experimentally through controlled sentence design.

As Table 1 shows, we tested coordinate sentences with possessive pronouns *ta-de* 'his' in the first clause, and either *shi* 'be' or lexical verbs in the second clause, as shown in the

columns in A and B in Table 1. In addition, to test the interaction of pragmatics and syntax, our design included manipulation of two pragmatic factors which would be expected to affect the likelihood of a particular interpretation of the sentences. One of these factors was the nature of the object. An inalienable object, such as a body part, would be less likely to allow a strict reading. The other factor was the nature of the predicate: some predicates are biased toward a self-oriented action, such as eating, while others are not.

Table 1. Act Out Task Sentences (Pronoun Sentences only):

=====

A. BE

a) Inalienable Possession:

(+self-oriented)

A07 : SN *dong-yi-xia ta-de jiao-jiao*, MM ye shi.
 SN move-1-time his foot-foot MM also be
 'SN moves his foot and MM does too.'

B10: NT *yao-yi-xia ta-de shou-shou*, SL ye shi.
 NT shake-1-time his hand-hand SL also be
 'NT shakes his hand and SL does too.'

(-self-oriented)

A04 : MM *zhi-yi-xia ta-de zhaopian*, SN ye shi.
 MM point-1-time his picture SN also be
 'MM points at his picture and SN does too.'

B02 : SL *mo-yi-xia ta-de zhaopian*, NT ye shi.
 SL touch-1-time his picture NT also be
 'SL touches his picture and NT does too.'

b) Alienable Possession

(+self-oriented)

A09: DD yao-yi-xia ta-de shuili, SN ye shi.
 DD bite-1-time his pear SN also be
 'DD bites his pear and SN does too.'

B01: GF tian-yi-xia ta-de bing-bang, NT ye shi.
 GF lick-1-time his ice-bar NT also be
 'GF licks his ice-bar and NT does too.'

(-self-oriented)

A10: DD peng-yi-xia ta-de qianbi, SN ye peng-yi-xia.
 DD hit -1-time his pencil SN also hit-1-time
 'DD hits his pencil and SN does too.'

B07: GF gun-yi-xia ta-de beizi, NT ye gun-yi-xia.
 GF roll-1-time his cup NT also roll-1-time
 'GF rolls his cup and NT does too.'

B. LEXICAL VERB

a) Inalienable Possession:

(+self-oriented)

A05: MM yao-yi-xia ta-de jiao-jiao, SN ye yao-yi-xia.
 MM shake-1-time his foot-foot SN also shake-1-time
 'MM shakes his foot and SN does too.'

B06: SL dong-yi-xia ta-de shou-shou, NT ye dong-yi-xia.
 SL move-1-time his hand-hand NT also move-1-time
 'SL moves his hand and NT does too.'

(-self-oriented)

A02: SN mo-yi-xia ta-de zhaopian, MM ye mo-yi-xia.
 SN touch-1-time his picture MM also touch-1-time
 'SN touches his picture and MM does too.'

B09 : NT zhi-yi-xia ta-de zhaopian, SL ye zhi-yi-xia.
 NT point-1-time his picture SL also point-1-time
 'NT points at his picture and SL does too.'

b) Alienable Possession

(+self-oriented)

A01 : SN tian-yi-xia ta-de shuili, DD ye tian-yi-xia.
 SN lick-1-time his pear DD also lick-1-time
 'SN licks his pear and DD does too.'

B11: NT yao-yi-xia ta-de bing-bang, GF ye yao-yi-xia.
 NT bite-1-time his ice-bar GF also bite-1-time
 'NT bites his ice bar and GF does too.'

(-self-oriented)

A11: SN gun-yi-xia ta-de qianbi, DD ye shi.
 SN roll-1-time his pencil DD also be
 'SN rolls his pencil and DD does too.'

B04 : NT peng-yi-xia ta-de beizi, GF ye shi.
 NT hit-1-time his cup GF also be
 'NT hits his cup and GF does too.'

=====

In this paper, we report only results from the pronoun sentences.⁴ At the top of Table 1, you will find the factors least likely to provoke a strict reading, and more likely to encourage a sloppy reading. The object is inalienable, and the action is self-oriented, as in sentence A07. The sentences at the bottom of the table combine the factors of alienable object and no bias for self-oriented action. These structures are predicted to provoke the strict reading more easily, like sentence A11.

⁴ Our design also included control sentences with (i) null pronouns and (ii) specified NP possessors. We will not discuss either of these sentence types here.

As shown in Table 2, we tested 61 Chinese-speaking children between the ages of 3 years, 5 months and 6 years, 11 months. (We also tested an adult control group; results are given in the Appendix.) The results were analyzed by age group.

Table 2. Subject Information

Group	Number of Subjects	Age Range	Mean Age
1	14	3,5-3,11	3,8
2	16	4,2-4,11	4,6
3	15	5,1-5,11	5,3
4	16	6,0-6,11	6,6
Totals	61	3,5-6,11	5,0

We now turn to results by group for the Chinese experiment, concentrating on the child groups.⁵ Table 3 shows that in Chinese, the sloppy reading was preferred in every age group, as well as overall. For example, this is shown in the bottom row of table 3: 61% sloppy and 24% strict overall for Chinese. Even in the youngest group, in the top row, 64% of responses were sloppy and 10% were strict.

In Chinese, at the same time, table 3 shows that the strict reading was also demonstrated in every age group. This confirms our first two predictions: first, that the sloppy reading is unmarked, and second, that both readings are possible continuously.

⁵ Fuller analyses of all our empirical results can be found in Guo (1996).

Table 3. Mean Percentage of Responses: Sloppy, Strict and Ungrammatical Readings on Pronoun Sentences

Group	%Sloppy	%Strict	%Correct	%Ungram
1 (N=14)	64	10	74	6.3
2 (N=16)	58	21	79	4.7
3 (N=15)	63	28	91	3.3
4 (N=16)	59	35	95	1.2
Mean (N=61)	61	24	85	3.8

In Figure 1, we can see that ungrammatical readings are almost completely ruled out from the beginning. As we mentioned earlier, there are five logically possible but ungrammatical interpretations. Even though there are more possible ungrammatical interpretations than grammatical ones, children mostly avoid the ungrammatical ones. They appear to know the constraints from the very beginning, confirming our third prediction.

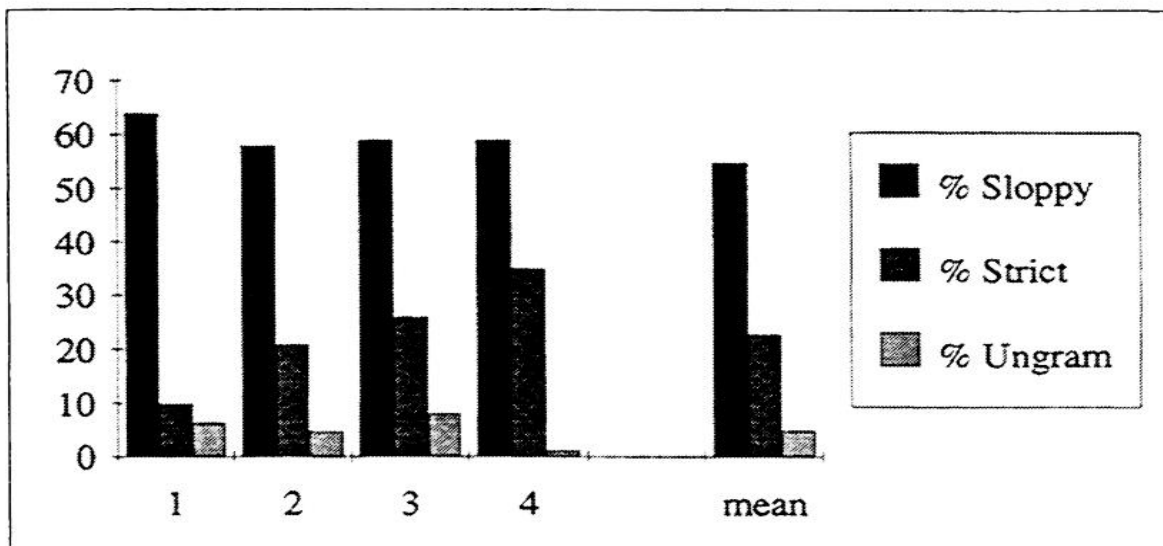
Figure 1. Mean Percentage of Responses: Sloppy, Strict and Ungrammatical Readings on Pronoun Sentences

Table 4 gives the percentage of Chinese-speaking children who showed us only sloppy responses, the percentage of children who showed us only strict responses, and the percentage who showed us both types in their responses to the pronoun sentences. More children showed us only sloppy readings than only strict readings in every age group. At the same time, most children (58%) show both types of reading. Once again, the result holds even in the youngest age group.

Table 4. Within Subject Analysis:
Percent of subjects giving sloppy only, strict only,
& both readings among correct responses

Group	% sloppy only	% strict only	% both
1 (N=14)	43	0	57
2 (N=16)	44	6	50
3 (N=15)	31	6	63
4 (N=16)	25	13	58
Mean (N=61)	36	6	58

Earlier, we predicted that if children represent VP ellipsis structures at the abstract level of LF, then the specific second clause verb (*shi* 'be' or lexical verb) should not affect interpretation of the sentence. If both structures are truly VP ellipsis structures, then the same grammatical constraints should hold whether the second clause repeats the lexical verb or contains the verb *shi* 'be'.

Table 5 shows that this prediction was confirmed. In every age group, amounts of sloppy and strict readings are similar for the two verb types. Figure 2a shows the results for sloppy interpretations, and Figure 2b shows the results for strict. Differences in means between *shi* 'be' and lexical verb sentences

were not statistically significant for either reading. (Overall statistical results are given above each figure.) These results suggest that children's representation of these structures is abstract, and that *shi* and the lexical verb behave equivalently with regard to VP ellipsis.

In our predictions, we hypothesized that the strict reading should be a marked reading which requires pragmatic motivation. This prediction is confirmed by our results, sketched in Table 6a and Table 6b. Both the pragmatic factors of *alienable vs. inalienable object* and *self-oriented vs. non-self-oriented action* had a significant effect on choice of strict reading.

Finally, we turn to a brief contrast in one part of our Chinese results and the earlier English results. (For fuller English results, see Foley et al., 1992 a,b,c). Figure 3a shows that Chinese children acquiring Chinese gave many more strict readings than children acquiring English at similar ages, even though the percentages of sloppy readings they gave are almost identical, as in Figure 3b. This is further demonstrated by Figure 4: Chinese children gave more strict readings than English children under every combination of pragmatic factors. Under our theory, the strict reading requires pragmatic motivation. Chinese is a null topic language; interpretation of null topics relies crucially on pragmatics (Huang 1984). Our results suggest that children acquiring Chinese and English have already determined basic properties of this language-specific interaction between grammar and pragmatics. We leave this issue for further study.

Table 5. Percent of Sloppy and Strict Responses: 'Be' vs Lexical Verb

Group	Reading	shi(Be)	Lexical verb	Average
1 (N=14)	% Sloppy	67	61	64
	% Strict	7	13	10
2 (N=16)	% Sloppy	60	56	58
	% Strict	21	21	21
3 (N=15)	% Sloppy	63	62	63
	% Strict	28	28	28
4 (N=16)	% Sloppy	59	59	59
	% Strict	36	34	35
Total N=61	% Sloppy	62	59	61
	% Strict	23	24	24

Figure 2a. Sloppy

F=1.925

P=0.171

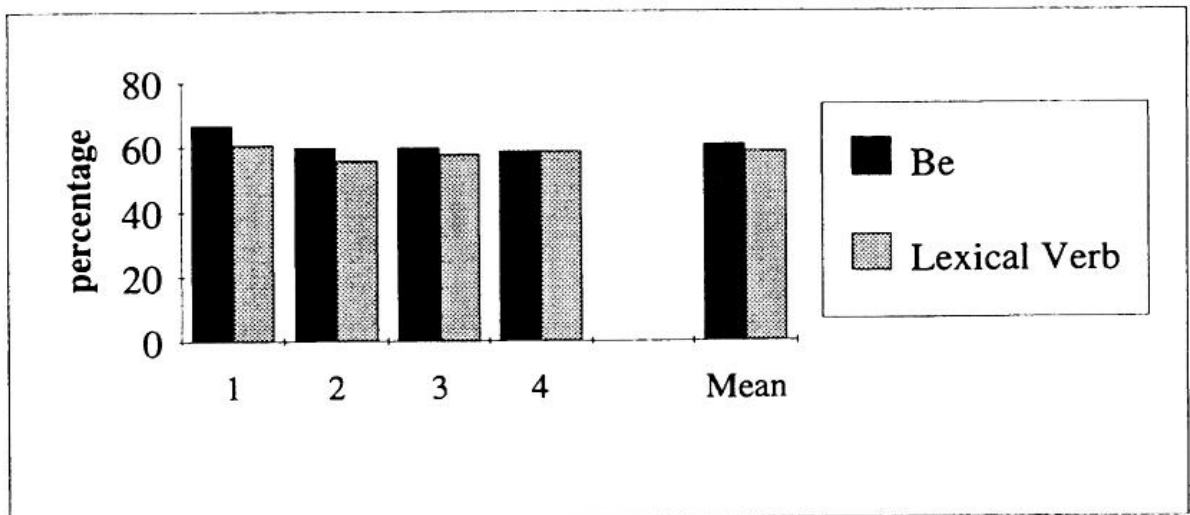
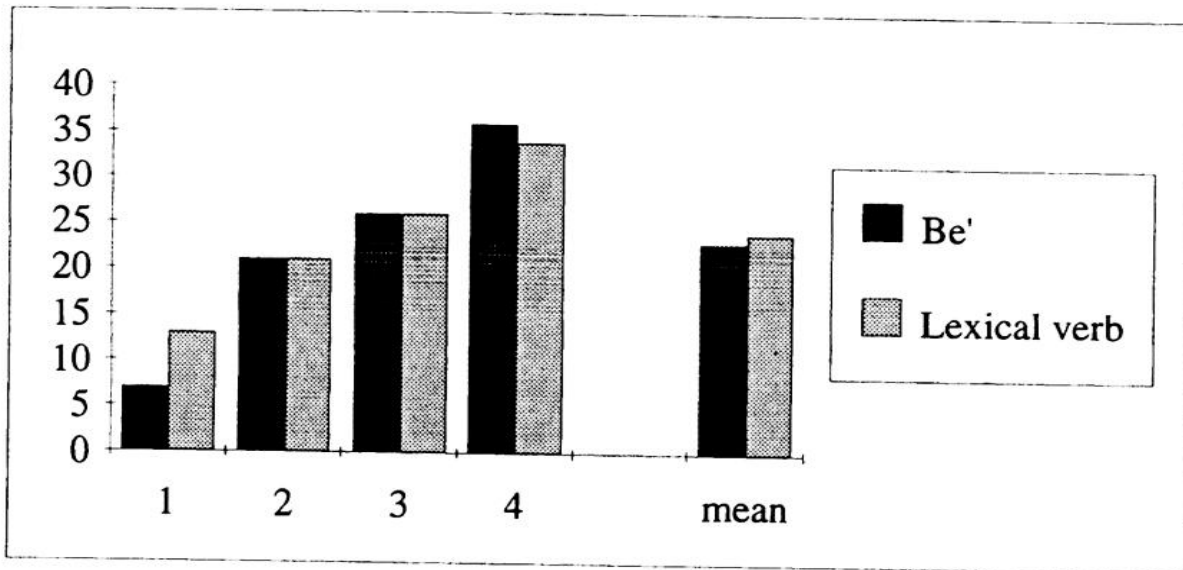


Figure 2b. Strict

F=0.090

P=0.765

Table 6a. Percent of Strict Responses by Pragmatic Factors:
Alienable vs Inalienable

F=16.870

P=0.000**

Group	(+) Alienable	(-) Alienable	Average
1	11	10	11
2	26	16	31
3	35	20	28
4	40	30	35
Mean	28	19	24

Table 6b. Percent of Strict Responses by Pragmatic Factors:
Self-oriented vs. Non-self-oriented

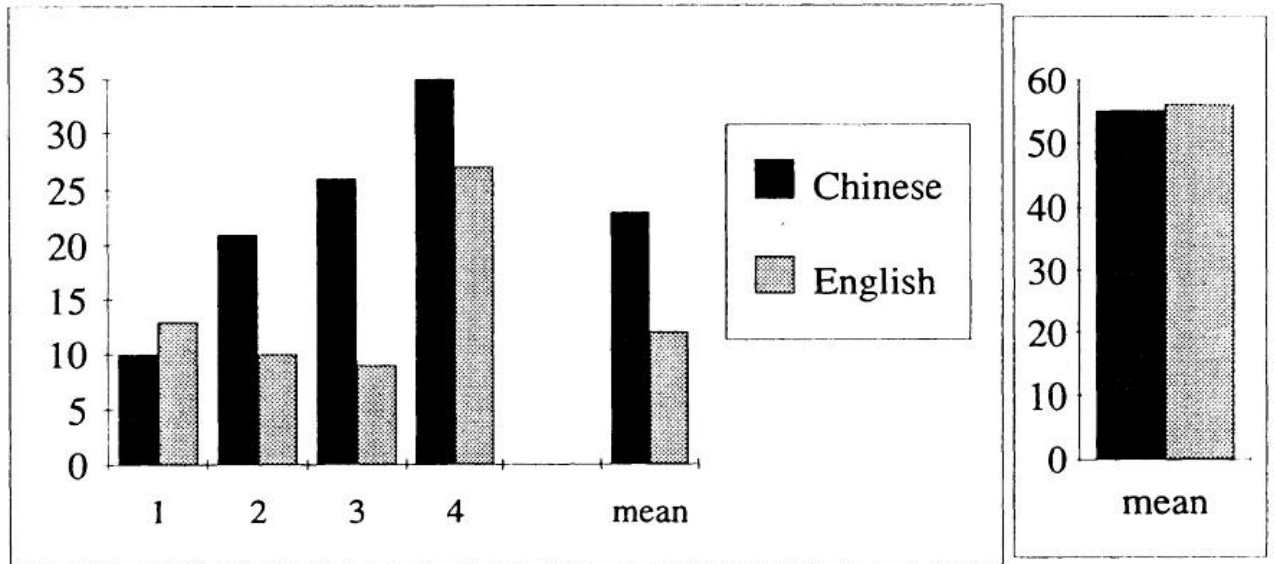
F=9.766

P=0.003**

Group	(+) Self-oriented	(-) Self-oriented	Average
1	6	13	10
2	19	23	21
3	21	34	28
4	31	39	35
Mean	20	28	24

Figure 3. Mean % Strict Responses on Pronoun Sentences:
Chinese vs English

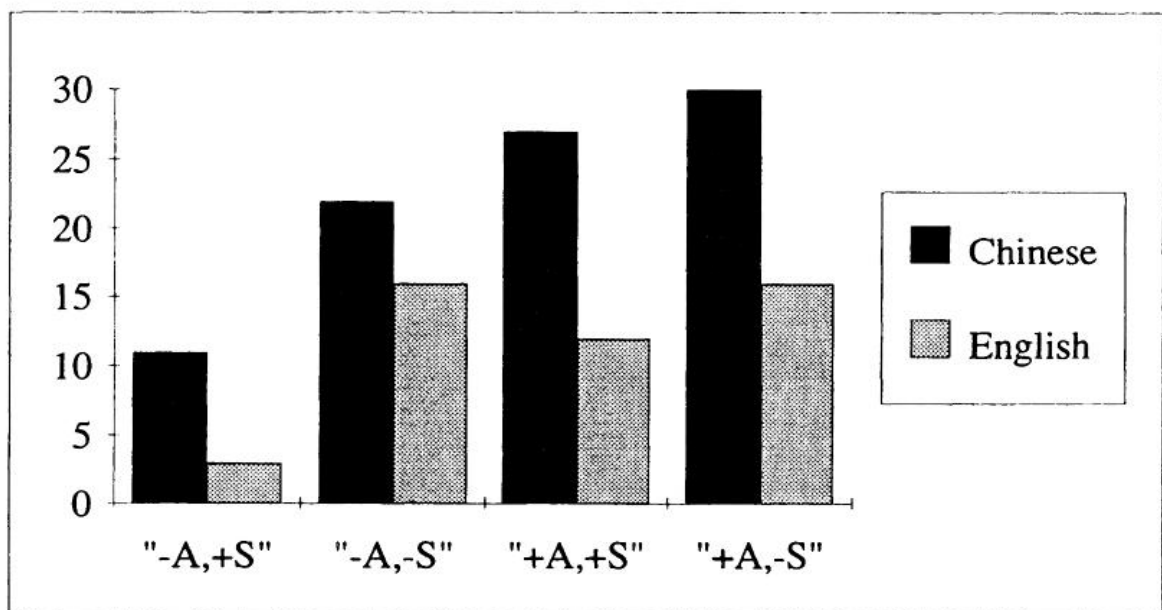
$t=2.5968$ $P<0.05$



3a: Strict Readings

3b: Sloppy Readings

Figure 4. Percentage of Strict Readings by Pragmatic Factors:
Chinese *shi* 'be' sentences only vs English



5. CONCLUSION

Across all the age groups we tested, for Chinese as well as English, the sloppy reading is unmarked. At the same time, Chinese-speaking children demonstrate the competence for both the sloppy and the strict readings in all age groups. In addition, children know that the ungrammatical readings are impossible. Pragmatic factors have a significant effect on results, but do not override grammatical constraints.

Results lend support to Huang's (1987) analysis of these coordinate structures as true VP ellipsis structures. Similar results on *shi* and lexical verb structures support the claim that children interpret VP ellipsis structures at the abstract level of LF.

Finally, children acquiring Chinese produced more strict readings than children acquiring English, even though like English children, they prefer sloppy readings in all conditions, and like English children, they show both readings. We suggest that this result may reflect early sensitivity to pragmatics by children acquiring Chinese; this early sensitivity may be necessary for the interpretation of such Chinese structures as null topics. Our results as a whole support the theory that children have continuous knowledge of operator-variable relations at LF. This knowledge characterizes UG and is continuous, even given language-specific variation with respect to the lexicon, the syntax of verb-raising, and the interaction between syntax and pragmatics.

Appendix Table 1. Percentage of Sloppy and Strict Readings by Pragmatic Factor (Overall, Chinese Study)

A1a: Chinese ('Be' sentences)

BE							
Group	N	Readings	(-) Alienable		(+) Alienable		Mean
			(+) Self	(-) Self	(+) Self	(-) Self	
1	14	% Sloppy	82	68	64	54	67
		% Strict	4	11	7	7	7
2	16	% Sloppy	75	72	47	47	60
		% Strict	9	19	25	31	21
3	15	% Sloppy	87	57	50	60	63
		% Strict	10	27	33	40	28
4	16	% Sloppy	78	56	53	50	59
		% Strict	22	38	44	41	36
Mean	61	% Sloppy	80	63	53	52	62
		% Strict	11	24	28	30	23

Adult	16	% Sloppy	97	66	78	81	81
		% Strict	3	34	19	19	18

A1b: Chinese (Lexical verb sentences)

LEXICAL VERB							
Group	N	Readings	(-) Alienable		(+) Alienable		Mean
			(+) Self	(-) Self	(+) Self	(-) Self	
1	14	% Sloppy	68	61	61	54	61
		% Strict	4	18	11	18	13
2	16	% Sloppy	62	59	59	44	56
		% Strict	13	25	28	19	21
3	15	% Sloppy	80	53	63	50	62
		% Strict	10	33	30	37	28
4	16	% Sloppy	75	59	61	50	59
		% Strict	25	38	34	41	35
Mean	61	% Sloppy	71	59	59	50	59
		% Strict	13	29	26	29	24

Adult	16	% Sloppy	100	59	44	63	67
		% Strict	0	41	53	31	30

Appendix Table 6. Percentage of Sloppy and Strict Readings by Pragmatic Factor (Overall, English Study)

Group	N		(-) Alienable		(+) Alienable		Mean
			(+) Self	(-) Self	(+) Self	(-) Self	
1	N=23	% Sloppy	46	39	36	23	36
		% Strict	7	18	11	14	13
2	N=25	% Sloppy	68	74	72	46	65
		% Strict	2	12	8	18	10
3	N=25	% Sloppy	82	68	72	42	66
		% Strict	0	10	12	12	9
4	N=8	% Sloppy	87	50	56	25	55
		% Strict	0	44	31	31	27
Mean	N=86	% Sloppy	67	59	59	35	55
		% Strict	3	16	12	16	12

Adult	12	% Sloppy	63	50	46	42	50
		% Strict	25	46	50	46	42

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Received September 1995

Revised January 1996

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