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CHINESE PRONOMINALS IN UNIVERSAL GRAMMAR: A STUDY OF LINEAR PRECEDENCE AND COMMAND IN CHINESE AND ENGLISH CHILDREN'S FIRST LANGUAGE ACQUISITION*

This paper concerns a particular problem raised by Mandarin Chinese pronouns, *viz.* they appear to obey a linear precedence constraint unlike English (e.g., Huang (1982)). This calls into question the nature of UG and how it can account for these cross-linguistic differences.

In this paper, experimental analyses of children's (null and lexical) pronoun interpretation in Chinese and English argue for universal 'structure dependence' (including 'command') in the Initial State and against either a universal or a language-specific role of 'linear precedence' alone. A linear precedence effect is developmentally achieved only in Chinese.

The acquisition results provoke a revised theoretical analysis of the grammar of pronouns in Chinese and a strong form of UG. We argue that it is not necessary to propose a language-specific definition of 'command' in Chinese in order to explain the apparent linearity effects on Chinese pronouns, and it is not necessary to propose a linear precedence rule in UG. Rather, consideration of an articulated structure of Chinese NP, which is motivated by the acquisition data, explains essential differences between lexical *ta* pronominals and null pronominals in Chinese and accounts for linearity effects in the adult language. We propose that *ta* pronominals are not themselves in argument position and are not N^0 heads. They are not equivalent to null pronominals.

Together the experimental and theoretical results support a 'strong continuity' theory of UG in which universal "principles and parameters" of UG continuously constrain the child's mapping from UG to a specific-language grammar. Language development, and the Chinese precedence effect for pronouns, lies in pragmatic/semantic features connected with the lexical realization of the specifier of a pronominal NP, not in the development of UG.

1. INTRODUCTION

In this paper, we present the results of a set of comparative studies which were designed to investigate children's acquisition of the grammar of pronominals in Mandarin Chinese and English.[1] In the course of this investigation we are led to new insights regarding the grammar of Chinese pronominals and its relation to Universal Grammar (UG). This paper represents one component of a cross-linguistic project in which first language acquisition of English and several other languages are compared in order to investigate the nature of principles and parameters in UG. We assume the theory of UG (as summarized in (1)) to provide a model of the "Initial State" for language development (cf. Lust (to appear, in preparation)).

(1)   **Theory of Universal Grammar:**
        ". . . UG provides an innate 'precondition for experience' which
        appears to be the critical factor in determining the course and
        result of language learning" (Chomsky (1988: 78)). ". . . so we
        may say that a specific theory of UG is descriptively adequate
        if it gives a correct account of the initial state . . . a descrip-
        tively adequate theory of UG provides an explanation for the fact
        that under the boundary conditions of experience the child comes
        to know that the facts are as characterized by descriptively
        adequate grammar" (Chomsky (1981: 36)).

On the basis of the experimental results from the current study, and those
from previous studies, several points concerning children's development
of knowledge of the grammar of pronouns will be argued:

First, in spite of the ostensible differences between Chinese grammar and
English grammar, children acquiring Chinese and those acquiring English
share an initial hypothesis regarding the "local" domain in which pronouns
are free. Language-specific differences in locality, specifically in type of
'command' – which had been proposed in order to explain apparent
language-specific linearity effects in Chinese (e.g., Huang (1982)) – are
not supported in the Initial State; neither is a linear precedence rule.

Second, on the surface, Chinese children appear to differ from Chinese
adults in some of their hypotheses about pronouns. Chinese child language
reflects the essence of UG, rather than the Chinese adult model.

Third, in accordance with UG principles, for both Chinese- and English-
acquiring children, the domain in which pronouns are free is based on the
structure or configuration of the sentences rather than on surface linearity
alone. A uniform definition of locality can account for the data.

Fourth, in accordance with UG, both English- and Chinese-acquiring
children consult a configurational parameter concerning their specific
language (i.e., CP "head direction" or "principle branching direction") in
order to establish a grammatical theory about pronoun domain. It is because
of this that Chinese-speaking children differ from English-speaking children
in the way they exhibit a linearity (or a directionality/precedence) effect
on their early pronoun interpretations.

Fifth, the relation between lexical and null pronominals in Chinese adult
grammar is developmentally achieved through a process of lexical learning
which involves the acquisition of the features of the third person *ta* and
its relation to a null NP head. Our acquisition results lead us to a new theory
of pronouns in Chinese. We suggest that *ta* itself is not in an argument
position (i.e., A position) but in Spec of NP. This new proposal obviates

the need to stipulate different definitions of 'command' across languages (English and Chinese). The developmental facts provide support for aspects of independently motivated theories of overt pronouns in Chinese (Tang (1989); Huang and Tang (1991)) and in other pro-drop languages (Larson and Lujan (1991)). These developmental facts allow us to maintain the null hypothesis in UG regarding lexical and null pronominals (Montalbetti (1984)).

Sixth, in general, UG plays a continuous role in first language acquisition. It guides and constrains (by principles and parameters) the mapping from UG (Initial State) to specific language grammars.

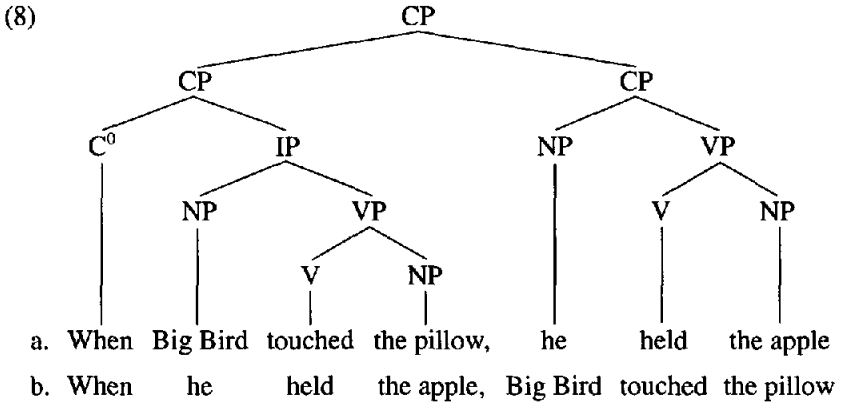### 1.1. *Specific Concerns of the Current Study*

In this paper, we are concerned with children's interpretation of complex sentences with a lexical or a null pronominal occupying a subject position. The corresponding English sentences are exemplified in (2) and (3); and the corresponding Chinese sentences are exemplified in (4) to (7). In (6) and (7), "∅" denotes the null pronoun or 'pro'.

(2)   When Big Bird touched the pillow, he held the apple.

(3)   When he held the apple, Big Bird touched the pillow.

(4)   Milaoshu   chui   lazhu   de-shihou, ta   daizhe yiding
       Mickey-Mouse blow candle time-Rel.   he   wear   one-Cl
       maozi.
       hat

       'When Mickey Mouse is blowing a candle, he is wearing a hat.'

(5)   Ta chui lazhu   de-shihou, Milaoshu   daizhe yiding
       he blow candle time-Rel.   Mickey-Mouse wear   one-Cl
       maozi.
       hat

       'When he is blowing a candle, Mickey Mouse is wearing a hat.'

(6)   Milaoshu   chui   lazhu   de-shihou, ∅ daizhe yiding
       Mickey-Mouse blow candle time-Rel.   ∅   wear   one-Cl
       maozi.
       hat

       'When Mickey Mouse is blowing a candle, ∅ is wearing a hat.'

(7)   Ø chui   lazhu   de-shihou,   Milaoshu   daizhe yiding
       Ø blow   candle time-Rel.   Mickey-Mouse   wear   one-Cl

       maozi
       hat

       'While Ø is blowing a candle, Mickey Mouse is wearing a hat.'

English sentences such as (2) and (3) are assumed to contain a left-branching adverbial subordinate clause, an adjunct structure (specifically, Chomsky adjunction), as represented in the schematic configuration in (8).[2]

(8)

a. When Big Bird touched the pillow,   he   held   the apple
b. When   he   held   the apple, Big Bird touched the pillow

In accordance with the classical interpretation of Principle B in the Binding Theory, the pronoun "he" in sentences like (2) and (3) (illustrated in (8)) is "free." This means that "he" may either be co-indexed with, or contraindexed (disjoint in reference) with, the name (possible antecedent) "Big Bird."[3] Directionality of the pronoun in this structure (i.e., whether "forward" as in (2) or "backward" as in (3)) does not affect the grammatical relationship between the pronoun "he" and the name "Big Bird." With regard to the Binding Theory Principle B, both forward and backward pronominals are free in these cases; that is, both forward and backward pronominals are possible with either a co-indexing or a contraindexing relationship with the name. The name and antecedent do not share a local domain.

Similarly, Principle C of the Binding Theory rules out neither a forward nor a backward coreferential relationship between the pronoun and the name (possible antecedent) for sentences like (2) and (3). In these sentences the name "Big Bird" is not c-commanded by the pronoun "he." Only in a sentence like the one in (9) is the pronoun "he" prevented by Principle C from coreferring to the name "Big Bird." This is due to the fact that in (9), the pronoun c-commands the name "Big Bird."

(9)   He held the apple when Big Bird touched the pillow.

In Chinese, complex sentences such as (4) to (7) involve a time adverbial clause (or an adjunct structure) like the English sentences exemplified in (2) and (3). As can be seen from (4) to (7), Chinese allows either lexical (e.g., *ta*) or null pronominals ('pro' denoted by "Ø") in these domains. In either case, both forward and backward pronominals should be possible by instantations of the Binding Theory similar to that in English. If we assume a structure similar to (8) for the Chinese time adverbial sentences like (10) then, both forward and backward pronouns are free for the same reasons as in English.[4] Neither Principle B nor C rules out the possibility for *ta* or Ø in (4) to (7) to be coreferential (forward or backward) with the name *Milaoshu*. We assume that sentences like (10) do share the general structure of (8), except for a right-headed C^0 in Chinese, indicated by the clause-final *de-shihou* (cf. Lust (in preparation)).

(10) a. Milaoshu   chui   lazhu   de-shihou, ta/Ø   daizhe
        Mickey-Mouse blow candle time-Rel.   he/Ø wear

        yiding   maozi.
        one-Cl   hat

        'When Mickey Mouse (is) blowing (a) candle, he/Ø wears a hat.'

    b. Ta/Ø chui   lazhu   de-shihou, Milaoshu   daizhe
        he/Ø blow candle time-Rel.   Mickey-Mouse wear

        yiding   maozi.
        one-Cl   hat

        'When he/Ø (is) blowing (a) candle, Mickey Mouse wears a hat.'

1.1.1. *A Problem in Chinese*

Based on the assumption that null pronominals (pro) are grammatically equivalent to lexical pronominals (although they bear no phonetic content) (cf. Montalbetti (1984) for discussion), the null pronominals should behave similarly to the lexical pronominals with regard to the Binding Theory. In other words, in (4) to (7), either forward or backward pronominal anaphora should be possible. However, in Chinese, as recognized by Huang (1982) (see (11) below), the facts do not appear to cohere with this theory.

(11)   ". . . while the failure of a pronoun to c-command an NP may
         be sufficient for the pronoun to be referentially dependent upon
         the NP in English, it is not in Chinese" (Huang (1982: 389)).

> "When we turn to Chinese, it turns out that failure of a pronoun
> to c-command an NP is not a sufficient condition for the latter
> to be the antecedent of the former" (Huang (1982: 388)).

For example, the Chinese facts illustrated in (12) to (14) below (see Huang
(1982: 388)) do not appear to correspond to the standard application of
the Binding Theory.

(12)   (= Huang: 171)
    a.* [ta$_i$ neng-bu-neng lai]   dui Zhangsan$_i$ mei guanxi.
        he   can-not-can   come to   Zhangsan   no   matter

        'Whether he$_i$ can come or not doesn't matter to Zhangsan$_i$.'

    b. [Zhangsan$_i$ neng-bu-neng lai]   dui ta$_i$ mei guanxi.
       Zhangsan   can-not-can   come to   he   no   matter

       'Whether Zhangsan$_i$ can come or not doesn't matter to him$_i$.'

(13)   (= Huang: 172)
    a.* [[Wo kanjian ta$_i$ de] shihou],   Zhangsan$_i$ zai dazi.
        I   see   he   DE   time-Rel. Zhangsan   at   type

        'When I saw him$_i$, Zhangsan$_i$ was typing.'

    b. [[Wo kanjian Zhangsan$_i$ de] shihou],   ta$_i$ zai dazi.
       I   see   Zhangsan   DE   time-Rel.   he   at   type

    'When I saw Zhangsan$_i$, he$_i$ was typing.'

(14)   (= Huang: 173)
    a.* [Buguan   ta$_i$ xi-bu-xihuan], Zhangsan$_i$ dou dei   lai.
        regardless he   like-not-like   Zhangsan   all   must come

        'Regardless of whether he$_i$ likes it or not, Zhangsan$_i$ has to
        come.'

    b. [Buguan   Zhangsan$_i$ xi-bu-xihuan], ta$_i$ dou dei   lai.
       regardless Zhangsan   like-not-like   he   all   must come

       'Regardless of whether Zhangsan$_i$ likes it or not, he$_i$ has to
       come.'

In (12) to (14), while the forward pronoun *ta* in (b) can be co-indexed
with the name *Zhangsan*, the backward pronoun *ta* in (a) cannot. In fact,
the pronoun data illustrated in (12) to (14) and some other similar facts have
grounded the speculations in (15) and (16) for differentiating English and
Chinese grammars:

(15) Tai (1973: 661):
      "Unlike English, Chinese doesn't allow backward pronominal-
      ization under any condition . . . even if two referential noun
      phrases are in the relationship of command."

(16) Huang (1982: 390):
      "The parameter that distinguishes between Chinese and English
      would then be whether the linear notion of precedence or the
      hierarchical notion of c-command is relevant."

These differences between Chinese and English raise a fundamental
question: How can this cross-linguistic variation be represented in UG? Can
languages vary as to which is unmarked, *linear precedence* or *hierarchical
structure* (cf. Lust (1986))? Recent theory of UG suggests that linear
precedence has no place in a theory of UG, except as derivative of struc-
ture. However, if linear precedence is not involved in UG, then how can
we explain (12) to (14)? In order to account for these Chinese data, Huang
(1982) has argued against a precedence principle like (15) or (16) and has
proposed a hierarchical condition (17) as a special requirement (18) for
Chinese pronominals. Huang argued that in Chinese, the relevant hierar-
chical notion for lexical pronominal interpretations should be specified in
terms of "cyclic c-command" rather than "c-command." He further argued
that the notion of cyclic c-command constrains only the interpretation of
lexical pronominals in Chinese, not null pronominals.

(17) "Chinese obeys an even stronger hierarchical condition than
      English; . . . to the general principle . . . we add the language-
      specific condition on Chinese, though not on English: A
      pronoun may not cyclic c-command its antecedent." (Huang
      (1982: 395))

      Cyclic c-command: A cyclic c-commands B if and only if:
      a. A c-commands B, or
      b. if C is the minimal cyclic node (NP or S-bar) that domi-
         nates A but is not immediately dominated by another cyclic
         node, then C c-commands B. (Huang (1982: 394))

(18) There is ". . . a special requirement solely on the position
      of lexical pronouns with respect to their antecedents in
      Chinese."

The example in (19) shows that, unlike lexical pronominals, a null pronom-
inal may be coreferential with a following name (backward).

(19)   [pro$_i$ deng-le   sange zhongtou yihou], Zhangsan$_i$
        [Ø$_i$ wait-Asp three hour   after]   Zhangsan$_i$

        shuizhao-le.
        fell-asleep-Asp

        'After he had waited for three hours, Zhangsan fell asleep.'

Consider the tree structure given in (8) and the corresponding sentences again. If the notion of cyclic c-command (given in (17)) constrains the interpretation of lexical pronominals in Chinese, then backward pronouns in a structure like (8) will cyclic c-command the following name. (The minimal cyclic node containing the pronoun subject in (8b) is CP (= S bar). We refer the reader to Huang (1982: 388–400) for details regarding application of (17)). Principle C of the Binding Theory will thus restrict the coreferential relationship between the pronoun and the name in Chinese (although not in English, where c-command, not cyclic c-command, applies).

One may assume that if the English version of c-command is provided by UG, then the Chinese-specific condition and requirement specified in (17) and (18) should not be part of UG. Therefore, it would be necessary for Chinese children to subsequently learn the language-specific knowledge (e.g., the notion of cyclic c-command) specified in (17). In order to apply (17), the Chinese children must differentiate the configuration (or hierarchical structure) of command as cyclic c-command, rather than c-command and must learn to apply an even stronger condition in Chinese.[5] They must also acquire the differential interpretations associated with the lexical pronouns and the null pronouns. In other words, in order to apply (17) correctly, children acquiring Chinese would have to restrict their hypotheses to the lexical pronoun as distinct from the null pronoun in accord with the requirement specified in (18). This overrides what Montalbetti (1984) has called the null hypothesis of UG given in (20). Again, the Chinese child would appear to have to be at odds with UG.

(20)   **The Null Hypothesis** (Montalbetti, 1984):
        In a classic theory of Universal Grammar (UG), the null hypothesis concerning empty categories is that: ". . . the distribution, type and content of [e]$_{NP}$ must be fully determined by conditions and principles that apply to the category NP, without discrimination as to whether it is lexical or not." (Bouchard (1984: 11); after Chomsky (1981))

In sum, given the hypothesis in (17), it would appear that children acquiring Chinese need to learn the apparent linear precedence effects

with the lexical pronouns in Chinese by applying the notion of cyclic c-command as the relevant constraint, but they must not do so with the null pronoun.[6] They must apply a "stronger" language-specific condition and modulate UG in Chinese, as opposed to English.

1.2. *The Assumptions and the Hypotheses of this Paper*

In contrast to (17), we begin with the strong, simple, universal assumptions regarding UG which are stated in (21). These assumptions lead us to several testable hypotheses regarding the first language acquisition of Chinese, which we have pursued in our empirical research. On the basis of these assumptions, and the experimental results from our study of Chinese first language acquisition, we are led to sketch a stronger theory of UG in this area (section 4.2), one which supports the universal definition of UG in (1) (as a precondition which constrains and guides experience) and in doing so suggests certain revisions in our theory of Chinese syntax. In particular, we will suggest a revision in our theory of Chinese lexical proforms (like *ta*) and, in doing so, eliminate the need for replacing c-command by cyclic c-command in Chinese.

(21)   **Our Assumptions:**
    a. UG determines "structure-dependence;" this is available in pronominal interpretation (e.g., Chomsky (1988)). "Structure-dependence" is universally available.
    b. In UG, hierarchical structure is unmarked, not linear precedence.
    c. The relevant structure-dependent notion for pronominal interpretation is the same as it is in English; here we will assume it is universally c-command.[7]
    d. The null hypothesis in (20) holds in UG (all other factors being equal).

The differences mentioned above between Chinese and English in conjunction with the assumptions given in (21) allow us to test a strong hypothesis. Namely, if the assumptions about UG stated in (21) actually hold, then Chinese children (unlike Chinese adults) should accept backward pronoun coreference in sentences like (5) (or (12a) to (14a)), because the notion of c-command does not rule out the coreferential interpretation for any of these backward pronoun sentences. This hypothesis should be confirmed even though the adult Chinese grammar does eschew backward pronouns in these sentences; and presumably the adult Chinese language serves as the inductive learning base for Chinese children's pronoun acqui-

sition. If the children were not guided by UG, they would have only this adult model as the basis for their learning.[8]

This hypothesis becomes even more interesting when it is realized that children acquiring English do show early linear precedence effects in pronoun interpretation; and these have been argued by some to reflect a universal linear precedence effect (e.g., Carden (1986)). As attested by several studies (e.g., Lust (1986); Eisele and Lust (to appear)), children acquiring English productively assign a pronoun to be coreferential with an antecedent that precedes the pronoun, but less productively with an antecedent that follows the pronoun in complex sentences containing adverbial subordinate clauses (i.e., they demonstrate a precedence effect in this domain), even when pronouns are free.

1.3. *Precedence Effects in Acquisition: Parameterization of Chinese-English Grammatical Differences*

In our previous work, we argued that children acquiring English productively eschewed backward pronouns in constructions like (9), not simply because of the linear order of the pronoun and its antecedent, but because the backward pronoun order is not, in general, consistent with the command structure associated with their right-branching (i.e., left CP headed and rightward adjunction) value of English grammar. Thus, the child may productively run into Principle C offenses in right-branching structures with backward pronouns. An interaction of principles and parameters in UG constrains children's early hypotheses about their grammar. (See Lust, Eisele, and Mazuka (1992) for a review of evidence that knowledge of Principle C appears early in acquisition. See Lust (to appear, in preparation) for theoretical arguments with regard to this proposal; and Mazuka (in press) for discussion of this proposal and evidence that knowledge of CP parameterization may appear early, perhaps before the first word.) Lust and Chien (1984) provided an initial test of this theory in Chinese acquisition. They found evidence there for "an interaction . . . between children's sensitivity to a predominant Chinese topic-comment structure (in SV) and their sensitivity to the abstract, specifically grammatical concept of Principal Branching Direction" (p. 50). (See also Chien, Lust, Mangione, and Guo (in preparation) and Guo, Lust, Chien, and Chiang (in preparation) for further empirical evidence on this point in Chinese.)

If this proposal to explain directionality effects in acquisition is correct, then the hypothesis concerning Chinese children's pronoun acquisition proposed above may be elaborated in the following way: Even if children acquiring English eschew backward pronouns in sentences like (3) (i.e., they

do not productively assign "he" to be coreferential with "Big Bird" in sentences like "When he held the apple, Big Bird touched the pillow"), children acquiring Chinese would *not* show this same precedence effect when dealing with similar Chinese sentences. Given a left-branching parameter-setting in Chinese (cf. Lust and Chien (1984)), children would have no need to constrain backward pronoun anaphora. We can formulate a strong hypothesis. Namely, in Chinese, a linear precedence effect on pronoun interpretation which Chinese adults demonstrate (i.e., eschewing backward pronouns in contrast to forward in sentences like (10)) must develop over time and must be linked to the learning of language-specific grammar. It is not determined by UG.

The rationale for such a hypothesis is that backward pronouns in complex sentences like those above are consistent not only with a universal Binding Theory in UG but also with the parameterized grammar for Chinese, that is, the left-branching CP adjunction structure of Chinese. (Chinese is parametrically left-branching in the sense that, in contrast to English, relative clauses and adverbial subordinate clauses appear unmarkedly leftward (cf. Huang (1982); Lust and Chien (1984); Lust (in preparation)). In fact, in contrast to the English preposed structures, such as in (8), the Chinese preposed adverbial subordinate 'when' clauses may *not* occur in postposed position. Lust (to appear, in preparation) formalizes this phrase structure variation in terms of CP head direction, correlating with a 'principal branching direction' for the language. See also Huang (1994) for more recent analysis of Chinese phrase structure.)[9]

If we consider adverbial clause embedding and subject pronoun anaphora, then in a left-branching structure (e.g., (8) or (10) above), a pronoun in a preposed subordinate clause will not c-command a name (potential antecedent) in the main clause that linearly follows the pronoun. This contrasts with a right-branching structure (e.g., (9) above) in which a pronoun in the initial main clause is likely to c-command (rather than be c-commanded by) a name antecedent in the subordinate clause that follows the pronoun.[10]

If children are sensitive to hierarchical structure and to parameterized grammar in pronoun interpretation and if they are constrained by the Binding Theory to avoid Principle C offenses (where a pronoun c-commands an antecedent), then children acquiring Mandarin Chinese and English should differ in their early hypotheses regarding pronoun interpretation in left-branching sentences such as (2) to (7). In Chinese, unlike English, adverbial subordinate clauses must be left of main clauses. Therefore, we would predict that the precedence effect on pronoun interpretation observed in English acquisition would not appear in Chinese acquisition.

More specifically, if the child's grammar (led by UG) consults an unmarked structural notion of c-command in accord with the Binding Theory, then backward pronouns in these constructions (like (8) or (10)) are not grammatically ruled out. Moreover, in Chinese, these constructions are consistent with the unmarked command structure associated with this left-branching language. On the other hand, if Chinese children were consulting cyclic c-command then they would not be predicted to consult this right-left branching direction (or CP head direction) factor. On the basis of cyclic c-command as defined in (17), either right or left adjunctions of adverbial subordinate clauses (CP adjuncts) should be equivalent. Both should rule out backward pronouns.

1.4. *Summary of Hypotheses*

In summary, we formulate and test two critical predictions: (i) Both a universal theory regarding "command" and the left-branching nature of Chinese conspire to predict that Chinese children will *not* show linear precedence effects in structures like (5) by eschewing coreferential backward pronoun interpretations. This would be true even though in Chinese adult language, backward co-indexing between a lexical pronoun and a name antecedent that follows the pronoun is rejected and even though children acquiring English do exhibit such linear precedence effects. (ii) If we assume that UG provides a model of the initial state for language development and that the null hypothesis (state in (20)) is preprogrammed in UG, then given appropriate experience with Chinese, we would expect Chinese children to have to learn the language-specific distinction between the lexical and null pronominals over time. The initial hypothesis (UG) for the Chinese-acquiring children would be that lexical and null pronominals follow the same grammatical constraints; they will not be differentiated initially.

In contrast, if a parameter like (16) existed and the linear precedence constraint on lexical pronouns were an option in UG, then, contrary to our predictions, Chinese children should show linear precedence effects on lexical and/or null pronouns, demonstrating anaphora for forward (but not backward) pronominals, like children acquiring English. Similarly, if linear precedence were unmarked in general, our research results should reveal that children acquiring Chinese (like English) show forward linearity or precedence effects in pronoun interpretation. Also, if Chinese children are simply attempting to induce language knowledge from the adult model, then they should show precedence effects on lexical pronouns, although not on null pronouns, like the adult.

2. THE DESIGN AND METHODOLOGY OF THE EXPERIMENTS

2.1. *The Design of the Chinese Experiment*

2.1.1. *The Task*

In this Chinese experiment, a truth value judgment (TVJ) test of compre-
hension (a yes/no judgment task) was adopted to test subjects' interpretation
of different types of time adverbial constructions involving lexical and
null pronouns.[11] In the TVJ task, the subject was presented with a cartoon
picture and a sentence related to the picture. After initial training, he or
she was asked to judge whether the picture depicted a possible interpreta-
tion of the sentence by simply replying "yes/right" or "no/wrong." Since
young children may favor saying "yes" on this task, in training, some
obvious "no" picture-question pairs were given; and children were fre-
quently reminded during the task that some answers were "yes" and some
were "no."

2.1.2. *Stimulus Set Design: The Sentences and the Pictures*

The test sentences included in the Chinese study were complex construc-
tions containing two clauses (a main clause and a subordinate clause adjunct)
in a natural left branching structure (where the subordinate clause is
preposed, i.e., preceded the main clause) connected by the time relative
marker *de-shihou*.[12] In one of the two clausal units, the subject position
was occupied by a name (e.g., *Tanglaoya*); in the other, the subject position
was occupied by a proform (either null or lexical). Examples of the Chinese
experimental constructions are given in (22) to (25) and (28) to (31).

   As can be seen from these examples, in the test constructions we varied
the syntactic factors according to two binary dimensions, namely "proform
type" and "proform direction." The factor proform type was varied as to
whether the proform occupying one of the subject positions was the lexical
ta 'he' (e.g., (22) to (25)) or the null pronominal pro, denoted by 'Ø' (e.g.,
(28) to (31)). The factor proform direction was defined in terms of the linear
relationship between the proform and another term in the subject position
(i.e., a name).[13] The factor proform direction varied as to whether it involved
a forward (precedence) or a backward linear relation between the proform
and the name. In the forward case, the proform followed the name (e.g.,
(22), (23), (28), and (29)). In the backward case, the proform preceded
the name (e.g., (24), (25), (30), and (31)). According to the two factors (i.e.,
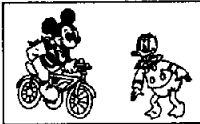proform type (lexical pronominal/null pronominal) and proform direction

CHINESE LEXICAL PRONOMINAL

CO-REFERENCE   DISJOINT REFERENCE

(22) FORWARD (Name$_i$...ta$_i$)   (23) FORWARD (Name$_i$...ta$_j$)
      Tanglaoya, kan dianshi de-shihou, ta, baozhe yi-ge piqiu.   Tanglaoya, kan dianshi de-shihou, ta, baozhe yi-ge piqiu.
      Donald-Duck watch TV time-Rel., he hold one-CL ball   Donald-Duck watch TV time-Rel., he hold one-CL ball
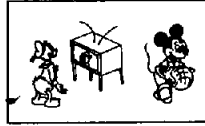   'While Donald Duck is watching TV, he is holding a ball.'   'While Donald Duck is watching TV, he is holding a ball.'
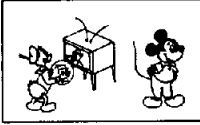
(24) BACKWARD (Ta$_i$...name$_i$)   (25) BACKWARD (Ta$_i$...name$_j$)
      Ta, qi chezi de-shihou, Milaoshu, beizhe yi-ge shubao.   Ta, qi chezi de-shihou, Milaoshu, beizhe yi-ge shubao.
      He ride bike time-Rel., Mickey-Mouse carry one-CL backpack   He ride bike time-Rel., Mickey-Mouse carry one-CL backpack
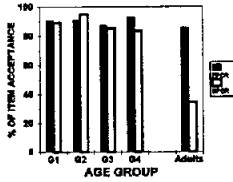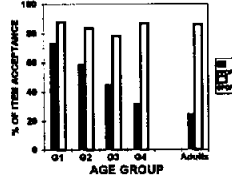   'While he is riding a bike, Mickey Mouse is carrying a backpack.'   'While he is riding a bike, Mickey Mouse is carrying a backpack.'
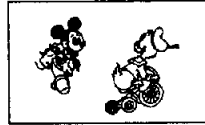
(26) RESULTS   (27) RESULTS

(forward/backward)), we derived four different experimental constructions:
the *forward lexical pronominal* construction (e.g., (22) and (23)), the
backward lexical pronominal construction (e.g., (24) and (25)), the *forward
null pronominal* construction (e.g., (28) and (29)), and the *backward null
pronominal* construction (e.g., (30) and (31)). All experimental construc-
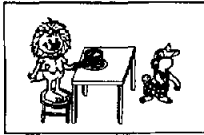tions were roughly equivalent in syllable length (15 or 16).

With regard to the design of pictures in this TVJ test, we systemati-
cally varied the relationship between the actions depicted in each picture
and the two cartoon characters drawn in the picture. Paired with each
experimental sentence construction were two different pictures. One was
a coreference pictorial context (e.g., (22), (24), (28), and (30)). The other
was a disjoint reference pictorial context (e.g., (23), (25), (29), and (31)).
In the coreference pictorial context, the stimulus picture depicted one
cartoon character simultaneously carrying out two different actions described
in the stimulus sentence, with a second cartoon character present, yet
disengaged from any activity. In the disjoint reference context, one cartoon

CHINESE NULL PRONOMINAL

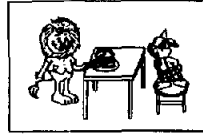CO-REFERENCE

(28) FORWARD (Name$_i$...θ_i)
Xiaoshizi$_i$ qie dangao de-shihou, θ_i zhanzai yizi shangmian.
Little-Lion cut cake time-Rel., null stand chair top
'While Little Lion is cutting the cake, θ is standing on the chair.'

(30) BACKWARD (θ_i...name$_i$)
θ_i Pa louti de-shihou, Tuhaobao$_i$ tizhe yi-ge lanzi.
Null climb ladder time-Rel., Peter-Rabbit hold one-CL basket
'While θ is climbing the ladder, Peter Rabbit is holding a basket.'

(32) RESULTS

DISJOINT REFERENCE

(29) FORWARD (Name$_i$...θ_j)
Xiaoshizi$_i$ qie dangao de-shihou, θ_j zhanzai yizi shangmian.
Little-Lion cut cake time-Rel., null stand chair top
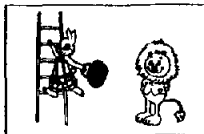'While Little Lion is cutting the cake, θ is standing on the chair.'
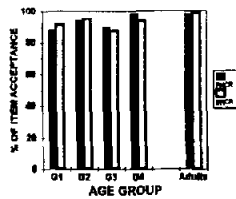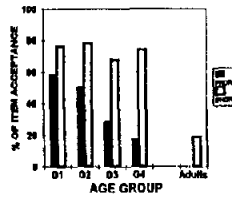

(31) BACKWARD (θ_i...name$_j$)
θ_i Pa louti de-shihou, Tuhaobao$_j$ tizhe yi-ge lanzi.
Null climb ladder time-Rel., Peter-Rabbit hold one-CL basket
'While θ is climbing the ladder, Peter Rabbit is holding a basket.'

(33) RESULTS

character was engaged in one activity while a second cartoon character was engaged in a second activity, corresponding to the two predicates mentioned in the stimulus sentence. If the sentence is interpreted to accord with the coreference (CR) condition, both the name and the lexical pronoun or null subject refer to one single agent. If the sentence is interpreted to accord with the disjoint reference (DR) condition, the lexical subject refers to one agent and the pronoun or null subject refers to a second agent.

Adding the factor of "picture coreference" (CR) (or disjoint reference (DR)) (to each of the four experimental constructions) provided eight experimental conditions: FPCR, FPDR, BPCR, BPDR, FNCR, FNDR, BNCR, and BNDR. (F = Forward, B = Backward, P = Lexical Pronominal, N = Null Pronominal, CR = Coreference, DR = Disjoint Reference.) There were four items for each experimental condition, making a total of 32 items for each subject.

2.1.3. *The Subjects*

The study included 144 children between the ages of 3 (3;0) and $7^{1}/_{2}$ (7;6) years. It also included 16 adults as a control group. The children were assigned to five different age groups with one-year intervals for the first four groups and a 6-month interval for the final group. Each age group consisted of 32 children except for the final group which consisted of 16 children.

The children were monolingual Chinese speakers in the sense that they were acquiring Mandarin Chinese as their first language. Some subjects were also acquiring the dialect of Taiwanese concurrently with Mandarin Chinese.[14] The children were sampled from day-care centers, nursery schools, kindergartens, and elementary schools in Taipei, Taiwan.

The 16 adults were a random sample of students attending National Chengchi University in Taipei, Taiwan. The adults served as the control comparison group.

2.1.4. *Scoring and Analyses*

Based on the subjects' "yes" or "no" responses, the mean number of co-reference judgments or disjoint reference judgments which were accepted by each group of subjects for each condition were compared. We tested whether there was statistically significant variation in acceptance of given sentence-picture pairs which was determined by the experimental factors. In this paper, we will report the patterns which emerged from these statistical results.[15]

2.2. *A Corresponding English Study*

The results from this Chinese study were contrasted to those from a previous English study (Eisele (1988); Eisele and Lust (to appear)) which involved a closely matched design and methodology, including similar sentences varying in direction of proform and similar pictures indicating coreference or disjoint reference exemplified in ((34) to (37)).[16] The TVJ task, the materials (i.e., the sentence-picture pairs), and the test procedures were all closely matched in the Chinese study and the English study.

In the English study, there were 72 child subjects and 18 adults. The child subjects were divided into 4 age groups with one-year intervals (3;0–4;0, 4;0–5;0, 6;0–7;0, 7;0–8;0). Each subject was tested on 2 items in each condition in these left-branching constructions. (See Eisele (1988), Lust, Eisele and Mazuka (1992), and Eisele and Lust (to appear) for detailed design and analyses of this study.)

ENGLISH LEXICAL PRONOMINAL

CO-REFERENCE   DISJOINT REFERENCE

(34) FORWARD (Name$_i$...he$_i$)   (35) FORWARD (Name$_i$...he$_j$)
When Big Bird, touched the pillow, he, held the apple.   When Big Bird, touched the pillow, he, held the apple.

(36) BACKWARD (He$_i$...name$_i$)   (37) BACKWARD (He$_i$...name$_j$)
When he, held the apple, Big Bird, touched the pillow.   When he, held the apple, Big Bird, touched the pillow
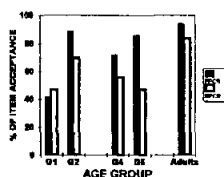
(38) RESULTS   (39) RESULTS
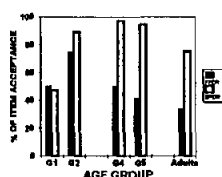
3. THE RESULTS

3.1. *The Results of the English Study*

Results of the English study are illustrated in the figures in (38) and (39).[17]
As shown in (38), beginning with group 2 (age 4;0–5;0), in English there
was a significantly greater acceptance of a CR picture when the sentence
had a forward pronoun than when it had a backward pronoun. In other
words, when the sentence and the picture in (34) were presented to the
children, they answered "yes" more frequently than when they were pre-
sented with the sentence and the picture in (36). The data suggested that
children acquiring English productively interpreted a pronoun to be co-
referential with a name antecedent which preceded the pronoun but less
productively interpreted a pronoun to be coreferential with a name
antecedent which followed the pronoun. A much weaker (forward) prece-
dence effect characterizes the adult group. As indicated by the final two bars

in the figure given in (38), at adulthood, forward and backward pronoun coreference tended to merge in these structures. Adults allowed the pronoun "he" to be coreferential with the name antecedent "Big Bird" whether it preceded or followed the name.

As can be seen from the figure given in (39), in English, the DR picture was accepted to a large degree across development (after G1) when a sentence had a backward pronoun, although it was frequently rejected when a sentence had a forward pronoun. In other words, when the sentence and the picture in (37) was presented to the children, the children after G1 and the adults frequently answered "yes;" when they were presented with the sentence and the picture in (35), children (Group 2 on) accepted this DR picture less frequently. Adults rejected the DR picture even more in this case. The figure in (39) indicates that the acceptance of a DR picture for a forward pronoun sentence, in fact, diminished with development. The adults allowed a pronoun to be disjoint in reference with a name antecedent which preceded the pronoun less than 40% of the time. On the other hand, they allowed a pronoun to be disjoint in reference with a name antecedent which followed the pronoun more than 75% of the time.

In summary, the English data indicated that there was a directionality (or precedence) effect on pronouns in acquisition of English. The precedence effect was observed in the coreference condition as well as in the disjoint reference condition. This replicated the precedence effects achieved with other methods in the study of English pronoun acquisition (cf. Lust (1986), among others).

An unexpected result in this English study showed also that the DR effects (i.e., rejection of DR interpretations) increased in adulthood for forward pronouns. This result in the adult group can only be due to pragmatic factors since this forward pronoun is "free" with regard to the Binding Theory and therefore should grammatically allow either a coreference or a disjoint reference interpretation. Adult grammar, we assume, is intact. This pragmatic effect increases with age, and therefore appears to be learned gradually. We return to this point below.

3.2. Results of the Chinese Study

Analyses of the four conditions involving lexical *ta* pronominals in Chinese are illustrated in figures (26) and (27).[18] Those of the four conditions involving null pronominals ('pro') are illustrated in figures (32) and (33). In each figure we plot age groups on the abscissa and percentage of items indicating acceptance of a picture on the ordinate. Overall, adults responded

"yes" 56% of the time and "no" 44% of the time. Children replied "yes" 76% of the time and "no" 24% of the time.[19]

3.2.1. *Experimental Conditions Involving the Chinese Lexical Pronominal* ta

3.2.1.1. *Lexical Pronominal Coreference Interpretations.* The figure in (26) illustrates the results of the two conditions involving the lexical *ta* and a coreference pictorial context, (i.e. both the FPCR ($name_i$ . . . ta_i) and the BPCR (ta_i . . . $name_i$) conditions). The major findings are summarized in (A) and (B).

(A) As indicated by the black bars of this figure (26), the adults allowed *ta* to be coreferential with the name that precedes it about 86% of the time (i.e., forward pronominal: $name_i$ . . . ta_i). Similar to the adults, children in all age groups also consistently allowed this type of forward anaphora. In general, they reacted to a picture like (22) and the corresponding sentence with a "yes" response about 90% of the time (ranging between 87.50% and 93%).

(B) The empty bars in the same figure, (26), illustrate the results of the BPCR condition. As can be seen, the adults rarely allowed *ta* to be coreferential with the name that followed it (i.e., backward pronominal: ta_i . . . $name_i$ (< 35%)). Unlike the adults, however, Chinese children, in all age groups, consistently allowed *ta* to be coreferential with a following name. They reacted to a picture like (24) and the corresponding sentence with a "yes" response about 87.75% of the time (ranging between 83.63% and 94.63%).

The results (A) and (B) indicate that most Chinese children between the ages of 3;0 and 7;6 did not obey the language specific constraint against backward lexical pronominal anaphora which Huang (1982) noted for adults (cf. (11) to (14) above). In accord with Huang, however, most Chinese-speaking adults followed the language-specific constraint against backward lexical pronominal anaphora.

In line with our reasoning above, this set of results suggests that Chinese children obeyed an unmarked constraint consistent with c-command and did not invoke a language-specific notion of cyclic c-command. Backward pronouns in the test constructions were consistent with their left-branching language, and they are grammatically free. These results confirmed that there is no linear precedence effect on lexical pronominals in Chinese

acquisition until adulthood. Therefore, this precedence effect must, in some way, be learned. This lack of a precedence effect in Chinese child language pronominals with a TVJ task replicates results on similar sentences with an Act Out test of comprehension (cf. Lust, Mangione, and Chien (1984) and Chien, Lust, Mangione, and Guo (in preparation)), and also one with an elicited imitation test of production (Guo, Lust, Chien, and Chiang (in preparation)). It also replicates results from an independent study by Wilcoxan (1992) (also see Smith (1994)).

3.2.1.2. *Lexical Pronominals and Disjoint Reference Interpretations.* The results concerning the two conditions involving the lexical *ta* and a disjoint reference pictorial context (that is, the FPDR (name$_i$ . . . ta$_j$) and the BPDR (ta$_i$ . . . name$_j$) conditions) are shown in figure (27). The major findings are summarized in (C) and (D).

(C)   As indicated by the final black bar in figure (27), the adults allowed *ta* to be disjoint in reference with the preceding name (i.e., name$_i$ . . . ta$_j$) only about 25% of the time, even though this was grammatically allowed. Young Chinese children allowed this type of DR reading more frequently than older children. In general, the children reacted to a DR picture like (23) and the corresponding sentence with a "yes" response about 50% of the time. The acceptance rate for this type of forward DR relationship decreased continuously from the level of 73.50% at age 3;0 to the level of 34.50% at age 7;6. With development, children's response patterns gradually approached the adult-like responses.

(D)   As indicated by the empty bars of the same figure, (27), both Chinese adults and children consistently allowed *ta* to be disjoint in reference with a name that followed it (i.e., ta$_i$ . . . name$_j$). The adults answered "yes" to a picture like (25) and the corresponding sentence about 86% of the time, and the children answered "yes" about 84.50% of the time. Children's acceptance of this type of backward DR relationship varied little with development, ranging between 83.63% and 89%. Developmental change thus occurs only with the DR condition with a forward pronoun.

3.2.1.3. *The Development of Pragmatics Concerning Lexical Pronominals.* The failure of the Chinese-speaking adults and older children to accept a DR interpretation for forward lexical pronominals in Chinese resembled the results observed in English-speaking adults (see the figure in (39)). This result raises the question of why older children and adults rejected this

disjoint reference reading for forward pronouns so strongly if it is not ungrammatical in Chinese or in English. No structural constraints, in either Chinese or English, would rule out a disjoint reference reading for these forward pronominals which are grammatically free to be interpreted as either CR or DR. As suggested above for the English results, this effect must involve some principle or strategy by which an adult prefers to seek coreference with a preceding linguistic antecedent, if there is one, even when external context provides a possible grammatically disjoint reference interpretation. In other words, they prefer an anaphoric to a deictic interpretation for a pronoun in cases like these. Since this effect involves the relation between a linguistic form and referential context and does not involve pronoun 'meaning' per se, we must consider it a pragmatic principle or strategy. This language-specific pragmatic principle or strategy must be learned. (For discussion of other possibly related pragmatic strategies, see Reinhart and Reuland (1986).)

3.2.2. *Experimental Conditions Involving Chinese Null Pronominals*

3.2.2.1. *Null Pronominals and Coreference Interpretations.* The results concerning the two conditions involving a null pronominal and a pictorial context, that is the FNCR (name$_i$ . . . $\emptyset_i$) and the BNCR ($\emptyset_i$ . . . name$_i$) conditions, are illustrated in the figure given in (32). The major findings are summarized in (E) and (F).

  (E) As can be seen from the black bars of the figure in (32), the adults allowed the null pronominal to be coreferential with the name that preceded it (i.e., forward pronominal: name$_i$ . . . $\emptyset_i$) about 98.50% of the time. Similar to the adults, children in all age groups consistently allowed this type of forward anaphora. They reacted to a picture like (28) and the corresponding sentence with a "yes" response about 93.50% of the time.
  (F) The empty bars of the same figure (32) illustrate the results of the backward null pronominal cases (i.e., $\emptyset_i$ . . . name$_i$). As indicated, the adults allowed a null pronominal to be coreferential with the name that followed it about 98.50% of the time. Children in all age groups also consistently allowed this type of backward anaphora. When presented with a picture like (30) and the corresponding sentence, they answered "yes" about 92.25% of the time.

Thus, in contrast to the results of the lexical pronominal sentences, the results for the null pronominals indicated that there was very little devel-

opmental change with regard to their coreferential interpretation and no precedence effects for either children or adults.

3.2.2.2. *Null Pronominals and Disjoint Reference Interpretations.* Figure (33) illustrates the results of the two conditions involving a null pronominal and a disjoint reference pictorial context, that is the FNDR (name$_i$ ... $\emptyset_j$) condition and the BNDR ($\emptyset_i$ ... name$_j$) condition. The major findings are summarized in (G) and (H):

(G) As can be seen from figure (33) (black bars), the adults never permitted the null pronominal to be disjoint in reference with the name that precedes it (name$_i$ ... $\emptyset_j$). In general, the children reacted to pictures like (29) and the corresponding sentence with a "yes" response about 35.50% of the time; young children accepted a forward disjoint reference relationship between a name and a null pronominal more frequently than older children.

(H) The empty bars of the same figure, (33), illustrate the results of the backward null DR condition (BNDR: $\emptyset_i$ ... name$_j$). The adults very rarely (18.75%) allowed a backward null pronominal to be disjoint in reference with the name that followed it. Unlike adults, children in all age groups often allowed this type of backward DR relation. When presented with a picture like (31) and the corresponding sentence; the children answered "yes" about 74% of the time.

The results (G) and (H) indicate that, for null pronominals, disjoint reference was completely rejected by the adults for the forward cases and rarely accepted by the adults for the backward cases. Unlike adults, most children in all age groups which we tested accepted disjoint reference for backward null pronominal sentences. In contrast, children developed a rejection of the disjoint reference interpretation for the forward null pronominal between the ages of 3 and 7;6. This is seen in a sharp decrease (of their "yes" responses) over these ages for the forward null pronominal in Figure (33) with a DR picture. The acquisition of the restriction against disjoint reference for backward null pronominals shows a distinct pattern. It does not occur until adulthood. The adult group is in sharp contrast to all the child age groups which we studied, and these age groups show no indication of this development.

3.2.2.3. *Developmental Convergence.* The rather sharp developmental resistance to a disjoint reference interpretation for a backward null pronominal

(figure (33)) resembled the sharp development of resistance to a corefer-
ence interpretation for a backward lexical *ta* pronominal (figure (26)). (Of
course, the 'sharpness' may be artefactual; as we may have seen if our
age range had extended beyond 6;0–8;0. Our point here is that both of these
changes must be discretely *past* the early language acquisition period of
2 to 6 or 8 years. They do not appear continuous with this early develop-
ment.)

3.2.3. *Summary of Chinese Null and Lexical Pronominal Coreference Results*

The results in (E) and (F) show that most Chinese children (3;0 to 7;6)
allowed a null pronominal to be coreferential with a name which followed
it (backward anaphora, $\emptyset_i \ldots$ name$_i$) as frequently as with a name which
preceded it (forward anaphora, name$_i \ldots \emptyset_i$). Therefore, they showed no
precedence effect for the null pronominal cases. Children's response patterns
concerning the two null pronominal coreference conditions (FNCR &
BNCR) resembled their response patterns concerning the two corresponding
lexical pronominal conditions (FPCR & BPCR). In other words, children
tested in this study consistently accepted a coreference interpretation for
a pronominal and a name antecedent, no matter whether the pronominal was
lexical or null, or whether the linearity relationship between the pronom-
inal and the antecedent was forward or backward.

Chinese adults accepted both backward and forward null pronominal
coreference interpretations just as the children did. However, this response
pattern was different from their response pattern regarding the two corre-
sponding lexical pronominal conditions. For adults, a forward coreferential
relationship between a lexical pronominal and a name was accepted, but
a backward one was rejected. As far as coreference interpretations are
concerned, null and lexical pronominals were treated similarly by the
children and differently by the adults.

3.2.4. *General Summary of the Chinese Results*

3.2.4.1. *The Effect of Linear Precedence*. Considering either the null
pronominal or the lexical pronominal, the results of the Chinese experi-
ment suggested that no forward precedence effects can be observed in the
early stages of Chinese acquisition. Children accepted coreference inter-
pretations for both the forward and the backward pronominal sentences,
no matter whether the pronominals were lexical or null.

A precedence effect was observed in the adults for lexical pronominals but not for null pronominals. Adults accepted the coreference interpretations for the forward lexical pronominal sentences but not for the backward lexical pronominal sentences. Differently from children, Chinese-speaking adults accepted, and in fact insisted on, coreference interpretations for both the forward and the backward null pronominal sentences, rejecting disjoint reference for either of these. There was a gradual developmental decrease in the acceptance of disjoint reference (i.e., deictic, nonanaphoric) interpretations of forward pronominals from the youngest children to the adults. This decrement characterized both lexical and null pronominals, although it was more pronounced and "thorough" for the null pronominal (i.e., it became 0% in the adult). This effect, which was found in English with lexical pronominals, generalized in Chinese over both the null and the lexical pronominals.

3.2.4.2. *A Comparison of the Null Pronominal and the Lexical Pronominal.* The results of this Chinese experiment suggested that a distinction between null and lexical pronominals mainly characterized the grammar of the Chinese adults but not that of the Chinese children. The Chinese adults distinguished lexical pronominals from null pronominals by showing a precedence effect for lexical pronominals but not for null pronominals. They rejected disjoint reference interpretations for backward null pronominals but not for backward lexical pronominals. These results confirmed Huang's (1982) analyses concerning Chinese adults' pronominal interpretations. For Chinese children, however, the null and the lexical pronominals are treated quite similarly with regard to both coreference and disjoint reference interpretations. No precedence effect appears in either.

4. CONCLUSIONS AND DISCUSSION

The results of this study have led us to several conclusions with regard to Chinese language acquisition and the nature of UG. They also lead us to a revision in the theory of Chinese-English variation in this area (section 4.2.).

First, Chinese children are distinct from either the Chinese adults or the English-speaking children. The Chinese child-adult difference suggests that the precedence effect in the Chinese adult language is not directly determined by UG. The linear precedence effect on lexical pronominals and the obligatory coreferential nature of null pronominals, demonstrated by the Chinese-speaking adults, are not part of the 'Initial State.' The Chinese-English child differences suggest early parametric differences across these

two languages. They critically disconfirm a universal forward precedence constraint on child language.

Second, the absence of the linear precedence effect in Chinese pronominal acquisition generalized across the lexical and the null forms. This result verifies a version of the null hypothesis in UG (cf. (20) above). These results suggest that, in the Initial State, Chinese children initially construct a grammar of pronominals which applies the same principles to both the lexical and the null form, regardless of differences in their phonetic content.

As discussed above, a general, universal notion of command, combined with the general principles of the Binding Theory, predicts no precedence effect in sentences such as we have tested. In accord with this notion, both forward and backward coreferential interpretations are possible for the sentences with lexical pronominals tested with the Chinese children. The results suggest that Chinese-acquiring children do access the general, perhaps universal, notions of structure-dependence, including command, and the Binding Theory made available by UG. The Chinese-speaking children interpreted Binding Theory with regard to the "locality of pronouns" in a way which would be compatible with adult English; no special, revised notion of hierarchical structure (such as cyclic c-command) was necessary. The corresponding language-specific notions which characterize the Chinese adults' pronominal interpretations are developed only over time. They, therefore, must reflect something other than UG.

There are, however, differences between Chinese and English children. Here the parameter of UG, which characterizes English as a right-branching (i.e., left C^0 head of CP) language and Chinese as a left-branching (i.e., right C^0 head of CP) language, and the theory of language acquisition which we have proposed, predicts that Chinese-speaking children should differ from English-speaking children by showing no forward directionality preference for pronominals. The results of the current study confirm this prediction and suggest that Chinese-speaking children do access the general notions of structure dependence which follow from the parameter-setting of the dominance/command structure of their language (cf. Lust (in preparation); Lust and Chien (1984)). These results, taken together, corroborate the proposal that there exists a preprogrammed and universal "structure-dependence" in first language acquisition (Lust, Eisele, and Mazuka (1992)). The structure-dependence is principled; yet, the application of the related principles is modulated by phrase structure parameter-setting (cf. Lust (in preparation) for further discussion).

4.1. *Speculation on the Explanation for Change*

What then accounts for the developmental change which leads to the adult grammar of Chinese pronominals?

4.1.1. *Pragmatic Account*

One might speculate that the significant difference between Chinese children's and Chinese adults' pronominal interpretations is merely a reflection of a change in pragmatics. This explanation is parallel to the one given by Eisele and Lust (to appear) for the English results, wherein English-speaking adults were also found to eschew disjoint reference interpretations for forward lexical pronominals much more frequently than English-speaking children (on this TVJ Task). As we have reasoned, such an effect on forward pronominal interpretation must be attributed to pragmatic learning; and such pragmatic learning must develop into adulthood. It is possible that the Chinese-speaking adults, like the English-speaking adults, are showing a similar pragmatic effect when they refuse disjoint reference interpretations for forward lexical pronominals which are grammatically free in these conditions.

An account which focuses on change in pragmatic competence alone, however, does not seem to provide a complete and coherent explanation for all of the Chinese data collected in this study. For example, a simple pragmatic account alone cannot explain why effects on the lexical pronominals and on null pronominals should converge developmentally (cf. section 3.2.2.3). That is, a simple pragmatic account does not explain why two developmental changes converge in Chinese: (1) change in ruling out coreferential interpretations for the backward lexical pronominal cases and (2) change in ruling out disjoint reference interpretations for the backward (as well as forward) null pronominals. Finally, a simple pragmatic account also cannot explain why the developmental patterns in figures (27) and (33) differ. The rejection of DR in forward lexical pronominals (figure (27)) does appear, in Chinese as in English, to represent a gradual transition from child-like into adult-like responses in keeping with pragmatic learning. However, in the backward cases (illustrated by the empty bars in figures (26) and (33)), both the developmental patterns representing change toward rejecting the coreference interpretations for backward lexical pronominals (26) and rejecting disjoint reference for backward null pronominals (33) are acute after group 4. In these cases (unlike the forward lexical *ta* pronominal), an apparently sharp change in obviation effects can be clearly detected between children and adults.

4.1.2. *Linguistic Account*

If the developmental changes of the pronominal interpretations observed in this study cannot be fully explained by the pragmatic account, then how can one interpret them? What are the mechanisms or the determining factors for these developmental changes? We suggest that the observed results provide support for a lexical-syntactic approach, in keeping with currently developing linguistic theory reading the nature of pronominals. The results also provide insights concerning the underlying structure of the Chinese pronominal system (e.g., Huang and Tang (1991); Larson and Lujan (1991); Tang (1989)). Under this proposal, we obviate a need for either precedence effects or a language-specific hierarchical concept of cyclic c-command in Chinese and propose a new explanation of Chinese-English variation in pronominal systems.

We suggest that the full set of diverse results in Chinese is linked to the learning of the language-specific lexical features of pronominals (e.g., *ta* in Chinese) and their syntactic role in NP structure. This learning is combined with a language-specific grammatical connection between the lexical and the null pronominal in underlying structure in accord with the null hypothesis in (20) above. We will argue that this connection explains the link between the change in null and lexical pronominals in Chinese adults. It also characterizes Chinese as a "pro-drop" language (Huang (1984)).

Many lexical effects are acquired precisely during the age range of 6 to 8 years (cf., Chien (1992); Chien and Wexler (1990); Cohen Sherman (1983); Cohen Sherman and Lust (1993); Lust, Mazuka, Martohardjono, and Yoon (1989); Padilla-Rivera (1990)). In fact, on the basis of observed acquisition data, it has been argued that by the 6;0–8;0 year period, lexical differentiation of a language's pronominal lexicon is completed, providing a lexicon which is finally categorized by the distinctive features of the Binding Theory, namely [+an –pron] or [–an +pron] (cf. Lust, Mazuka, Martohardjono, and Yoon (1989); Mazuka and Lust (1994)).

4.2. *A Proposal Concerning Chinese Pronominals*

4.2.1. *Background Assumptions*

The assumptions for our proposal are stated as follows. They are all consistent with a strong theory of UG.

Assumption 1. All pronominals correspond to NP's. In fact, all pronominals correspond to XP's = NP's. In other words, pronominals cannot be

simply treated as X^0 nominals. (For previous linguistic argumentation in this regard, see Hornstein and Lightfoot (1984) among others.) This assumption follows a principle of UG. In keeping with the X-bar theory in UG, it is assumed that XP = NP has the full XP structure, namely, it includes a Head and a Complement, as well as a possible Spec.

Assumption 2. A pronominal (XP = NP) receives both phi (ϕ) features (person, number, gender) and referential (r) features. These two sets of features are independently assigned to a pronominal (XP = NP); yet, jointly received by the pronominal (where XP = NP). Thus, [. . .]$_{NP}$ $_{(. . .)}$ $_\phi$ $_{(. . .)}$ $_r$. This assumption follows UG principles.

Assumption 3. Different languages may assign ϕ-features and r-features to pronominals by different mechanisms, interacting with the pronominal lexicon in a particular language. For example, in some languages, for certain pronominal forms, either the ϕ-features or the r-features (or both) may be null (empty). An example is the Chinese bare reflexive *ziji*, where both the ϕ-features and the r-features are null (Huang and Tang (1991)). This is in contrast to the English reflexive "himself," where the r-features (but not the ϕ-features) are null. Phi-features may differ across languages. For example, the Chinese *ta* carries features for number and person (i.e., third person, singular) but not for gender, as opposed to the English pronominal "he," which carries the features for number, person, and also gender.

Assumption 4. A null pronominal carries neither ϕ-features nor r-features inherently, although these may be grammatically derived. Consider those languages which allow null pronominals.[20] The Binding Theory applies here without interacting with lexical features. The assignment of ϕ-features is grammatically derived. The assignment of r-features may reflect pragmatic coindexing where the Binding Theory allows the null pronominal to be free.

Assumption 5. The basic principles of the Binding Theory hold in all languages. Under the constraints of the Binding Principles (A, B, and C), the Binding Theory assumes mechanisms for the inheritance of both the r-features and the ϕ-features. These mechanisms involve either binding (in the case of Principle A) or free co-indexing (in the case of Principle B or C, i.e., coreference, which is pragmatically determined). Binding Theory interacts with the language specific lexicon and the grammar of empty categories in the language.

4.2.2. *A Proposal with Regard to Chinese Pronominals*

4.2.2.1. *Underlying Structure of Pronominals.* We propose the underlying structures for the NP underlying Chinese pronominals in (40).

(40) a. $[\emptyset[\emptyset]]_{NP}$

   b. $[\emptyset[ziji]]_{NP}$

   c. $[ta[ziji]]_{NP}$ (and other variants, e.g., $[wo[ziji]]_{NP}$ or $[ni[ziji]]_{NP}$)

   d. $[ta[\emptyset]]_{NP}$

The proposed structure for *ziji* given in (40b) corresponds to the structure discussed in Tang (1989), which was annotated by Tang (1989) as "pro-ziji." Also, in keeping with Tang (1989: 97), we assume that *ta* in (40c) is "a prefix (or compound word) of the anaphoric reflexive, but not an independent pronominal." However, extending Tang's proposal, we propose that, in the underlying structure of the unique form *ta*, *ta* is "a prefix" on a null head (i.e., $[ta[\emptyset]]$ in (40d), where "$\emptyset$" denotes pro just as in (40a)).

More specifically, we propose that *ta* in both (40c) and (40d) reflects a Spec position on XP = NP.[21] Tang's (1989) proposal concerns the morphological status of *ta*; our proposal concerns the correspondence between the morphological status of *ta* and its underlying structural status involved in X-bar theory of NP's. According to our proposal, the head of the XP = NP may be either lexical or null, as in (40c) and (40d), respectively. This accords with Chinese as a 'pro-drop' language.

4.2.2.2. *Grammar of Pronominals.* The grammar for Chinese pronominals proposed in (40) resembles, in part, that proposed by Larson and Lujan (1991) for Spanish pronominals. We will first review those aspects of Larson and Lujan which correspond with our proposal, and then show where we differ. Larson and Lujan have attempted to explain attested interpretive differences between lexical pronominals and null pronominals in Spanish (lexical pronouns may be disjoint in reference where nulls may not) by considering differences in underlying structures representing these two kinds of pronominals and differences in the grammatical processes which they undergo. Larson and Lujan suggest that lexical pronominals in Spanish receive the structure in (41b), as opposed to the structure in (41a), for null pronominals. They further suggest that Spanish lexical pronominals undergo the grammatical process of Quantifier Raising (QR) at the level of Logical Form (LF), while null pronominals do not. Lexical pronominals in Spanish reflect focus in this way.

(41) a. $[Pro]_{NP}$ trabajo
       He   works

   b. $[\emptyset[él]_{NP}]_{QP}$ trabajo

For Larson and Lujan, lexical pronominals in Spanish are comparable to emphatically focused (e.g., stressed) pronominals in English (e.g., (42));

and, thus, often exhibit obviation effects.[22] On the other hand, they propose that null pronominals in Spanish are comparable to unstressed pronominals; they do not exhibit these same obviation effects.

(42)   When HE [+stress] arrived home, John left.

We will not consider Larson and Lujan's proposal in detail here. However, we argue that Chinese lexical pronominals, such as *ta*, behave as they have argued lexical pronominals in Spanish or stressed lexical pronominals in English do. We also assume Chomsky's (1976) approach in which stressed (or focused) nominals have quantificational force and are represented in terms of quantification involving raising at LF (e.g., (43)).

(43)   John   left
        John$_i$ [t$_i$ left]

        for x = John, x left

Like Larson and Lujan (1991) for Spanish, we propose that obviation effects in Chinese may result from focusing of pronominals in certain cases (e.g., QR in LF). We also attribute this focus to lexical effects, connected to *ta* as a lexical morpheme. In essence, we propose that lexical *ta* in Chinese involves obligatory [+focus], in contrast to "he" in English where [+/−focus] is optional. Like Larson and Lujan (1991: 30), we suggest that in Chinese "the apparent occupation of pro-positions by overt pronominals must always be merely apparent." This is because, in accord with (40), we propose that *ta* occurs in Spec, not Head, position of NP. Thus, it is not equivalent to a 'null pronoun'.

The details of our proposal, however, are different from those of Larson and Lujan's. Unlike Larson and Lujan, we assign the same underlying NP configuration for the null pronominals and the lexical pronominals (see (40) as opposed to (41)). Also, Larson and Lujan (1991) attempted to explain differences between null and overt pronominals in Spanish by the fact that Spanish INFL assigns φ-features, phonologically identifying a chain under a chain identification constraint. In their words, "chains must be uniquely identified phonologically; thus, any context 'strong enough' to permit pro will be 'too strong' to permit an overt pronominal (p. 30)." Since we may assume that Chinese INFL does not assign φ-features, we do not adopt this aspect of Larson and Lujan's explanation concerning differences between null and overt pronominals.[23]

4.2.2.3. *Grammar of Chinese Pronominals.* Our explanation for observed differences between lexical and null pronominals in the Chinese grammar is as follows: Lexical effects in Chinese are due to *ta* as the lexical Spec

of the XP, not due to *ta* as the lexical nominal Head of an NP. The Spec
of the XP = NP can either be lexically filled or not, regardless of whether
the head is. If Spec is lexically filled, then NP undergoes QR in Chinese;
if Spec is not lexically filled, then it does not. The same grammatical
processes (e.g. QR) apply in Chinese as well as in English. The differ-
ence across these languages lies only in the lexicons of the two languages,
and the language-specific constraints on whether the language allows Spec
and/or Head of NP to be phonetically null or not.[24]

We propose that in adult Chinese, the prefix *ta* in (40) provides ϕ-features
(number and person), in its function as the Spec of the XP = NP. It does
not directly assign or carry the r-features itself. The assignment of the r-
features arises from the XP (= NP) as in (44).

(44) $[ta_{\langle person,\ number\ =\ i \rangle}\ [\emptyset]]_{\langle person,\ number\ =\ i \rangle\ \langle r\ =\ j \rangle\ \langle i,\ j \rangle}$
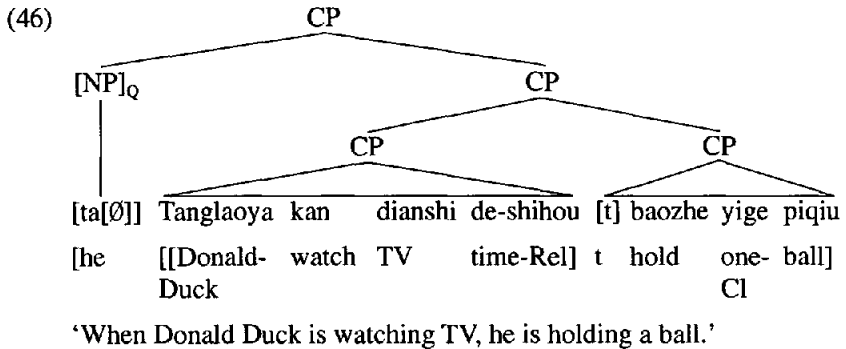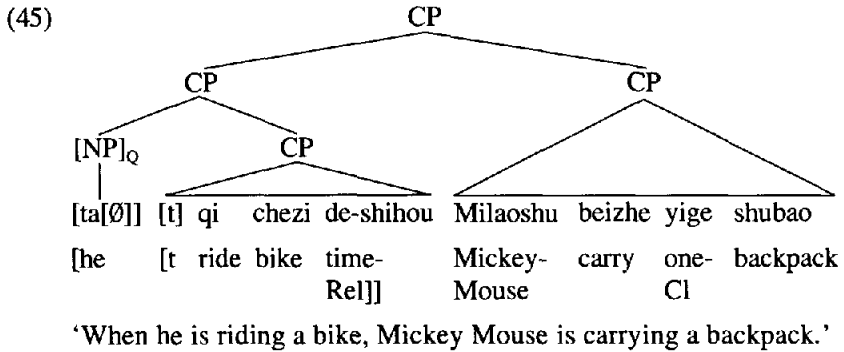
In agreement with Huang and Tang (1991), we suggest that the ϕ-features
take a certain priority over the r-features; they assist in determining the
assignment of r-features. In fact, by treating *ta* (which does assign certain
ϕ-features) as the specifier of the referential XP, this priority can be captured.
However, we argue that the $\emptyset$ Head in $[ta[\emptyset]]_{NP}$ as in the null pronominal,
$[\emptyset[\emptyset]]_{NP}$, is capable of inheriting both ϕ-features and r-features grammati-
cally as in the case of all null pronominals and/or empty categories. When
the lexical *ta* prefix appears as the Spec of the NP, the ϕ-features of this
lexical morpheme must interact with the grammatical assignment of features
to ensure that the XP = $NP_{\langle i,\ j \rangle}$ feature assignment coheres with the lexical
features of the specifier *ta*. Intuitively, the lexical specifier *ta* forces the
reference of the XP to accord with the ϕ-features provided by the *ta*
morpheme. One can represent this process of *ta* feature assignment to NP
as a process analogous to quantifier raising in LF.

4.2.2.4. *Configuration.* QR is sensitive to configuration. Here we also adapt
aspects of Larson and Lujan's (1991) proposal, but again, we differ in certain
critical details. Unlike Larson and Lujan, we derive QR by referring only
to a strict version of c-command. We derive directionality results which
differentiate forward from backward pronominals.

In left branching sentences with adverbial subordinate clauses (like those
tested in our experiment), the LF structure representing the QR of a
lexically specified null pronominal (i.e., $[ta[\emptyset]]$) in a backward pronom-
inal case) is illustrated in (45). The LF structure representing the QR of a
lexically specified null pronominal in a forward pronominal case is illus-
trated in (46).

The structures illustrated in (45) and (46) reflect Larson and Lujan's

assumption (and ours) that adverbial clauses are CP's and are adjoined at least as high as the CP.[25] In (45), the focused pronominal adjoins to the adverbial CP, while in (46), it adjoins to the matrix CP.[26]

(45)

```
                              CP
            ┌──────────────────┴──────────────────┐
           CP                                      CP
       ┌────┴────┐                       ┌─────────┴─────────┐
    [NP]_Q       CP
      │      ┌────┴────┐
   [ta[Ø]]  [t] qi  chezi de-shihou  Milaoshu  beizhe  yige  shubao
   [he      [t ride  bike  time-     Mickey-   carry   one-  backpack
                           Rel]]     Mouse             Cl
```

'When he is riding a bike, Mickey Mouse is carrying a backpack.'

(46)

```
                    CP
        ┌────────────┴────────────┐
     [NP]_Q                        CP
        │              ┌───────────┴───────────┐
     [ta[Ø]]          CP                        CP
        │         ┌────┴────┐              ┌─────┴─────┐
     [ta[Ø]]  Tanglaoya kan  dianshi de-shihou [t] baozhe yige piqiu
     [he      [[Donald-  watch  TV    time-Rel] t  hold   one- ball]
               Duck                                       Cl
```

'When Donald Duck is watching TV, he is holding a ball.'

In [ta[Ø]], as opposed to [Ø[Ø]], we propose that the lexical features involved in ta, acting as the Spec of the XP = NP, [ta[Ø]], trigger a raising of the NP in LF. As a result, the XP, which is equivalent to a focused element, has scope over the sentence. The contrast between [ta[Ø]] and [Ø[Ø]] would be analogous to the contrast between a quantified and a non-quantified NP in English (e.g., "all men" or "those particular men" versus "men"). We thus use the term QR here in a general sense to describe the raising we propose.

As can be seen from (45) (i.e., the backward pronominal case), QR results in a raised NP which c-commands (and thus has scope over) the left-branching adverbial subordinate clause. In the forward pronominal represented in (46), QR results in a raised NP which c-commands (and thus has scope over) the whole sentence, including the higher CP.

If the quantification in (45) applies, it will determine interpretation of the trace, such that the $\langle i, j \rangle$ indices of the pronominal NP ([ta[Ø]]) in the first clause are determined independently of the features of the grammatical

antecedent which follows in the main clause, and which is outside of the quantifier scope. This would force a deictic reading in keeping with the φ-features determined by *ta* in [*ta*[Ø]]. Thus, backward [*ta*[Ø]] in the structures tested in this study will have deictic readings. In this theory, this effect should not be attributed to the factor of linear precedence or to variation in type of c-command (e.g., cyclic c-command). Rather, it should be attributed to the standard assumptions of the structure of NP in UG, and to the effects of focus raising which the Chinese lexical pronominal form, [*ta*[Ø]]$_{NP}$, involves.[27]

On the other hand, in (46), the interpretation of the trace [t] of the [*ta*[Ø]] in the second clause has two forms of identification, and these two forms of identification converge. The [t] is in the scope of the quantifier, a domain which allows co-indexing with the preceding grammatical antecedent. Thus, inheritance of the φ- and the r-indices from the preceding name is available, and that from the raised quantifying NP is also available.[28] Since the assignment of the r-index is grammatically free, a disjoint reference interpretation, or deixis to pragmatic context, is also grammatical. However, we may assume, on pragmatic grounds, that the quantification in (46) would lead to disfavoring a non-coreferential interpretation.

It should be pointed out that in this part of our proposal, we diverge further from Larson and Lujan (1991) who propose that forward lexical pronominals in Spanish and forward stressed pronominals in English are disjoint in reference with the preceding name. Based on the results of our research, we find that this aspect of Larson and Lujan's proposal does not hold for Chinese.[29]

4.2.3. *Explanation of the Observed Acquisition Data*

How can the proposed model sketched above account for the developmental changes observed in Chinese pronominal acquisition? How can it explain cross-linguistic variation in Chinese and English adult grammars?

4.2.3.1. The Explanatory Adequacy of the Acquisition Theory. As mentioned earlier in this paper, the period of 6;0–8;0 and beyond has been considered as a period of lexical learning in many areas related to pronominal anaphora. In fact, we saw that it has been argued elsewhere that cross-linguistic research on acquisition related to the Binding Theory provides evidence that it appears to take this amount of time in many languages for the language-specific lexicon to be sorted out by children with regard to the Binding Theory.

The changes we have observed in the Chinese acquisition experiment appear to reflect another area of lexical learning, that of the lexical features of the Chinese *ta*. More specifically, if the lexical learning of the *ta* morpheme is completed by eight years of age, and at this time a distinctive feature set including [+ focus] is invested in the lexicon for *ta*, then this will cause a linked set of developmental effects such as those observed in the current Chinese experiment: (i) Since the *ta* prefix characterizes Spec of NP, where the Head of NP is null in Chinese, the lexical learning of features for *ta* forces a focus interpretation of the [ta[Ø]] forms. As we have suggested above, this focus raising leads to precedence effects.[30] But these precedence effects result from configuration (from (45) vs. (46)). The precedence effects for this lexical pronominal which appear in the adult, develop in the child by 6;0–8;0 and are ultimately triggered by lexical learning. (ii) The developmental changes we have observed in the [Ø[Ø]] forms (that is, children, like adults, stop accepting disjoint reference in the backward null conditions as an option to coreference and start treating the null pronominals as being necessarily coreferential) are also linked to the lexical changes in *ta*. We suggest that this is due to the fact that, after lexical learning, the children, for the first time, possess a contrast between [*ta*[Ø]] and [Ø[Ø]] – a contrast between a lexically specified Spec of XP(+) and a non-lexically specified Spec of XP(–). If the specification concerning *ta* has the effect of forcing deixis (and thus disjoint reference) on the backward *ta* sentences as it does in the adult grammar, then the absence of this *ta* specifier will become distinctly informative. It appears to have the effect of providing no motivation for (or licensing of) this independent r-index by deixis. The result is that the grammatically derived indexing takes over completely in the absence of Spec *ta*, for [Ø[Ø]].

First, the model allows us to explain why the apparent developmental changes in Chinese children's knowledge regarding *ta* closely converged with the developmental changes in their knowledge regarding Ø. In our system, *ta* and Ø are not independent; these two proforms are linked in terms of their underlying structures. In both cases, the XP Head is Ø. The connection between the underlying structures of these two proforms explains why, in first language acquisition, when interpretation changes developmentally with regard to the lexical *ta*, it also changes with regard to the null Ø.

Second, the proposed model allows us to explain why children in their initial stages of development (up to the transition period of 6 to 8 years) treated the lexical pronominal and the null pronominal sentences consistently. In the early stages of development, null pronominals are treated in accordance with the Binding Theory of Universal Grammar. In accordance

with the Binding Theory, sentences with pronominal null headed NP's (either [ta[Ø]] or [Ø[Ø]]) in clausal subject position are free with either forward or backward directionality. According to their unmarked sensitivity to locality (i.e., c-command in a local domain) and the pragmatic context, children allowed either a coreference or a disjoint reference interpretation of these pronominal sentences.

Third, the model allows us to explain why during the early stages of language acquisition (up to the transition period of 6 to 8 years when there is a shift to the adult model) either a coreferential or a non-coreferential (DR) interpretation is assigned to the backward null cases as well as to the forward null cases. These results reveal the grammatically based inheritance of indexing (both φ- and r-features) because the null pronominals are grammatically free in accord with the Binding Theory. The free pronominals are subject to inheritance of indexing from the sentence-internal antecedent as well as to deixis.

4.2.3.2. *Lexical learning of* ta.   The proposal that the Chinese child must learn that the quantificational features, [+ focus], characterize the Chinese lexical pronominal *ta* is generally consistent with a theory proposed independently, whereby children are hypothesized to need to learn the lexicon or morphology which characterizes language specific forms of pronouns and anaphors guided by the Binding Principles of UG. (See Lust, Mazuka, Martohardjono and Yoon (1989); Mazuka and Lust (1994); and Jakubowicz (1989) for a similar but non-identical proposal). The acquisition of these features over time (often taking at least 6 to 8 years) which is proposed here is also consistent with that theory.

Note, however, that this proposal does not imply that the Chinese child does not have the competence for Quantifier Raising at LF or that this must be learned. Independent evidence for both English and Chinese, in fact, has confirmed very early competence for QR, specifically when NP's Quantifier Raise in VP ellipsis structures allowing sloppy identity readings (see Foley, Nuñez del Prado, Barbier, and Lust (1992a, b, c, to appear) for English; and Guo, Foley, Chiang, Chien, and Lust (1995) for Chinese). Rather, our proposal is that it is the lexicalization of features [+ focus] of the pronominal morpheme, *ta*, which acts as a lexical trigger for QR, which must be learned. (See also Chien (1994) for independent evidence that the Chinese child (i) has early knowledge of quantifier scope which concerns configuration, not merely surface linearity; and (ii) that individual quantifier meanings may involve some language-specific learning.)

We will not pursue the question here of how children actually learn the lexical features for *ta*; but we assume that it must involve the use of both

positive and indirect negative evidence, as in the case of the Binding Theory
(cf. Kapur (1994); Lust, Mazuka, Martohardjono, and Yoon, 1989).[31]

4.2.4. *Correlations with Other Facts of Chinese Syntax*

Our proposal differentiating the lexical pronominal morpheme *ta* and
a null pronominal with regard to [+ focus] features (in the lexical *ta*) is
consistent with previous observations regarding the differential use of *ta*
and Ø in Chinese discourse (e.g., Chen (1984); Li and Thompson (1979);
Ross (1981)). We will not pursue details here but provide one relevant
observation (e.g., (47)) by Chen (1984: 7).

(47) a. Da Xiu he   Xiao Yun yiyang da
         Da Xiu and Xiao Yun same   big

     b. Ø yiang gao,
           same   tall

     c. zhishi Ø chuanzhuo butong,
           only   clothes   different

     d.*Ø chuan-zhe yi   tiao laoshi   de   yiku,
          wear-Dur   one Cl   old-fashioned   Nom   pant-suit

     e.*Ø chuan-zhe yi   tiao xinzuo   de   lianshangqun.
          wear-Dur   one Cl   newly-made   Nom   dress

     'Da Xiu and Xiao Yun are of the same build and same height.
     (They) differ only in the clothes (they) wear. (Da Xiu) has an
     old-fashioned pant-suit, while (Xiao Yun) has a newly-made
     dress.'

In this example, it can be seen that the null pronominal in (b) and (c)
picks up a plural reference, not distinguishing the two available antecedents.
If the speaker requires selection and distinction of referents among the
available set, the null is unacceptable as in (d) and (e). Here the lexical
pronominal *ta* would be required; presumably because of its [+ focus]
features which function in selecting a distinct referent and contrasting this
referent within the set.

In addition, if the proposal described in sections 4.2.2 and 4.2.3 is correct,
it accords with several independent facts of Chinese syntax. First, the
Chinese pronominal *ta*,[32] although specified for person and number, differs
from the English third-person pronominal in that it does not inflect for case.
This can be seen from the following examples ((48)–(50)) given by Tang
(1989).

(48)   Tang (1989: 111, fn. 13, iib)
        Zhangsan$_i$ renwei [Lisi$_j$ taoyan ta$_{i/*j}$].
        Zhangsan think   [Lisi dislike him]

        'Zhangsan thought that Lisi disliked him.'

(49)   Tang (1989: 111)
        Zhangsan$_i$ gaosu Lisi$_j$ [Wangwu$_k$ dui ta$_{i/j/*k}$ mei
        Zhangsan tell   Lisi [Wangwu to   him no

        xinxin].
        confidence]

        'Zhangsan told Lisi that Wangwu had no confidence in him.'

(50)   Tang (1989: 105, 42a)
        [wo$_i$ na [[ta$_j$ de] qian] $\emptyset_k$] $\emptyset_i$ dui ziji$_{i/*j/*k/*l}$ meiyou
        I   take [[his]   money] $\emptyset$] $\emptyset$ to   self   not-have

        haochu.
        advantage

        'That I took his money did me no good.'

If *ta* is not in a structural position to receive case (e.g., if it occupies the Spec position of an XP rather than the nominal Head position ($X^0 = N$ of an NP)), then these facts (illustrated in (48) to (50)) cohere.

    Second, if our proposal is correct, then, a sentence like (48) should be analyzed as having the underlying structure in (51).

(51)   Zhangsan$_i$ renwei [Lisi$_j$ taoyan [ta [$\emptyset$]]].
        Zhangsan think   [Lisi dislike [him [$\emptyset$]]]

        'Zhangsan thought that Lisi disliked him.'

In this case, sentences such as (48), as analyzed in (51), actually have a null object. Null objects fall under Huang's (1984) Generalized Control Rule (GCR).

    Third, if our proposal is correct and Tang's (1989) theory of *ziji* is correct (i.e., the underlying structure for *ziji* is [pro [*ziji*]]), then this will explain why long distance domains overlap in Chinese as they do in sentences such as (52) and (53). This is because in (52) and (53), the overlap is between [$\emptyset$[*ziji*]] and [*ta* [$\emptyset$]]. It is the null in both cases which is subject to the "feature copying rule" of co-indexing (e.g., Tang (1989)). In accordance with the Binding Theory for pronominals, the pronominals in both cases are free (and thus subject to pragmatic co-indexing) in long distance domains.

(52)   Huang (1982)
        Zhangsan$_i$ kanjian-le [ta$_j$/ziji$_i$-de shu].
        Zhangsan see-Asp [his/self's book]

        'Zhangsan saw his/his own book.'
        [Both *ta* and *ziji* = Zhangsan]

(53)   Huang (1982)
        Zhangsan$_i$ shuo [ziji$_i$/ta$_{i/j}$ hiu lai].
        Zhangsan say [self/he will come]

        'Zhangsan says that he will come.'

Fourth, the commonality we have proposed between Chinese *ta* and Spanish lexical pronouns accords with the fact that, like Spanish (cf. Montalbetti's (1984) 'Overt Pronoun Constraint'), in certain Chinese dialects, *ta* is restricted from certain quantificational environments (see Aoun (1985); Higginbotham (1980), and Li (1985) for example). According to Aoun (1985), in these environments (e.g., (54)), *ta* cannot be bound.

(54)   (= Aoun: 18a)
        Meiren shuo ta yao lai.
        nobody say he want come

        'Nobody said he would come.'

In the approach we have developed in this paper, the explanation for these facts may lie in the syntactic interaction of two forms of QR, the one involving the overt quantifier and the one triggered by the [+ focus] features of [*ta*[Ø]]. We leave this hypothesis to future research.

Finally, our analysis coheres, in general, with Chinese as a null pronominal or a "pro-drop" language; a property of grammar which appears to be known by children at a very young age (e.g., Nuñez del Prado, Foley, Proman, and Lust (1994)). In this, Chinese shares more typological similarity with other left-branching languages such as Korean, Japanese, Tamil, or Sinhalese than has previously been acknowledged. In typological studies, Chinese appears to be distinct from other languages in its more productive use of the lexical pronominal forms. (In Japanese, for example, the third person pronoun *kare* is highly marked.) Our results suggest that this apparent typological difference does not involve the null pronominal option. Whatever typological difference exists between Chinese and other left-branching languages (e.g., Japanese) must be captured elsewhere. For example, it may be captured in terms of differences in the Spec of NP systems of these languages, or, more precisely, in the lexicon which instantiates categories which may fulfill this function.

4.2.5. *Correlation With Other Facts of First Language Acquisition*

If this proposal is correct, then the observed changes in the development of the Chinese lexicon provide an interesting parallel to changes in lexicons of other languages and in other areas at about this time (cf. Cohen Sherman (1983); Cohen Sherman and Lust (1993); Padilla-Rivera (1990); Lust, Mazuka, Martohardjono and Yoon (1989)). It will also help to explain a cross-linguistic difference between Chinese and other languages in which acquisition relevant to the Binding Theory has been studied. Namely, although children in many languages studied have been found to make an error in certain experimental designs whereby they appear to co-index the pronominal to a local antecedent in sentences like the one given in (55), thus appearing to offend Principle B of the Binding Theory, Chinese children show a smaller amount of this error and appear to overcome this error earlier (cf. Chien and Wexler (1987)).

(55)   Kitty says that Sarah is pointing at her.

(56)   Xiaomaomao shuo   Xiaohua zhi-yi-zhi   ta.
         Kitty   say   Xiaohua point-one-point her

         'Kitty says that Xiaohua is pointing at her.'

(57)   Xiaomaomao shuo   Xiaohua zhi-yi-zhi   [ta[Ø]].
         Kitty   say   Xiaohua point-one-point her

         'Kitty says that Xiaohua is pointing at her.'

If our proposal is correct, then, the Chinese sentences (e.g., (56)) are not equivalent to the English sentence given in (55). They have an underlying structure corresponding to the one given in (57). Thus, these Chinese sentences have a null object; they are not directly susceptible to Binding Theory as it applies to lexical pronominals. If UG principles apply more directly to empty categories than to lexical ones (as hypothesized in Lust, Mazuka, Martohardjono, and Yoon (1989); and Mazuka and Lust (1994), then this early success by Chinese children will be explained. We leave these matters to future study.

4.3. *General Conclusions*

The results of the current Chinese experiment, especially when they are compared to the results of the corresponding previous English experiment, are consistent with a theory of the Initial State which includes basic principles and parameters of UG. In particular, the results suggest that Chinese children, in their early stages of pronominal acquisition, are guided

by the basic principles of Binding Theory, the basic principle of structure-dependence, as well as a universal structural notion of 'command' with regard to phrase structure (cf. Lust, Eisele, and Mazuka (1992)). The results are consistent with a continuous role of these components of UG over development and a uniform notion of local 'domain' with regard to the Binding Theory across languages. The results also have implications for several aspects of Chinese linguistics. It is not necessary to parameterize a notion of command in order to account for Chinese grammar or acquisition. It is not necessary to state distinct grammatical principles for null and lexical pronominals in Chinese.

The results of the current Chinese experiment suggest that linear precedence plays no critical role either in the early stages of Chinese pronominal acquisition or in Chinese adults' grammar of pronominals. This is in accordance with Huang's (1982) fundamental hypothesis which argues against the principle of linear precedence for Chinese lexical pronominal interpretations.

In addition, this research provides evidence that acquisition of pronominals in Chinese proceeds as a grammatical system relevant to the Binding Theory, including relations among null and lexical forms. Finally, Chinese *ta* should not be treated as equivalent to the English lexical pronominal "he/him." Similar to other left-branching (right C^0 head) languages, Chinese is a null pronominal language. As Larson and Lujan (1991: 27) propose for Spanish, "strictly speaking overt and null pronominals never occur in the same positions . . . they are in complementary distribution."

Our results suggest that one should not be deceived by apparent cross-linguistic differences in acquisition and ignore underlying similarities. Ironically, it is the apparent "differences" between Chinese and English acquisition and the "differences" between Chinese child grammar and Chinese adult grammar which confirm our conclusions in this paper. The UG principles appear to act as a "precondition" on experience, whereby the child must eventually construct the specific language grammar to which he or she is exposed. Chinese child language differs from the adult language; it is closer to Universal Grammar than to the specific grammar of the Chinese language.

NOTES

[1] By "pronominals" we refer to either lexical pronouns or null (zero) pronouns.

[2] Here and throughout we omit details of phrase structure not directly related to our argument, e.g., the articulation of IP. (See also further discussion related to (45) later.) Here also, (with Larson and Lujan (1991); see also Reinhart (1983)) we tentatively assume that adverbial subordinate clauses are CPs, adjoined as sentence adverbs to CP.

[3] A strict notion of "c-command" and a classical assumption that a finite S constitutes a "local" domain are adopted here.

[4] Geis (1970) has proposed a structure for English temporal adverbials which is closely related to the Chinese.

[5] We leave aside a more fundamental logical issue. It is not clear how learnability of such structural command differences would be possible at all.

[6] It is important to point out that Huang's (1982) cyclic c-command is not motivated purely to account for linear precedence regarding Chinese pronouns.

[7] Actually, for this paper, it will only be essential that English and Chinese do not differ in their 'command' notion. If 'c-command' were not precisely the correct notion of 'command' for English, this would not change our argument.

[8] One anonymous reviewer suggests that if the input data consist only of simple sentences (Baby Talk Register), then there may not be an inductive base available for any type of directionality. We have argued elsewhere against this assumption (e.g., Nuñez del Prado, Foley, Proman, and Lust (1994)). In addition, even if the assumption were well-motivated, it would provide no reason for Chinese and English acquisition results to differ as they do in this study. Even simple sentences will model precedence (e.g., (i)).

(i)   Tangtang, ni   yao-bu-yao   chi Ø?
          candy   you   want-no-want eat Ø

          'Do you want to eat candy?'

[9] For convenience, we refer to Left-Branching and Right-Branching; but Left-Branching = Right CP head; Right-Branching = Left CP head.

[10] The notion of c-command is assumed here. We use the term 'likely' because of ambiguities involved in the exact point of attachment of right-branching adverbial structures (cf. Haegeman (1984); Reinhart (1980); Lust (in preparation)).

[11] We also used an elicited imitation task to provide converging evidence, although we do not report these results here (cf. Guo, Lust, Chien, and Chiang (in preparation)). In previous research, other tests of comprehension have been used (e.g., Chien, Lust, Mangione, and Guo (in preparation)).

[12] In a related study (Chien, Lust, Mangione, and Guo (in preparation)) using both production and comprehension tasks, the *de-shihou* connective was found to be acquired earlier than other connectives such as *yiqian* 'before' and *yihou* 'after')." Also, this "when" connective allows comparison to experiments on English.

[13] This name may be co-indexed and is thus a possible antecedent in the case of free anaphora.

[14] Since the relevant structural properties of Taiwanese and Mandarin Chinese are basically the same (Li and Thompson (1981)), we did not exclude those subjects who could speak both Mandarin and Taiwanese.

[15] In addition to the analyses of group means, a set of individual subject analyses were also conducted. These focused on the number of subjects who accepted or rejected a particular type of coreference or disjoint reference pictorial context for a particular construction. We classified subjects into three categories according to the degree of their acceptance (or rejection) of the coreference relationship (or disjoint reference relationship) between a possible name antecedent and a proform across the four items for each experimental condition. The three categories were "strongly reject," "chance," and "strongly accept." Strongly reject means that the subject accepted only 0 or 1 out of 4 items indicating a particular relationship between the proform and the NP under consideration. "Strongly accept" means that the subject accepted 3 or 4 out of 4 items. The subjects who did not belong to the category of "strongly reject" or "strongly accept" were classified into the category of "chance." Due to length concerns, the results of the individual subject analyses will not be discussed in this paper. These within-subject data are consistent with the group data we report. For those readers who are interested in more detailed quantitative results of this Chinese study, contact Dr. Yu-Chin Chien, Department of Psychology, California State University San Bernardino, 5500 University Parkway, San Bernardino, California, 92407, USA.

[16] In the English study, children were also tested on right-branching sentences (with postposed subordinate clauses). We select English left-branching sentences here to compare to Chinese.

[17] In English, there were 36.80% "yes" and 63.20% "no" responses in overall data. Eisele ((1988), also see Eisele and Lust (to appear)) included a "True/False predicate condition" to guarantee comparable "yes/no" responses in her design and to assess the degree to which children were in fact responding to 'truth' in the task. Children generally rejected the "false predicate" sentences. Amount of rejection was: G1 (3;0–4;0): 93.63%, G2 (4;0–5;0): 90.31%, G4 (6;0–7;0): 96.88%, G5 (7;0–8;0): 96.25%.

[18] In order to make the results easier to understand, each figure illustrating a particular set of the results is given on the same page with the corresponding sentences and pictures in the Method section.

[19] Children did not simply answer "yes" without consulting the structure of the sentence. For example, as will be reported later, Chinese children allowed coreference interpretations for the forward null condition about 93.50% of the time, and they allowed disjoint reference interpretations only 35.50% of the time. In the very youngest group, the contrast between their acceptance rate for the BNCR cases and that of the FNDR cases was significant (91.38% vs. 58.63%). This shows that our results cannot simply be explained by a general 'overacceptance' by the Chinese child.

[20] It is still an open issue as to whether English, and perhaps all languages, do allow null pronominals in some contexts.

[21] It would also be possible to consider *ta* as in a Det position if a DP analysis were assumed.

[22] As has long been noted in the literature (e.g., Akmajian (1973)), stress interacts with lexical pronominals in English to influence coreference interpretations. Stress may encourage "obviation effects"; e.g., in sentences like (42), where "John" and "he" do not necessarily have the same reference, although it need not always do so.

[23] In fact, there are problems with this aspect of Larson and Lujan's (1991) proposal, even for Spanish.

[24] See Boser, Lust, Santelmann, and Whitman (1993) for another related example of a proposal that, in addition to null specifiers being licensed by an X^0 head, pronominal X^0 heads can be licensed by their specifiers. In general, headless relatives provide another example where Spec may be lexically realized, while a head is null. (See Flynn and Lust (1981) and Lee (1991) for evidence that the headless relative is available early in acquisition across languages.)

[25] This assumption is necessary in order to derive the classic Reinhart (1983) anaphora effects.

[26] See Larson and Lujan (1991) and Foley, Nuñez del Prado, Barbier, and Lust (to appear) for arguments regarding QR to the highest scope position in this case.

[27] As Huang (1982) notes, backward pronouns with co-reference are possible for the adults in cases like (ia) and (iia). With our theory, the issue of how these sentences can be differentiated from sentences like (ib) and (iib) in the adult grammar remains open.

    (i)   a.   [Buguan   [ta$_i$ de mama] xi-bu-xihuan], Zhangsan$_i$ dou dei   lai.
                    regardless his   mother like-not-like   Zhangsan all   must come

                    'Regardless of whether his$_i$ mother likes it or not, Zhangsan$_i$ has to come.'

        b.   *[Buguan   ta$_i$ xi-bu-xihuan], Zhangsan$_i$ dou dei   lai.
                    regardless he like-not-like   Zhangsan all must come

            'Regardless of whether he$_i$ likes it or not, Zhangsan$_i$ has to come.'

    (ii)   a.   [Ta$_i$ de mama   chui lazhu   de-shihou], Milaoshu$_i$ daizhe yiding
                  his   mother blow candle time-Rel   Mickey-Mouse wear   one-Cl

                  maozi.
                  hat

                  'While his$_i$ mother is blowing a candle, Mickey Mouse$_i$ is wearing a hat.'

        b.   *[Ta$_i$ chui lazhu   de-shihou], Milaoshu$_i$ daizhe yiding maozi.
                  he   blow candle time-Rel   Mickey-Mouse wear   one-Cl hat
                  'While he$_i$ is blowing a candle, Mickey Mouse$_i$ is wearing a hat.'

In our theory, this differentiation must reflect a difference in focus options in these cases, and a full theory of QR and its sensitivity to configuration. It may also reflect a distinction between pronouns with null heads and those with lexical heads. We must leave these issues to further research.

[28] It would be possible that the co-indexing between the name and the pronominal applies first. Then focus quantification "confirms" the indexing assigned by this co-indexing process. The φ-features of *ta* in these cases are in accord with the r-index of the preceding name as well as the r-index of deixis. Alternatively, the co-indexing between the pronominal and the preceding antecedent, and the process of quantification, could apply simultaneously. In either case these two processes will converge, allowing coreference with the preceding name.

[29] In addition, it may not hold in English. For example, contrary to Larson and Lujan (1991), we do not believe that obviation effects are necessary in English sentences with a forward-stressed pronominal like (i).

    (i)   When John arrived home, HE did the cleaning.

[30] We assume here that children know the grammar of this type of focus raising. See Foley, Nuñez del Prado, Barbier, and Lust (1992a, b, c, to appear) for further evidence of this in English.

[31] It has been hypothesized by an anonymous reviewer that there may be an alternative explanation for the empirical results we have reported in this paper if the Chinese child is interpreting backward pronominal *ta* (as shown in figure 26) not on the basis of anaphora (i.e., not on the basis of linguistic construal or coindexing between the following antecedent and lexical pronominal) but on the basis of deixis to the referent in the picture. The following antecedent then is 'accidentally' coreferent in the backward case. (Presumably this accidental coreference would also occur in the forward case.) If this deictic interpretation of backward pronominal *ta* were true, then QR of the lexical pronominal could hold

for the child as well as for the adult. This alternative hypothesis, however, would leave unexplained the contrast between the adult and the child shown in the figure given in (26). More significantly, it cannot explain the children's acceptance of coreference for backward null pronominals (cf. the figure in (28)), which closely parallels their acceptance of coreference with the lexical *ta*. Since the coreferential backward null pronominal cannot be derived by deixis, it would be necessary to postulate two separate mechanisms for coreference judgments in the null and lexical pronominal forms and at the same time account for their common pattern. Thus we reject this alternative hypothesis.

[32] In our theory, of course, *ta* is not itself a pronominal, but [ta[Ø]] is. *Ta* itself is a Spec in category type (or Det) (cf. Footnote 21). Further studies should now investigate other aspects of the Chinese *ta* (e.g., the Chinese object expletive *ta* (it), analyzed by Jo-wang Lin (1994) as located in [Spec, Agr P]) for their possible relation to our proposal here.

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