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## Preface

This volume is a special edition of Cornell Working Papers in Linguistics dedicated to Language Acquisition studies. The contributors to this volume are faculty and students currently or formerly affiliated with Cornell. This volume was edited in the Cornell Language Acquisition Laboratory (CLAL), whose general aim is to discover and explain the fundamental nature of language acquisition through the interdisciplinary convergence of studies in linguistic theory with empirically sound scientific methods of investigation. The acquisition of diverse languages such as Arabic, Chinese, Dutch, English, German, Hindi, Indonesian, Inuktitut, Japanese, Korean, Malayalam, Sinhalese, Spanish, Swedish, and Tulu is being studied in the CLAL, and cross-linguistic analyses are being pursued. It is our great pleasure to present in this volume selections from the current research being conducted. Several studies in this volume show how language acquisition studies feed back to a re-evaluation as well as generation of new theoretical analyses of linguistic structures.

The first three papers in this volume explore the phenomenon of VP Ellipsis in the first language acquisition of English. Foley, Núñez del Prado, Barbier and Lust investigate ‘sloppy’ and ‘strict readings’ through operator-variable binding in VP Ellipsis structures. Using an act-out task and a truth value judgment test, they present evidence that children have competence for the sloppy reading, that this reading is the dominant one and moreover that children generally reject any ungrammatical reading from the earliest stages of language acquisition. This paper provides an example of acquisition results provoking a new theoretical representation of VP Ellipsis structures. Guo, Foley, Chien, Chiang, and Lust present results of a study of the acquisition of VP ellipsis structures in Mandarin Chinese and compare them to the parallel study in English. Their findings support the theoretical analysis of VP Ellipsis of Foley et al. (1992 and this volume) and argue for its universality. They provide evidence for the claim that, in accord with the theory of UG, the relation between an operator and a variable is part of the Language Faculty, with children showing early knowledge of the ambiguity in sloppy identity structures and of operator variable binding. In a related study of children’s production, Postman, Foley, Pactovis, Rothenstein, Kaye, Lowe, and Lust, looking more precisely at the VP Ellipsis phenomenon, challenge some contemporary views on very young children’s knowledge of verbal inflection, and its relation to grammatical knowledge. An elicited production task including VP Ellipsis and expanded coordinate sentences indicated that non-adult-like use of inflection is associated with VP ellipsis sentences, but not their expanded (redundant) counterparts. Their findings reveal a much more complex and rich base of knowledge of grammatical principles on the

part of the child, rather than deficient and/or underspecified knowledge. Their finding of a powerful interaction between phrase structure and inflectional morphology suggests that current description and explanation of children's early use of inflection require greater effort and articulation for us to achieve a deeper and more complete understanding of child grammar.

The two papers in the second group deal with anaphora. In one of the first studies on Principle C in a language other than English, Somashekar et al. report results of new experimental research which tested children acquiring Hindi as their first language, on the factors of embedding structure versus surface linearity of pronominals in adverbial *jab* clauses to determine whether children were initially constrained by principles of structure dependence, particularly Principle C, in comprehension. In addition, a pragmatic lead was administered to half the subjects to test the degree to which this might override or replace structure dependence at early stages. The authors confirm that the children, continuously, from the youngest group, were 'structure dependent' in their judgments of coreference. The strongest effect of Principle C were seen in the youngest groups, with increasing effect of pragmatics on the oldest group. The evidence supports a universal structure dependence principle which constrains the child's hypotheses from the beginning ('initial state'), and suggests an interaction of grammar with pragmatic knowledge. In the following paper, Oshima and Lust deal with anaphora in two types of Japanese adverbial clauses. They propose different structures for the *to* construction and the *nagara* construction. Their results demonstrate that the young Japanese children show early knowledge of the structural distinctions between the *to* and *nagara* constructions and the consequences for anaphora which they involve and they are motivated by the acquisition results to develop a fuller analysis of the representation of these structures. In a test of comprehension, the Japanese children from 3 to 5 years of age made significantly more coreference judgments (between the name and the null subject) for the *nagara* sentences than for the *to* sentences. The authors argue that this would follow if the child treated the *nagara* sentences as involving obligatory coreference (control), but the *to* sentences as optional (free). In accord with this, the presence or absence of a 'pragmatic lead' factor significantly affected the pattern of responding to the *to* sentences but not the *nagara* sentences. This would also be predicted if the children knew that the *nagara* sentences were a control structure, and *to* were not. Both of these results suggest that the child did distinguish the *to* and *nagara* sentences on terms of their control properties, or lack of them, in accord with Oshima and Lust's analysis of these structures.

Gair, Flynn and Brown's paper is one of two papers in this volume that deal with Second Language Acquisition. The paper deals with the availability of UG to L2 learners, the effects of putative L1 interference and parameter resetting, by focusing on the acquisition of relative clauses in English by Japanese, Chinese and Spanish-speaking subjects. Through analyzing and attempting to explain the different conversions the subjects produced while imitating English relative clauses, the authors conclude that the different results of Japanese and Chinese speakers are due to interaction of principles e.g., 'government direction' already established in L1 with principles of L2. They argue that these results are consistent with the availability of UG in L2 acquisition, and with the nature of L2 acquisition as involving theory construction.

Yamakoshi reviews existent literature, e.g., Lakshmanan and Ozeki (1996) and Otsu (1994), and argues that young Japanese children by around two years and five months of age have knowledge of intra-sentential scrambling, including the understanding that scrambled sentences are better if an appropriate context is given.

Nieddu focuses on the development of the Italian compound past tense called *passato prossimo* of transitive verbs in young Italian children's speech. In contrast to previous studies arguing for maturational theories, Nieddu proposes that UG is mapped to a specific grammar in such a way which requires constrained experience and learning as well as 'en route' theory construction, after re-examining the data offered by Antinucci and Miller (1976), McKee and Emiliani (1992), and Volterra (1976).

The three papers in the next group study the acquisition of null categories. Núñez del Prado, Foley, Proman and Lust look at *pro*-drop in the CP domain. The authors investigate the kinds of subject reductions the children make in an elicited-imitation study of adjunct clauses (preposed and postposed) and complement clauses with English-speaking and Spanish-speaking children. They argue that their results show that children have a clear knowledge of the *pro*-drop or non-*pro*-drop status of their native language and that the children are not limited to 'degree zero' data in their early acquisition of language. Specifically, they argue that the children are sensitive to CP subordination. Continuing with the investigation on *pro*-drop, Austin, Blume, Parkinson, Núñez del Prado, and Lust on the basis of controlled, systematic analyses of natural speech from monolingual Spanish and English speaking children ranging in age from 1 year 2 months to 3 years 4 months, argue that children have an adult-like grammar with respect to *pro*-drop, (i. e. that they know the licensing and identification requirements of null subjects). The authors compare this

knowledge to that of null auxiliaries which arise in adult grammar in question-answer contexts. They argue that the “errors” the children commit are related to pragmatic factors governing null auxiliary distribution and not to syntactic factors. Therefore, this paper places the focus of attention of language acquisition research in the interaction between Pragmatics and Syntax.

In her research on null auxiliaries, Boser argues on the basis of child German data that early child grammar is not qualitatively different from adult, but rather that there is strong evidence that the children have to learn the role of context and discourse licensing as well as master the auxiliary system. The data show that there is no point at which children move from not having aux to having it. Aux is always present at the same time that null auxs are found in a child’s speech (Infl is not underspecified.) Boser reports specific interactions between pragmatic context and null auxiliary

Kapur and Brill’s paper “An Information-theoretic approach to parameter setting” describe an automated learning algorithm to set a V2 parameter, based on a statistical distributional analysis of the words in the neighborhood of the verb. They argue that children could use this algorithm to properly obtain the target values of the word order parameters (comp-head and spec-head) for their language. Using this method on caretaker speech from a variety of languages, they found that the positional entropy values of the word one to the left of the verb is higher than that of the word to the right for V2 languages irrespective of base word order (SVO or SOV), with the pattern reversing for the other languages. (The results persisted when the 6 most frequent words (all closed class) were ignored, as well as when approximations were substituted for the log functions to calculate entropy).

Santelmann provides another paper about a V2 language. Santelmann reports her discovery of the striking fact that wh-less questions occur in early Swedish. Santelmann demonstrates that wh-less questions cannot be due to a lack of CP in the child’s grammar, because they occur alongside a number of other structures that require the full CP structure such as non-subject topicalization and complex clauses with overt complementizers. Santelmann argues that wh-less questions are best analyzed by the presence of a null wh-operator in child Swedish, and that these wh-questions reflect the child’s need to integrate language specific syntactic, lexical and prosodic factors into the syntax of questions.

In the second paper dealing with L2 acquisition in this volume, Lachter deals with the different models of lexical representation proposed for bilingual speakers. She looks at responses to cognates and non-cognates in a word fragment completion task and a lexical decision task by English-Spanish bilingual subjects. This study investigates if there is a “bilingual equivalence effect” that could support the interdependence model of bilingual lexical representations. Her conclusion is that this model is supported and the intersection between two lexicons includes the morpho-phonological features shared by cognates.

Núñez del Prado’s paper is another example of language acquisition data leading to revisions in linguistic theory. Núñez del Prado is interested in the accusative clitic doubling produced by Puerto Rican Spanish-speaking children, even when this doubling is ungrammatical for the adult speakers of this dialect. This phenomenon leads her to extend the theoretical analyses of these structures and to propose that accusative clitics are strong determiners at the level of the verb, that they act as scopal markers and thus that they are parallel syntactically and semantically to definite articles. This allows the author to propose a unified account of extraction phenomena at nominal and verbal levels.

Parkinson’s paper, the only one in this volume to deal with the acquisition of phonology, uses the framework of Optimality Theory to look at some data from the acquisition of English phonology, as originally reported by Smith (1973). Prince and Smolensky (1993) assume the constrained ordering in order to derive the lexicon, whereas Tesar and Smolensky (1993) assume the lexicon in order to derive the constraint ordering. The main argument in Parkinson’s paper is that the dilemma of lexicon vs. constraint hierarchy can be better resolved if we assume that the constraints operate both in perception and production.

Somashekar, Yamakoshi, Blume, and Foley

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Operator-Variable Binding in the Initial State:  
An Argument from English VP Ellipsis

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## 1. Introduction

### 1.1. Operator-variable binding

In current theory of UG, operator-variable binding plays a critical role. Either overt operators (e.g., *wh*-forms as in (1)) or null operators (e.g., operators in parasitic gap constructions as in (2)) underlie a wide array of syntactic structures, including all A-bar dependencies. It is a critical relationship at the syntactic level of Logical Form.<sup>1</sup>

- (1) What did Mary find *t* ?
- (2) Which article did you read *t* [Op without remembering *t* ] ?

### 1.2. General hypothesis

Given UG as a model of the initial state, this theoretical status of operator-variable binding makes a strong prediction for first language acquisition.

- (3) If operator-variable binding does characterize UG, then operator-variable binding should continuously characterize grammatical competence in the child from the earliest periods of language acquisition.

This prediction assumes a Strong Continuity hypothesis regarding UG in first language acquisition (Whitman, Lee and Lust 1991; Boser, Lust, Santelmann and Whitman 1992).

### 1.3. Previous study of first language acquisition

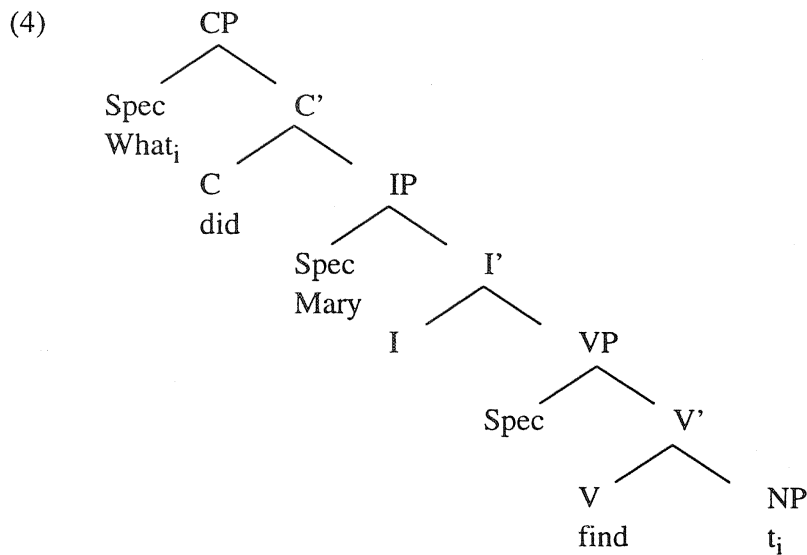
To date, only a few studies have directly addressed the hypothesis in (3) (e.g., Roeper and deVilliers 1993, Vainikka and Roeper 1995, Thornton 1990).

However, a wide set of studies addressing the acquisition of phrase structure (e.g., functional categories and their projections) would appear to challenge the hypothesis in (3). (See the collection of papers in Lust, Suñer and Whitman, eds., 1994.) An articulated phrase structure, including the C<sup>o</sup> head and

---

<sup>1</sup> In the recent Minimalist theory (Chomsky 1995), operator-variable binding plays a central role because it characterizes an interface level

its Spec position, would appear to be necessary for operator-variable representation. For example, the sentence in (1) is represented by (4).



In fact, Vainikka and Roeper (1995) have claimed that certain operator-variable structures do not emerge until CP structures emerge, suggesting that they are not available initially.

In addition, several studies which suggest that the “reference module” emerges first in acquisition would also appear to predict that the hypothesis in (3) will not be confirmed. (For example, see Nishigauchi and Roeper 1987). This is because variables are not assigned reference directly, as referential NPs are. They can only receive an index through operator binding.

Furthermore, many other studies which directly address acquisition of relative clauses, *wh*-questions, and quantifiers would appear to challenge the hypothesis in (3), given that long developmental delays, often until 6-8 years, are reported for such structures (Roeper and deVilliers 1993, Labelle 1990). Other studies admit operators in these structures but propose delays or constraints on their appearance (Guasti and Shlonsky 1995).

In our view, the above results leave open the status of the hypothesis in (3). All of the above literature concerns structures which reflect the intersection of a number of different UG modules—not only operator-variable binding, but also the *wh*-system, syntactic and semantic features of the *wh*-forms themselves, semantic features of quantifiers, predication, and A'-movement at S-structure (cf. Foley 1996). Therefore, there would be a number of possible interpretations of results from studies of these various structures.

We assume that no syntactic construction uniquely and directly reflects operator-variable binding; however, some constructions reflect it more directly than others do, if there are fewer confounding syntactic factors.

## 2. VP Ellipsis

### 2.1. English VP ellipsis structures

In this paper, in order to evaluate the hypothesis in (3), we report a set of comprehension results from an extensive investigation of VP ellipsis structures like (5).

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

#### Interpretations:

- a. O bites O's banana and B bites B's banana.....ii jj
- b. O bites O's banana and B bites O's banana .....ii ji
- c. O bites B's banana and B bites B's banana.....ij jj
- d. O bites E's banana and B bites E's banana .....ik jk

These structures clearly involve a 'bound variable' interpretation in one reading, e.g., (5a) above. The object in the second clause cannot be assigned reference directly in order to get the interpretation in (a). (This interpretation is often called a 'sloppy' reading.) While they involve variable binding, VP ellipsis structures like (5) do not involve overt *wh*-movement or overt quantification. Thus, they bypass the additional semantic and/or syntactic modules connected with those modules.

These structures also allow a contrast between the reading in (5a) and a type of reading which has been termed 'referential.' (5b) illustrates one such reading, where one particular referent is involved in both clauses (Oscar's banana). We will call this a 'strict' reading. In fact, (5) allows several 'strict' readings, as shown in (5b-d).

In addition, there are five other logically possible interpretations which are ruled out by the grammar, as shown in (5 e-i).

- (5) e. O bites O's banana and B bites E's banana.....ii jk
- f. O bites B's banana and B bites O's banana.....ij ji
- g. O bites B's banana and B bites E's banana.....ij jk
- h. O bites E's banana and B bites O's banana.....ik ji
- i. O bites E's banana and B bites B's banana.....ik jj

We assume that the competence for deriving the well-formed readings in (5a-d) must include the competence for ruling out the ill-formed readings in (5e-i).

## 2.2. Operator-variable binding in VP ellipsis

The precise linguistic representation of the ambiguity in VP ellipsis structures like (5) has long been a matter of investigation. (See Sag 1976, Williams 1977, Kitagawa 1991, and Fiengo and May 1994.) Fundamental issues concern the representation of the ambiguity these structures involve. In classic work (Williams 1977), two different forms of derivations were involved in the two types of readings ((5) a and b above), with two different rule orderings involved. In addition, in order to capture the ambiguity, the classic treatment was forced to assign pronoun indices to some pronouns at D-structure, but not all. In forthcoming work, we deal with these problems and propose a uniform representation for both sloppy and strict readings, in accord with current theory of UG. However, here we will simply sketch our assumed representation for the sloppy reading, instantiating clear bound variable knowledge.

### 2.2.1. Lambda operators

In classic treatments of the sloppy reading in (5a), a lambda operator representation has often been used, as shown in (6).

(6) Classic (lambda) derivation of the sloppy reading (Williams 1977)

a. Derived VP rule

Oscar [<sub>VP</sub>  $\lambda x$  (x **bites his banana**) ] and Bert does [<sub>VP</sub> [<sub>V</sub> e ] [<sub>NP</sub> [<sub>N</sub> e ]]]  
too

b. Variable rewriting rule

Oscar [<sub>VP</sub>  $\lambda x$  (x bites x's banana) ] and Bert does [<sub>VP</sub> [<sub>V</sub> e ] [<sub>NP</sub> [<sub>N</sub> e ]]]  
too

c. VP rule (=VP copy)

Oscar [<sub>VP</sub>  $\lambda x$  (x bites x's banana)] and Bert does [<sub>VP</sub>  $\lambda x$  (x **bites x's banana**)] too

We will not assume this lambda representation, but will assume a syntactic operator-variable representation for the following reasons.

First, the lambda operator representation for only the sloppy (5a) derivation leaves no way to capture the ambiguity between the sloppy and strict type readings with a single representation, without resorting to rule ordering and indexing of only some pronouns at D-structure.

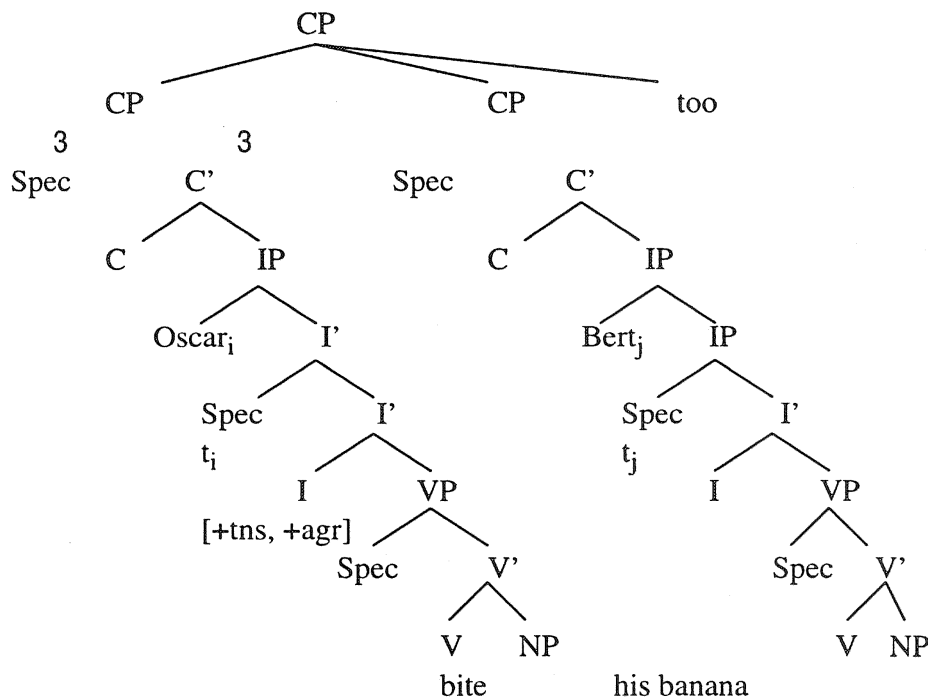
Second, the lambda representation renders the variable binding in structures like (5) non-homogeneous with other operator-variable binding structures, thus requiring representation significantly different from that in other operator constructions. In fact, the VP ellipsis structures do share properties with

other operator-variable binding structures (e.g., *wh*-constructions and antecedent-contained deletion structures, as we show in Foley, Núñez del Prado, Barbier and Lust, in prep.).<sup>2</sup>

**2.2.2. Alternative representation**

Alternatively, then, we will assume here the representation in (7). We assume that this representation, and the operator-variable binding that it reflects, holds at LF, or at the conceptual-intentional interface level, in keeping with the Minimalist theory (Chomsky 1995). In this representation, we bypass for the moment the exact nature of spell-out involved in the second clause. (See Postman et al., in prep., for discussion.)

(7) Sloppy reading



We assume the derivation in (8), which adopts Reinhart’s (1983) proposal in part. Reinhart recognizes that QR operations may involve NP raising (NPR), in which an NP is adjoined to an S, just as they may involve traditional quantifier raising (QR) in which a quantifier node is attached to S. (See also May 1985.)

<sup>2</sup> Fiengo and May (1994) point out further problems with a lambda representation. We do not assume their new level of indexing here, for reasons that we articulate in Foley et al., in prep.

- (8) Oscar bites his banana and Bert does [VP e [NP [e] e]] too

Local A' raising of the subject NP

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

[Oscar<sub>*i*</sub>] [ *t<sub>i</sub>* bites [*p<sub>i</sub>* banana ] ] ] and [Bert<sub>*j*</sub>] [ *t<sub>j</sub>* does [e[[*p<sub>j</sub>*]e]] ] ] too

With the derivation in (8), at LF, in each clause, the subject NP raises and adjoins to IP, locally binding the pronoun in its scope.

On the assumption that an 'operator' is an element in A-bar position which binds a variable, since the subject in each clause has raised to an A-bar position and binds the pronoun in its clause, this structure reflects operator-variable binding. We take this to be exactly parallel to quantifier structures like (9).

- (9) Every girl drinks her juice.

Note that this provides a simple explanation for examples like (10):

- (10) a. The teacher drinks her juice and every girl does too.  
 b. Every girl drinks her juice and the teacher does too.

A structure like (10) would require QR for the quantifier. Because we follow Reinhart in assuming similar movement in the other clause, the sentences in (10) will have the parallel structure needed for coordination.

### 3. An experimental study

In this section, we briefly sketch the results of an experimental study designed to test the hypothesis in (3) through an analysis of VP ellipsis structures.

### 3.1. Hypotheses

- (11) Hypothesis: If operator-variable binding does continuously characterize competence in the child, then we would predict evidence of this knowledge in children's interpretation of VP ellipsis structures. In particular:
- a. We predict that children would have competence for the sloppy reading, which requires variable binding, as we have shown above.
  - b. We predict that children will rule out the ungrammatical readings in (5e-i). This is because we assume that the competence to rule in the grammatical readings necessitates the competence to rule out the ungrammatical readings.
  - c. We predict that the competence for the sloppy reading will be available at the earliest points at which we can test and continuously thereafter.

If this hypothesis is confirmed, then two alternative hypotheses would be disconfirmed.

- (12) a. Alternative hypothesis 1: Children would begin with the competence for the strict reading and only subsequently develop the competence for the sloppy reading. That is, children would exhibit knowledge of the interpretations in (5b-d), but the competence for (5a) would not emerge until later.<sup>3</sup>
- b. Alternative hypothesis 2: Children would begin with no competence for any well-defined reading for these structures, given their complexity and ambiguity. That is, there would be no well-defined competence for these structures.

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<sup>3</sup> This prediction might follow if children's grammars were purely referential, and if the strict reading were a purely referential reading, as has been argued frequently in the literature. We argue elsewhere that the strict reading is not in fact a 'referential' reading (Foley et al., in prep.).

### 3.2. Design

We used converging methods to test children's comprehension of VP ellipsis structures. We combined an act-out (or toy moving) task with a truth value judgment test. Young children were tested for their comprehension of sentences like those shown in Table 1, A 1 and 2. These sentences allow either a sloppy or a strict type reading.

**Table 1. Act-out Task Sentences**

#### A. Pronoun Sentences

##### 1. Inalienable Possession

- +self (i) a. BB scratches his arm and E does too.
- b. FB rubs his foot and O does too.
- self (ii) a. BB moves his picture and E does too.
- b. B touches his picture and O does too.

##### 2. Alienable possession

- +self (i) a. BB licks his ice cream and S does too.
- b. O bites his banana and B does too.
- self (ii) a. S moves his penny and E does too.
- b. FB rolls his orange and B does too.

#### B. Forced Strict Sentences

##### 1. Bias: self-oriented

- a. BB licks S's ice cream and E does too.
- b. FB bites B's orange and O does too.

##### 2. No Bias: non-self-oriented

- a. E throws BB's penny and S does too.
- b. B touches FB's apple and O does too.

#### C. Definite and Indefinite Sentences

##### 1. Definite

- a. E licks the ice cream and S does too.
- b. B rolls the apple and FB does too.

## 2. Indefinite

- a. S smells a cookie and BB does too.
- b. B touches an apple and O does too.

## D. Base Control Sentences

### 1. Intransitive verb

- a. BB jumps up and down and E does too.
- b. B runs back and forth and E does too.

### 2. Transitive verb (No possession of object)

- a. E touches the ground and BB does too.
- b. O hits the floor and FB does too.

Note that in sentences like A1i, it might be possible that children would give a sloppy type reading for purely pragmatic reasons: for example, one is more likely to scratch one's own arm. For this reason, the design of our sentences included variation of the pragmatic content of the sentences. This was to determine whether or not the sloppy reading would appear only when there was a pragmatic motivation for it. Two pragmatic conditions were included: self vs. non-self-oriented and alienable vs. inalienable. A self-oriented predicate involved a typically self-directed action (e.g., scratching or eating), while a non-self-oriented predicate involved an action relatively more likely to be directed away from oneself (e.g., pushing). The alienable-inalienable factor applied to the object in the predicate: an inalienable object, on some level, cannot be divorced from the owner (e.g., an arm or a picture of oneself). (In these sentences, "pictures" referred to photographs of the dolls.) An alienable object is independent (e.g., an orange or a penny).

Note too that it might be possible that children would give only a sloppy-type reading for some artifactual reason linked to the experimental situation. For this reason, we designed the experimental context in such a way as to allow both types of readings equivalently. We describe this more fully in section 3.3.1 below. We also included a set of sentences which 'forced' a strict reading (see B on Table 1). This was to ensure that the child does have the obligatory strict interpretation when the reference of the possessor is specified.

We also included a set of four sentences (C in Table 1) that involved no pronouns, but rather involved either definite or indefinite determiners. Assumedly, the object NPs with these determiners can attain reference through a

mechanism other than variable binding.<sup>4</sup> These four sentences provide a critical control: these structures allow the readings that are ruled out in the pronoun structures. For example, given the right pragmatic context, sentence C 1 ii b, “Bert touches an apple and Oscar does too,” could mean “Bert touches Oscar’s apple and Oscar touches Fozzie Bear’s apple (or any other apple).” This contrasts with the pronoun sentences in (a), where no pragmatic context would license such a reading.

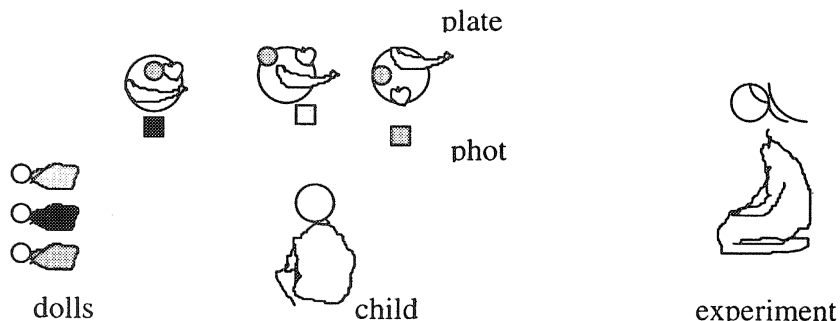
Finally, we included a set of sentences which tested children on simple VP ellipsis, with no pronouns or even possible possession (D in Table 1). If children were not capable of such VP ellipsis, they clearly could not be evaluated for their interpretation of the bound variables involved in ellipsis structures.

### 3.3. Experimental set-up and procedures

#### 3.3.1. Act-out task

The experimental set-up is sketched in Figure 1.

**Figure 1. Act-out Task. Experimental Set-up.**



In the act-out task, children were given three dolls. For each doll, there was a set of props belonging to it: A collection of three toys on a plate (e.g., an apple, an orange and a banana). The collection of toys was identical on each plate. Possession was established between the dolls and the plates by a photo of the doll placed in front of its plate. The set of plates was placed in front of the child, with the three dolls to one side. This design allowed the child to freely choose any of the dolls and any of the props in acting out the sentences: children could choose either NPs from within the sentence or an extra-sentential NP as antecedents for object pronouns.

<sup>4</sup> We leave aside here the issue that the definite and/or indefinite reference structures may also be represented in terms of some form of variable binding. Even if they may be represented by variable binding of some sort, they differ fundamentally from the pronoun structures.

The experimenter introduced the child to each doll, and then explained that each doll had a collection of toys belonging to it. The child was carefully shown each plate and photo, and each toy on each plate. After this introduction, the experimenter verified that the child understood possession through questions about the props (e.g., “Can you show me Big Bird’s apple?”)

The experiment included a pretraining battery and two randomized batteries of sentences. Each battery included a different set of dolls and props. There were 22 sentences in all, eleven in each battery.<sup>5</sup>

Once children had mastered the names of the dolls and toys and the possession between them, they were asked to demonstrate their interpretation of the set of pretraining sentences. Children were first pretrained on sentences without pronouns, to ensure that they were capable of behavior which would correspond to each type of reading and that they knew that both use of one object and use of two objects were options in the game to follow.

Thus the set-up and procedures together ensured that children could freely choose an interpretation and that experimenters could see what that choice was. For example, for the sentence in A 2 ii b, “Oscar bites his banana and Bert does too,” the child could either select the banana from Oscar’s plate for Oscar to eat, or select the banana from someone else’s plate. The child could retain that object for Bert to eat or could select another banana. The pretraining had assured the child that actions with either one object or two objects were acceptable.

### 3.3.2. Truth value judgment task

The act-out task allows the child to select an interpretation freely, and to select more than one throughout the set of 22 sentences. However, it does not guarantee that the child will show us more than one type of interpretation. For this reason, we added another test of comprehension to our procedures: a truth value judgment task. This task allows testing of both a sloppy and a strict interpretation individually, and allows us to evaluate children’s acceptance or rejection of each interpretation. This also provided a general test for converging evidence: the same hypotheses tested in our act-out task are tested here.

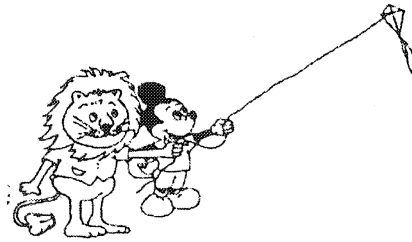
We tested a subset of the sentence types in Table 1 in this task using sentence-picture matches like those in Figure 2.

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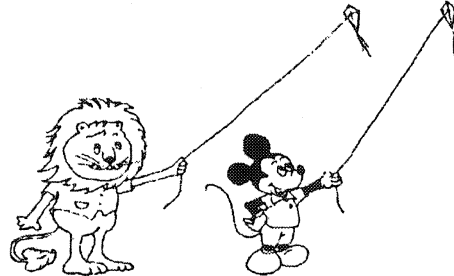
<sup>5</sup> In each experimental condition, there were two sentences, one a replication with different lexical items. The design included one sentence type not presented in Table 1 or discussed here.

**Figure 2. Truth Value Judgment Task. Pictures for “Lion flies his kite and Mickey does too.”**

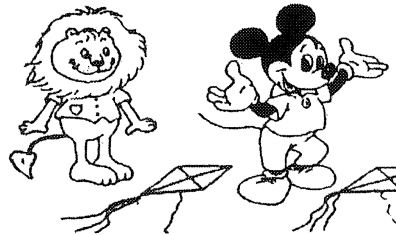
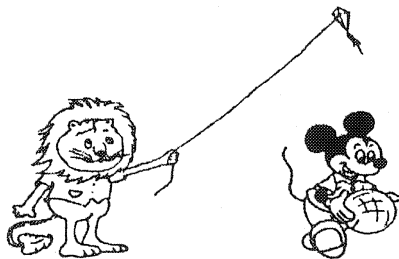
a. True Pictures  
(i) Strict



(ii) Sloppy



b. False Pictures



For each pronoun sentence, we tested the child on a picture with a strict interpretation, such as the one in (a i) in Figure 2, as well as one with a sloppy interpretation, such as the one in (a ii) in Figure 2. We also included two ‘false’ pictures in order to ensure that the child was judging the truth of the predicate in general.<sup>6</sup> (See Eisele 1988.) (This method relates to the methodology of Crain and McKee (1986) and was developed by Yu Chin Chien.)

### 3.4. Subjects

We tested 86 children in the act-out task and a subset of 35 in the truth value judgment task, as shown in Table 2.

<sup>6</sup>

We thank Yu Chin Chien and Laura Foley for providing the pictures.

**Table 2. Subject Information.****(a) Act-out Task.**

Group	Number of Subjects	Age Range	Mean Age
1	28	3,0-3,11	3,4
2	25	4,0-4,11	4,9
3	25	5,0-5,11	5,3
4	8	6,0-7,11	6,7
TOTALS	86	3,0-7,11	4,7

**(b) Truth Value Judgment Task.**

Group	Number of Subjects	Age Range	Mean Age
1	8	3,0-3,11	3,2
2	9	4,0-4,11	4,3
3	11	5,0-5,11	5,8
4	7	6,0-7,11	6,7
TOTALS	35	3,0-7,11	4,10

**4. Results**

In this paper, we provide a selection from the full set of results. The results we report here bear directly on the hypotheses as we formulate them in (11) above.

First, Table 3 gives the results from the base control structures on the act-out task (Table 1, sentences in D).

**Table 3. Act-out Task. Simple VP Ellipsis, Mean Percent Correct.**

Group	Intransitive	Transitive	Mean
1 (N=28)	68	66	67
2 (N=25)	94	92	93
3 (N=25)	92	90	91
4 (N=8)	94	88	91
Mean	85	83	84

The results show that most children have no problem with these structures, either transitive or intransitive. Even in group 1, children showed that they had the competence for VP ellipsis.

In (11c), we predicted that children would have access to the sloppy reading from the earliest points at which we can test. The results shown in Table 4 and Figure 3 are consistent with this prediction.

**Table 4. Act-out Task. Mean Percent of Responses, Sloppy vs. Strict Readings on Pronoun Sentences**

Group	% Sloppy	% Strict	% Correct	% Corlex*
1 (N=28)	36	13	49	61
2 (N=25)	65	10	75	83
3 (N=25)	68	9	76	85
4 (N=8)	55	27	83	94
Mean	56	12	68	77

\*Percent correct including responses with only lexical errors

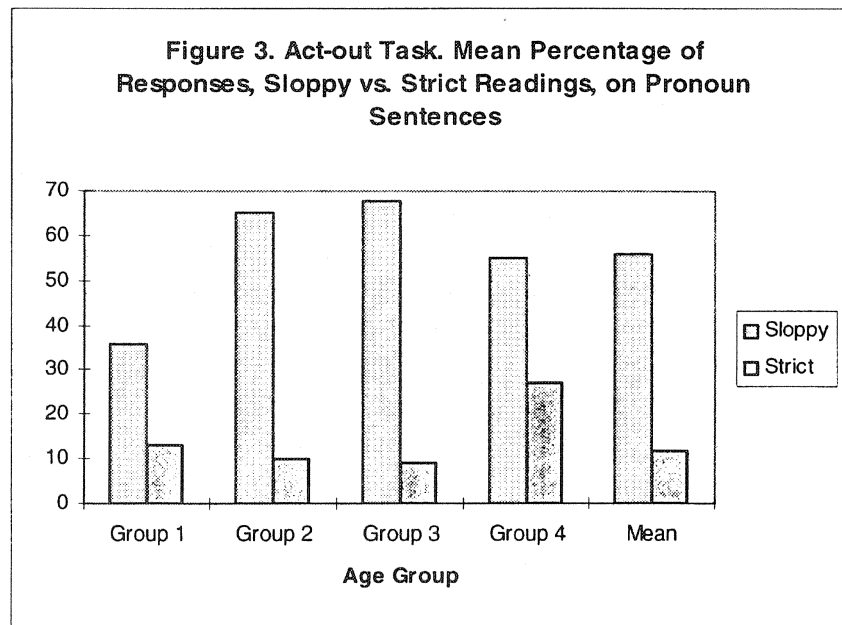


Table 4 shows the mean percent correct for sloppy and strict readings for pronoun sentences given by children in each age group. Figure 3 plots these results. There is no age at which sloppy readings do not appear, including the very youngest.<sup>7</sup>

<sup>7</sup> We tested several two-year-olds on these sentences, and we found that both readings are available to even these very young children.

Although there is a general depression in overall performance in Group 1, a substantial proportion of this is accounted for by lexical errors. This is shown by the last column in Table 4. In the responses reported in this column, the child completely and correctly analyzed the structure of the sentence.

These results are not consistent with the alternative hypothesis that children are limited to a strict interpretation. In fact, as shown in Figure 3, while the strict reading is evident at every age group, the sloppy reading is always the preferred interpretation.

Within-subject analyses for each group, shown in Table 5, confirm these results.

**Table 5. Act-out Task. Percent of Subjects Giving Sloppy Only, Strict Only or Both Readings Among Their Correct Responses to Pronoun Sentences**

Group	% Sloppy Only	% Strict Only	% With Both
1 (N=28)	50	18	25
2 (N=25)	60	4	36
3 (N=25)	76	0	24
4 (N=8)	38	0	62
Total (N=86)	59	7	31

In each age group, sloppy readings are not only evident but dominant. In fact, in the two older age groups, no children give only strict readings, whereas a small percentage do in the younger age groups. Table 5 also shows that at each age group, there are children who give both readings.

The truth value judgment task results generally converged with those of the act-out task, as suggested in Table 6.

**Table 6. Truth Value Judgment Task. Percent of Subjects who Perform Above Chance\* on Sloppy Only, Strict Only or Both**

Group	% Sloppy Only	% Strict Only	% With Both
1 (N=8)	25	0	75
2 (N=9)	44	0	56
3 (N=11)	27	0	73
4 (N=7)	0	0	100
Total (N=35)	26	0	74

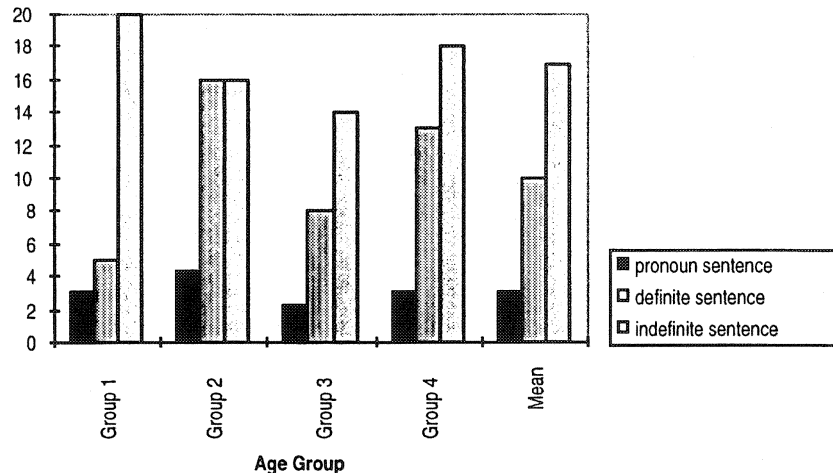
\*say 'yes' to more than 4/8 of true pictures on the condition

Here, too, there is no age group in which sloppy readings are not accepted as possible interpretations. This is true even in the youngest age group. Here, again, sloppy readings appear as the dominant reading. As Table 6 suggests, there is a percentage of children who only systematically accept sloppy readings, while there are no children who only accept strict readings.

We predicted in (11b) that evidence for true competence for variable binding in VP ellipsis structures would require evidence for knowledge that the "ungrammatical" readings in (5e-i) are ruled out. Our design allowed us to test for this knowledge by contrasting pronoun sentences (e.g., object 'his banana') with definite determiner sentences (e.g., 'the banana') and indefinite determiner sentences (e.g., 'a banana'). Our set-up and procedure ensured that children had the same free choice of interpretation for all sentence types.

The results shown in Figure 4 reveal that children in Group 1 and throughout all age groups differentiated the pronoun sentences and the definite or indefinite sentences.

Figure 4. Act-out Task. Percentage of Two-object Non-sloppy Readings in Pronoun Sentences (Ungrammatical) vs. Definite and Indefinite Article Sentences (Grammatical)



Children productively generated the readings in (5e-i) for sentences that grammatically allow them—definite and especially indefinite sentences. In contrast, Figure 4 shows the degree to which children were constrained in such interpretations for pronoun sentences.

Finally, further analyses confirmed that neither of the pragmatic factors were the explanation for the high productivity for the sloppy reading in children's interpretations, or for its dominance over the strict reading. In fact, although children chose more strict readings for some combinations of pragmatic factors than for others, the sloppy reading was always chosen more frequently than the strict.

## 5. Conclusions

In general, these results confirm our initial hypotheses and suggest that operator-variable binding is available in the initial state. We may be able to test children who are younger yet; so far, we have found no age at which we have not found support for the claim that children have access to operator-variable binding.

These results support the theory of UG as a model of the initial state where operator-variable binding at LF characterizes UG. Results correlate with those of a closely matching study of Chinese (Guo, Foley, Chien, Chiang and Lust, 1996), suggesting that the competence for variable binding at LF is part of a universal competence. The results will have implications for other research on structures which involve operator-variable binding that interacts with the *Wh*-system (e.g., questions and relative clauses).

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# A Cross-linguistic Study of Chinese and English Speaking Children's First Language Acquisition of VP Ellipsis Structures

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## 1. Introduction

In our earlier work, we investigated the hypothesis that operator-variable binding, an essential component of VP ellipsis representations at the level of Logical Form, characterizes the initial state in accord with the theory of Universal Grammar (Foley, Núñez del Prado, Barbier, & Lust, 1992). Furthermore, we tested the universal nature of this knowledge in Chinese language acquisition. We investigated a syntactic structure in Chinese where knowledge of certain language-specific lexical and syntactic factors can be dissociated from knowledge of abstract operator-variable relations. We reported basic results for our cross-linguistic study on VP ellipsis structures in our paper (Guo, Foley, Chien, Chiang, & Lust, 1996). On the basis of these results, we argued that the binding relation between an operator and a variable is part of the innate language faculty, i.e. Universal Grammar (UG) (Chomsky, 1986; May, 1985), and characterizes both Chinese and English first language acquisition (Foley et al, 1992).

In this paper, we first briefly review our earlier studies, and then we represent additional results from our cross-linguistic studies of VP ellipsis.<sup>1</sup> These results indicate a difference between Chinese and English children's language acquisition of VP ellipsis structures. This difference does not involve UG, but the interface between LF in UG and language-specific interaction between grammar and pragmatics. Even though Chinese acquisition data confirmed the universal nature of operator-variable binding in the initial state, at the same time these data suggested a difference between Chinese and English children in interpreting ambiguous VP ellipsis structures. In this paper, we consider the possible interpretation for this language specific difference in preference for resolving this ambiguity and we argue that it reflects Chinese as a topic language (Huang, 1984). Chinese children show earlier and stronger consultation of pragmatics in their interpretation of VP ellipsis sentences because of this language-specific fact.

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<sup>1</sup> Please refer to Guo et al (1996), *Operator-variable binding in the initial state: A cross-linguistic study of VP ellipsis structures in Chinese and English*, published in "Cahiers de Linguistique Asie Orientale", Vol 1, 1996 for further discussion of VP ellipsis structures.

## 2. Background

(1a) *English*

Oscar bites his banana and Bert does too.

(1b) *Chinese*

Oscar *yao-yi-xia ta-de xiang-jiao*, Bert *ye yao-yi-xia*.

Oscar bite-one-time his banana, Bert also bite-one-time.

‘Oscar bites his banana and Bert does too.’

(2) Interpretations:

a. *O bites O's banana and B bites B's banana.*      *ii jj*

b. *O bites O's banana and B bites O's banana.*      *ii ji*

c. *O bites B's banana and B bites B's banana.*      *ij jj*

d. *O bites E's banana and B bites E's banana.*      *ik jk*

\*e. *O bites O's banana and B bites E's banana.*      *ii jk*

\*f. *O bites B's banana and B bites O's banana.*      *ij ji*

\*g. *O bites B's banana and B bites E's banana.*      *ij jk*

\*h. *O bites E's banana and B bites O's banana.*      *ik ji*

\*i. *O bites E's banana and B bites B's banana.*      *ik jj*

The sentence in (1a) is an example of English VP ellipsis structures with possessive pronouns and (1b) is the corresponding Chinese VP ellipsis sentence. These sentences are equally ambiguous. The possible and impossible interpretations for both English and Chinese sentences are shown in (2). For example, both (1a) and (1b) can have the meaning in (2a), where Oscar and Bert each bite their own banana. This reading has been termed a 'sloppy' reading. They can also have the reading in (2b), where Oscar and Bert each bite Oscar's banana. This reading has been termed a strict reading.

Chinese and English VP ellipsis sentences are equally constrained. Any reading which involves a single object is a possible strict reading, as shown in (2b-d). The sloppy reading in (2a) is the only two-object reading which is grammatical for both Chinese and English. There are five other logically possible two-object combinations, but none of them yield possible interpretations of the sentences in (1), as shown in (2e-i). For instance, an interpretation where Oscar bites Oscar's banana and Bert bites Ernie's banana is ungrammatical in both Chinese and English, as shown in (2e).

The Chinese VP ellipsis structures, such as (1b), include a lexical verb in the second clause: *yao-yi-xia* (bite-one-time), but they have the same possible interpretations as English sentences: one sloppy interpretation, three strict interpretations and five logically possible but ungrammatical readings.

The explanation of these facts has long challenged linguistic theory. The theory must somehow explain the four grammatical possibilities in (2a-d) and rule out the five ungrammatical readings in (2e-i). A central problem for the different proposals by Williams(1977), Sag (1976), Reinhart (1986), Fiengo & May (1994) and many others is that they require a different series of rules for each reading, and they require that pronouns be assigned reference at different points in the derivation for each reading<sup>2</sup>. These previous proposals have been challenged by results from children's first language acquisition, where for both Chinese and English it was found that the grammatical competence for both types of readings develop in tandem. The proposals by Foley et al (1992 a, b) addressed this problem. They proposed that:

- (a) The proper representations for VP ellipsis structures are LF-representations.
- (b) Both sloppy and strict readings involve variable binding, i.e.: the pronominal in both derivations are A-bar bound. In particular, contrary to previous proposals, the so-called strict "referential" reading is in fact a bound-variable reading.
- (c) The two types of readings differ in the type of A-bar binding they involve. The sloppy type involves local QR; the strict type involves long distance QP-raising to an A'-position with scope over the two conjoined clauses.
- (d) The across-the-board raising in the strict reading is motivated by pragmatic (contrastive or emphatic) focus.

The representations of ambiguity of VP ellipsis structures for both Chinese and English proposed by Foley et al are given in (3) and (4):

(3) **Sloppy Reading:**

(3a) Oscar bites his banana and Bert does [<sub>VP</sub>e [<sub>NP</sub>[e]e ] ] too.

Local QR of Subject NP:

*English*

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

*Chinese*

[Oscar] [t *yao-yi-xia*[ *ta-de xiang-jiao*]], [Bert][ t *ye yao-yi-xia*[e [[e] e]]].

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<sup>2</sup> Please see Foley et. al. (this volume) for further discussion.

Local Operator- Binding of a Pronominal:*English*[Oscar<sub>i</sub>] [t<sub>i</sub> bites [p<sub>i</sub> banana]] and [Bert<sub>j</sub>] [t<sub>j</sub> does [e [[p<sub>j</sub> ]e]]] too.*Chinese*[Oscar<sub>i</sub>] [t<sub>i</sub> yao-yi-xia [p<sub>i</sub> xiang-jiao]] , [Bert<sub>j</sub>] [t<sub>j</sub> ye yao-yi-xia [e [[p<sub>j</sub> ]e]]].

(3b) Every boy eats his apple and every man does too.

(4) **Strict Reading:**

(4a) Oscar bites his banana and Bert does [vpe [NP [e]e ] ] too

Long Distance Operator Raising to the Discourse-linked Position:*English*

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

*Chinese*

[[ta-de]xiang-jiao] [[Oscar yao-yi-xia [t] ] , [Bert ye yao-yi-xia [e [t]]].

Long Distance Operator-Variable Binding of a Pronominal:*English*

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

*Chinese*

[[ta-de] xiang-jiao] [[Oscar yao-yi-xia[t]], [Bert ye yao-yi-xia[e [[t] ] ] ] .

X= Oscar, Bert, Ernie, ...

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

Foley et al.'s (1992c) analysis of the ambiguity in these VP ellipsis structures shows that variable binding is involved in both sloppy and strict readings. They vary in the interaction with pragmatics for the strict readings, but not the sloppy reading for the following reasons. In the sloppy reading illustrated in (3), the pronoun in each object NP phrase is locally bound by the subject, which has raised to an IP-adjoined position. And the subject binds the pronominal variable in each clause. In the strict reading illustrated in (4), the object NP in each verb phrase raises across-the-board to the highest CP-adjoined position, which is also an A-bar position. From this position, the object trace in each clause is bound, giving the unique object interpretation: whichever banana it is that Oscar bites, Bert also bites. This local subject raising is an unmarked option and needs no external motivations, just as local QR in (3b) does not. In contrast, the long-distance across-the-board

raising in (4) giving the strict reading requires external pragmatic motivation, analogous to the restrictive selective binding in (4b). When reference to an appropriate pragmatic context causes a single object to be contrastively or emphatically focused in a given set of objects, this raising is motivated to occur. When no such context provokes this focus, local subject raising yields the unmarked sloppy reading. Under this analysis, there is no way to derive the ungrammatical readings; which are consequently ruled out.

Foley et al.'s proposal was first confirmed by their study on English children's language acquisition. However, study of English alone does not allow dissociation of all relevant components from knowledge of operator-variable relations. Cross-linguistic evidence which based on typological differences between languages allows clearer dissociation of language-specific knowledge from knowledge provided by UG. For VP ellipsis structures, Chinese provides an ideal comparison and provided the basis for the next study (Guo et al., 1996).

### 3. Rationale of Chinese Study

As we showed in sentences in (1), and the analyses in (3) and (4), Chinese shows the same ambiguity in VP ellipsis structure, and the same constraints on possible readings as English. At the same time, Chinese differs from English in several respects. Chinese VP ellipsis structures include a lexical verb in the second clause, as shown in (5).

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

In Chinese, the same issues characterize another type of VP-ellipsis sentence which involves the verb 'shi'(be) in the second clause, shown in (6). This verb lacks the semantic context of a lexical verb, shown in (6).

- (6) GF *tian-yi-xia ta-de bing-bang*, NT *ye shi*.  
 GF lick-one-time his ice-bar, NT also is.  
 "GF licks his ice bar and NT does too."

The contrast in Chinese between a lexical verb and 'shi'(be) does not exist in English sloppy identity structures. We (Guo et al., 1996) predicted that if both the 'shi'(be) structure and the lexical verb structure in Chinese truly involve VP-ellipsis, there should be no difference in children's competence for representing the ambiguity in these structures, or between these and English.

Two possible underlying structures for (5) and (6) are hypothesized in (7a) and (7b).

(7) **Hypotheses:**(a) GF *tian-yi-xia ta-de bing-bang*, NT *ye* [VP *tian-yi-xia* [NP *e* ] ]GF *tian-yi-xia ta-de bing-bang*, NT *ye* [VP *shi* [NP *e* ] ](b) GF *tian-yi-xia ta-de bing-bang*, NT *ye* [VP *tian-yi-xia* [VP [NPe] *t<sub>v</sub>*]]GF *tian-yi-xia ta-de bing-bang*, NT *ye* [VP *shi* [VP [NPe] *t<sub>v</sub>*]]

In (7a) these structures are analyzed as simply involving an empty category in object position, in the object of the second clause is null on the surface (e.g. Hoji 1995). However, as Huang (1987) points out, if the structure in (7a) is correct, then only the strict reading, but not the sloppy reading would be permissible because the object could not be represented as a variable. In addition, the ungrammatical readings (2e-i) would be predicted to be permissible for this sentence. On the other hand, if the structure in (7b) is correct, then only the sloppy and strict readings are available. Our proposal for Chinese follows Huang's (1987) analysis, that the verb of the second clause has been moved into an abstract INFL node, thus leaving the VP as an empty category in the second clause. According to this hypothesis, the replicated verb in the second clause precedes a deleted VP, not a null object. It serves the same purpose as that of “do-support” in English.

We assume the hypothesis in (7b) is correct in Chinese. We assume that the lexical verb has raised. For the purposes of this paper, we assume that *yi-xia* has incorporated into the verb (Guo et. al , 1996). This analysis predicts both the sloppy reading, where the trace in both clauses is bound by a local subject, and the strict reading, where the trace in each clause is bound across the board by the object raised to the highest CP-adjoined position, just as for English.

There are certain ways in which Chinese VP ellipsis sentences may be expected to interact with pragmatic reference in a manner which is distinct from English. Chinese is known to involve a topic-comment structure, as in the example in (8), where the topic is overt. This topic may be null, as in (9b). As hypothesized in “Topic-comment structure and grammatical subject in first language acquisition of Mandarin Chinese: A study of the equi-construction” (Chien & Lust , 1983), this property of Chinese might be expected to trigger a distinct form of reference to pragmatic context in Chinese and in English.

(8) *Nei-ke shu, ye-zi hen da.*

that CL. tree, leaf very big.

“That tree, (its )leaves are very big.”

(9a) *Zhangsan qu na li le?*

Zhangsan go where?

“Where did Zhangsan go?”

(9b)  $\phi$  *hui jia le.*

$\phi$  go home.

“(He) went home.”

The concept of topic is not defined solely on the basis of syntactic structures, but rather it is determined both by the pragmatic context of an utterance and by linguistic structure (Reinhart, 1981). The notion of topic deals more directly with a pragmatic relation which can be understood best in terms of discourse and extra sentential considerations (Chien & Lust, 1983).

At the same time, Chinese has been characterized as a ‘cool’ language since the communication process requires active audience participation. The pronouns in the sentences are “usually omissible from grammatical sentences, and understanding a sentence requires some work on the reader’s or hearer’s part, which may involve inference, context, and knowledge of the word among other things”(Huang, p531, 1981). Lexical arguments may be null. Given these properties of Chinese, we might expect more naturally productive pragmatic reference in Chinese than in English.

In a related manner, in the VP ellipsis structures that we have been studying, e.g. (5) and (6), the lexical pronoun can be null in Chinese. The sentence in (10) shows this contrast. When this pronoun is null, all of the readings in (2a-i) are possible grammatical interpretations, and these depend upon discourse pragmatics.

(10) GF *ti-yi-xia*       $\phi$  *yi-zi*, DD *ye* *ti-yi-xia*.

GF kick-one-time  $\phi$  chair, DD also kick-one-time.

“GF<sub>i</sub> kicks (his <sub>i/j/k</sub>) chair and DD<sub>j</sub> does too.”

The contrast between null and lexical pronouns raises an interesting question. In previous research, it was found that young children treat lexical and null form of pronominal in Chinese as equivalent; only with development do children appear to learn to differentiate the lexical forms of pronominal (Lust, Chien, Chiang & Eisele, 1996). Based on these results we would not expect young Chinese children to distinguish the null and lexical pronoun sentences, but Chinese adults should differentiate the two types of sentences.

A summary of the central points of our Chinese analysis is given in (11).

(11) Summary of Chinese theoretical analyses

- (a) Chinese coordinate structures with repeated lexical verbs such as those in (4) involve verb-raising and VP ellipsis rather than empty objects, in accord with Huang’s (1987) analysis.
- (b) The structures with either shi (‘be’) or a lexical verb in the second clause have similar LF representations. The shi structure and the lexical verb structure do not differ in the degree to which they rule out the ungrammatical readings.

- (c) Variable binding is involved in both sloppy and strict readings in Chinese as well as English.
- (d) Across-the-board raising in the strict reading requires pragmatic motivation in both Chinese and English.
- (e) Chinese is a topic language, and also a pro-drop language. Either of these properties, which require pragmatic reference, could affect interpretation of VP ellipsis in Chinese. They may motivate more strict interpretations for Chinese than for English VP ellipsis sentences.

Based on our analysis of Chinese syntactic structure and the results from previous English studies, we made the following predictions:

(12) Predications for acquisition of Chinese VP-ellipsis structures:

- (a) Operator-variable binding is given by UG, so both the sloppy and the strict readings should be available to children from the beginning of language acquisition in both Chinese and English.
- (b) In Chinese both the sloppy and strict readings should be continuously available, and the ungrammatical readings ruled out, whether the second clause contains a lexical verb or 'shi' because both verbal types involve VP ellipsis, and not 'empty objects'. So the same grammatical constraints hold for both.
- (c) The choice of the strict reading over the unmarked sloppy reading may vary across different pragmatic conditions since pragmatic effects play a role in motivating the strict reading. This should hold in both Chinese and English.
- (d) There is no reason to predict cross-linguistic variation in predominance of 'sloppy' readings. Nevertheless since Chinese is a topic language which is fundamentally affected by pragmatics and discourse, Chinese speaking children may have access to pragmatic reference more productively than English speaking children, and consequently they may produce more strict readings than English children in same age group.
- (e) Chinese children may treat lexical and null pronominal as equivalent at early stages; and differentiate the lexical forms of pronominal later on.

In our previous paper (Guo et al., 1996), we concentrated on the first three predictions, i.e. To repeat, both sloppy reading and strict readings are available to children and ungrammatical readings are ruled out from the right beginning of their language acquisition. The sloppy reading is unmarked, while strict reading is triggered by pragmatics etc..

We will focus on the last two predictions in this paper.

#### 4. Methods

Our Chinese data were collected by Professors Chi-Pang Chiang and Yu Chin Chien in Taiwan. Our method was an act-out test of comprehension, where children were presented with a group of dolls and toys. They listened to a sentence administered by an experimenter, and were asked to show what the sentence means

by acting out with the dolls and toys. Our experiment first allowed children to choose among sloppy and strict interpretations of sentences, for which both sloppy and strict readings were equally pragmatically plausible in terms of general context. In addition, the pragmatic plausibility was varied experimentally through controlled sentence design.

## 5. Design

As Table 1 shown, we tested coordinate sentences with possessive pronouns *ta-de* ('his') in the first clause, and either *shi* ('be') or lexical verbs in the second clause (as shown in I). In addition, to test the interaction of pragmatics and syntax, our design included manipulation of two pragmatic factors which would be expected to affect the likelihood of a particular interpretation of the sentences. One of these factors was the nature of the object. An inalienable object, such as a body part, would be less likely to allow a strict reading than an alienable object, such as cup. The other factor was the nature of the predicate: predicates are biased toward a self-oriented action, such as eating, may be less likely to trigger the strict reading than a non-self oriented action, such as pointing. For example, the sentence A07 ("Snoopy moves his foot and Mickey Mouse does too.") involves an inalienable object "foot" and a self-oriented action "moving". This sentence is predicted to be the least likely to trigger a strict reading.

Meanwhile there are two types of control sentences: null pronoun sentences (as shown in II) and forced strict sentences (as shown in III). The null pronoun sentences had "non-self-oriented" and "inalienable" pragmatic factors (e.g. A12). They could be compared directly to lexical pronouns sentences with the same pragmatic condition(e.g. A04). There is a great freedom on the interpretation of the null pronoun sentences. All the interpretations in (2a-i) are possible grammatical interpretations for null pronoun sentences. In order to compare our results on lexical pronoun sentences, we call them 'sloppy type', 'strict type' and 'lexical ungrammatical type' readings respectively in comparison with the lexical pronoun sentences.

## 6. Subjects

61 native Mandarin-speaking children ranging in age from 3 years, 5 months to 6 years, 11 months were tested. 16 adults were also tested as the control group. The results were analyzed according to age groups at the Cornell Language Acquisition Laboratory.

Table 1 : Act out Sentences

A. ' BE '

## I. PRONOUN SENTENCES

## a) Inalienable Possession:

(+self-oriented)

A07 :

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

B10:

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

(-self-oriented)

A04 :

MM zhi-yi-xia ta-de zhao-pian, SN ye shi.  
 MM point-one-time his picture, SN also be.  
 'MM points at his picture and SN does too.'

B02 :

SL mo-yi-xia ta-de zhao-pian, NT ye shi.  
 SL touch-one-time his picture, NT also be.  
 'SL touches his picture and NT does too.'

## b) Alienable Possession

(+self-oriented)

A09:

DD yao-yi-xia ta-de shui-li , SN ye shi.  
 DD bite-one-time his pear, SN also be.  
 'DD bites his pear and SN does too.'

B01 :

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

B. LEXICAL VERB

## I. PRONOUN SENTENCES

## a) Inalienable Possession:

(+self-oriented)

A05 :

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

B06:

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

(-self-oriented)

A02:

SN mo-yi-xia ta-de zhao-pian, MM ye mo-yi-xia.  
 SN touch-one-time his picture, MM also touch-one-time.  
 'SN touches his picture and MM does too.'

B09 :

NT zhi-yi-xia ta-de zhao-pian, SL ye zhi-yi-xia.  
 NT point-one-time his picture, SL also point-one-time.  
 'NT points at his picture and SL does too.'

## b) Alienable Possession

(+self-oriented)

A01 :

SN tian-yi-xia ta-de shui-li , DD ye tian-yi-xia.  
 SN lick-one-time his pear, DD also lick-one-time.  
 'SN licks his pear and DD does too.'

B11:

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

Table 1 (Continued)

(-self-oriented)

A11:

SN gun-yi-xia ta-de qian-bi, DD ye shi.  
 SN roll-one-time his pencil, DD also be.  
 'SN rolls his pencil and DD does too.'

B04:

NT peng-yi-xia ta-de bei-zi, GF ye shi.  
 NT hit-one-time his cup, GF also be.  
 'NT hits his cup and GF does too.'

II. NULL PRONOUN SENTENCES:

Inalienable and non-self-oriented pragmatic condition

A12:

MM ti-yi-xia yi-zi, DD ye shi.  
 MM kick-one-time chair, DD also be.  
 'MM kicks (a) chair and DD does too.'

B08:

SL pai-yi-xia zhuo-zi, GF ye shi.  
 SL pat-one-time table, GF also be.  
 'SL pats (a) table and GF does too.'

III. FORCED STRICT SENTENCES:

Inalienable and non-self-oriented pragmatic condition

A03:

DD tui-yi-xia SN de che-zi, MM ye shi.  
 DD push-one-time SN rel car, MM also be.  
 'DD pushes SN's car and MM does too.'

B05:

GF na-yi-xia NT de ji-mu, SL ye shi.  
 GF take-one-time NT rel block, SL also be.  
 'GF takes NT's block and SL does too.'

(-self-oriented)

A10:

DD peng-yi-xia ta-de qian-bi, SN ye peng-yi-xia.  
 DD hit-one-time his pencil, SN also hit-one-time.  
 'DD hits his pencil and SN does too.'

B07:

GF gun-yi-xia ta-de bei-zi, NT ye gun-yi-xia.  
 GF roll-one-time his cup, NT also roll-one-time.  
 'GF rolls his cup and NT does too.'

II. NULL PRONOUN SENTENCES:

Inalienable and non-self-oriented pragmatic condition

A06:

DD pai-yi-xia yi-zi, MM ye pai-yi-xia.  
 DD pat-one-time chair, MM also pat-one-time.  
 'DD pats (a) chair and MM does too.'

B03:

GF ti-yi-xia zhuo-zi, SL ye ti-yi-xia.  
 GF kick-one-time table, SL also kick-one-time.  
 'GF kicks (a) table and SL does too.'

III. FORCED STRICT SENTENCES:

Inalienable and non-self-oriented pragmatic condition

A08:

MM na-yi-xia SN de che-zi, DD ye na-yi-xia.  
 MM take-one-time SN rel car, DD also take-one-time.  
 'MM takes SN's car and DD does too.'

B12:

SL tui-yi-xia NT de ji-mu, GF ye tui-yi-xia.  
 SL push-one-time NT rel block, GF also push-one-time.  
 'SL pushes NT's block and GF does too.'

## 7. Results

### 7.1. Cross-linguistic commonality

As can be seen in Table 2a and 2b, for the sentences with lexical pronouns, the sloppy reading was preferred in every age group, as well as overall, as we reported in our previous paper (Guo et al., 1996). This result obtained in both Chinese and English studies, as discussed above. Table 2 shows that the strict reading was also demonstrated in every age group cross-linguistically. Statistical analyses of Chinese results show that there was no significant development in acquiring sloppy reading ( $p=0.715$ ), while there was significant development for strict readings ( $p=0.012^*$ ). This confirms our predictions. The sloppy reading is unmarked, although both readings are possible continuously, the strict reading must be motivated pragmatically.

The results in Table 2 also show that ungrammatical readings are almost completely ruled out from the beginning in both Chinese and English. Even though there are more possible ungrammatical interpretations (2e-i) than grammatical ones (2a-d), children almost always avoid the ungrammatical ones. There is no significant difference among age groups in production of very small quantity of ungrammatical sentences ( $p=0.09$ ).

**Table 2a : Mean Percent of Responses: Sloppy, Strict and Ungrammatical Readings on Lexical Pronoun Sentences (Chinese Study)<sup>3</sup>**

Group	Age Group	%Sloppy	% Strict	%Correct	% Ungram
1 (N=14)	3;5-3;11	64	10	74	6.3
2 (N=16)	4;0-4;11	58	21	79	4.7
3 (N=15)	5;0-5;11	63	28	91	3.3
4 (N= 16)	6;0-6;11	59	35	95	1.2
<b>Mean(N=61)</b>	<b>3;5-6;11</b>	<b>61</b>	<b>24</b>	<b>85</b>	<b>3.8</b>

**Table 2b : Mean Percent of Responses: Sloppy, strict and ungrammatical readings on lexical pronoun Sentences (English Study)**

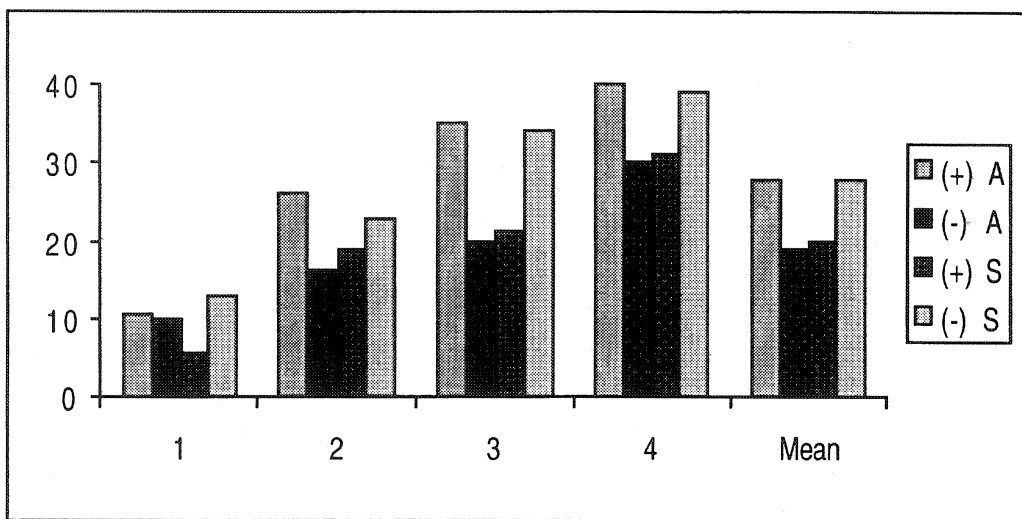
Group	Age Group	%Sloppy	% Strict	%Correct	%Ungram
1 (N=28)	3;0-3;11	36	13	49	3.1
2 (N=25)	4;0-4;11	65	10	75	4.5
3 (N=25)	5;0-5;11	68	9	76	2.5
4 (N=8)	6;0-7;11	55	27	73	3.1
<b>Mean (N=86)</b>	<b>3;0-7;11</b>	<b>56</b>	<b>12</b>	<b>68</b>	<b>3.3</b>

<sup>3</sup>

The sloppy, strict and ungrammatical interpretations are the ones introduced in (2) .

Our hypothesis that the strict reading should be a marked reading which requires pragmatic motivation is also confirmed by our studies of Chinese as well as English. Both pragmatic factors of alienable vs. inalienable object and self vs. non-self-oriented action had a statistically significant effect on choice of strict reading, with ‘ $F=16.87, p=0.00001^*$ ’ for alienable vs. inalienable object factors and ‘ $F=9.766, p=0.003^*$ ’ for self vs. non-self-oriented action factor respectively in the Chinese study (Figure 1a). The variation among the sentences with different pragmatic factors hold consistent for English study as shown in Figure 1b.<sup>4</sup>

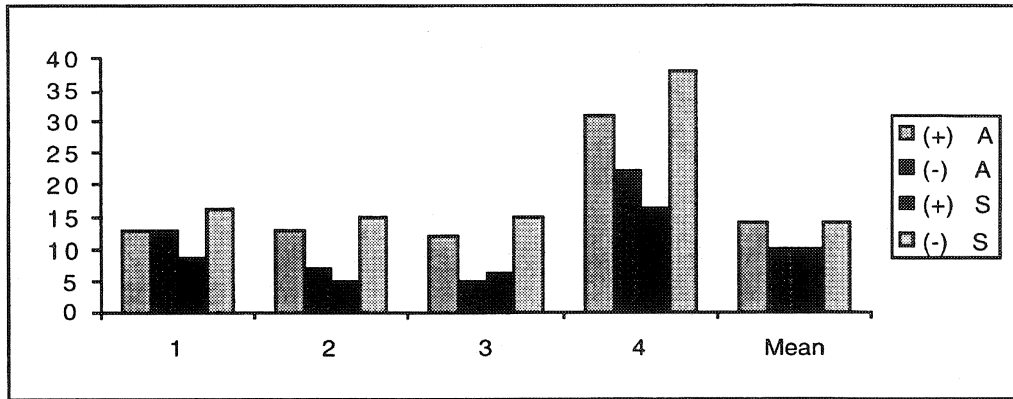
**Figure 1a: Chinese Study Percentages of Strict Responses by Pragmatic Factors: ‘Alienable vs. Inalienable’ & ‘Self-oriented’ vs. ‘Non-self-oriented’<sup>5</sup>**



<sup>4</sup> It is important to note that Figure 1a and 1b show that Chinese and English children demonstrated the same pattern in producing the amount of strict readings for the four different pragmatic conditions. Both Chinese and English children gave more strict readings for sentences with inalienable objects or non-self-oriented predicates than for the sentences with alienable objects or self-oriented predicates. The absolute numbers of the percentages of strict readings differ due to slightly different experimental methodology in the two studies despite controlling the experimental procedure for the two studies.

<sup>5</sup> “-A” indicates inalienable and “+A” stands for alienable possession of object. While “-S” indicates non-self-oriented and “+S” refers to self-oriented predicate. For example, “-A, +S” stands for sentences involving inalienable objects and self-oriented actions, such as “SN moves his foot and MM does too”.

**Figure 1b : English Study Percentages of Strict Responses by Pragmatic Factors: ‘Alienable vs. Inalienable’ & ‘Self-oriented’ vs. ‘Non-self-oriented’**



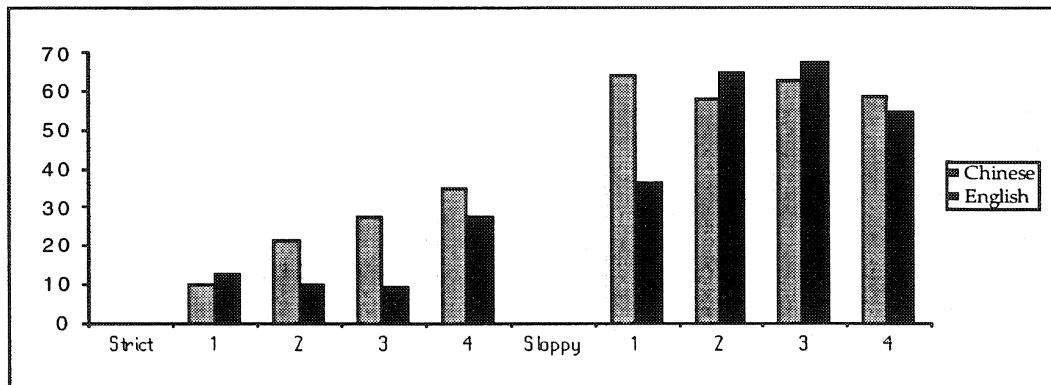
Our prediction that if they represent VP ellipsis structures at the abstract level of LF as Verb-raising, they should not distinguish interpretations of the second clause verb (*shi* ('be') or lexical verb) was also confirmed (Guo et al. 1996).

**7.2. Cross-linguistic difference**

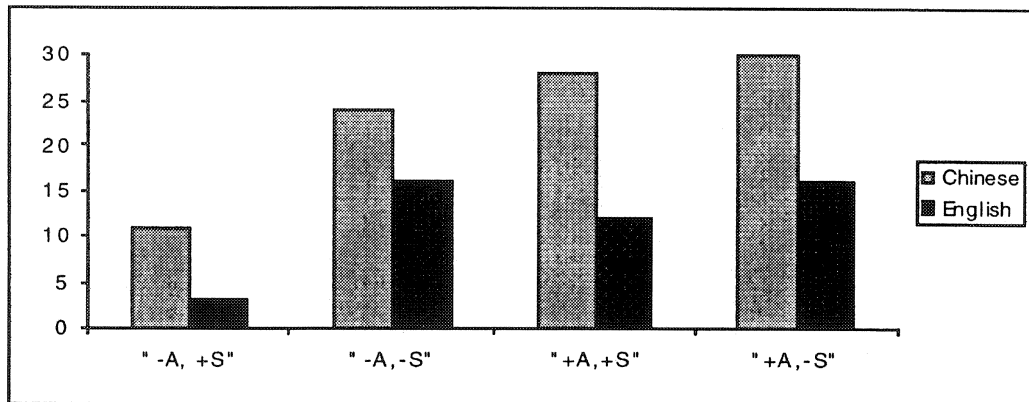
Besides the similarities in the ways in which children acted out VP-ellipsis sentences in Chinese and English, there were some important differences as well. All but the youngest age group (3;5 to 3;11) of Chinese children gave more strict readings than English children at similar ages, even though the percentages of sloppy readings they gave are very similar, shown in Figure 2. Moreover, Chinese children gave more strict readings than English children under each combination of pragmatic factors, shown in Figure 3.

The youngest Chinese speaking group gave more sloppy readings, but slightly fewer strict readings than the youngest English speaking group.

**Figure 2: Percentages of Strict Readings and Sloppy readings produced by Children for lexical pronoun sentences**



**Figure 3: Percentages of Strict Readings for Lexical Pronoun Sentences According to Pragmatic Factors: Chinese 'shi'(be) Sentences vs. English**



### 7.3. Differences within Chinese

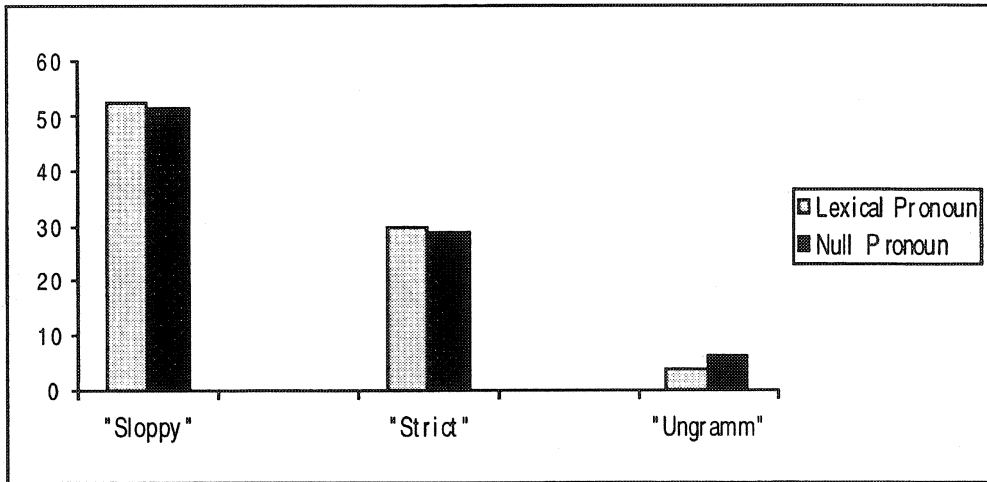
We next compared differences in Chinese children's interpretations of Lexical pronoun and null pronoun sentences in this study. Only the null pronoun sentences with alienable and non-self-oriented pragmatic factor combination were tested. They were compared with the lexical pronoun sentences with the same pragmatic factors.

Table 3 shows that Chinese children demonstrated competence in acting out null pronoun sentences, achieving a total of 86% correct interpretations. Comparison of Table 2a, which contains results for lexical pronouns with Table 3 reveals a similar pattern of readings. In deed, proportions of sloppy readings (52% lexical pronoun sentences vs. 51% null counterparts) and strict type readings (30% for lexical pronoun sentences vs. 29% for null pronoun sentences) were virtually identical across null and lexical pronoun sentences. Likewise both null and lexical pronoun sentences yielded a very small percentage of "lexical ungrammatical type" response.

**Table 3 . Mean Percentages of Correct Response for Chinese Null Pronoun Sentence**

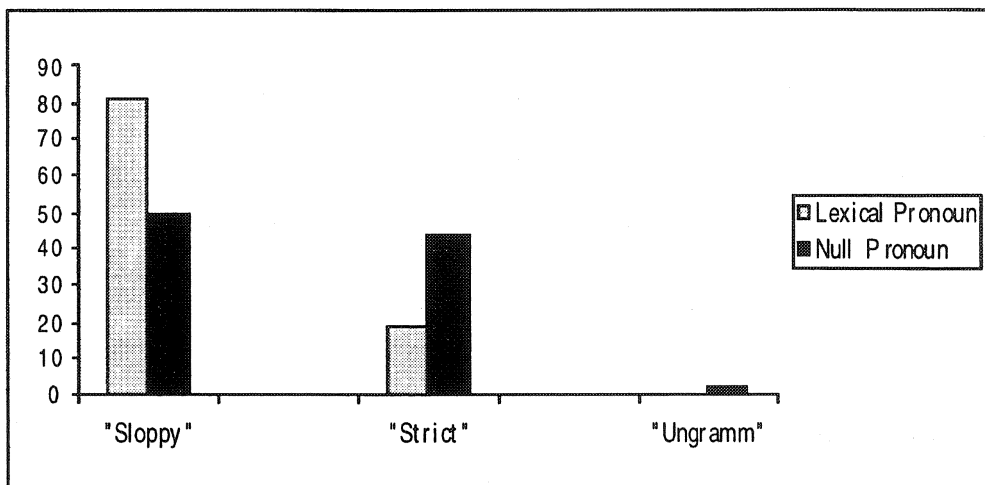
Group	"Sloppy type"	"Strict type"	"Ungrammatical type"	Total
1	52	16	5	75
2	58	23	5	86
3	44	34	7	83
4	50	41	6	97
<b>Mean</b>	<b>51</b>	<b>29</b>	<b>6</b>	<b>86</b>

**Figure 4. Percentages of “Sloppy”, “Strict” & “Lexical Ungrammatical” Readings in Chinese Children for Chinese Null pronoun Sentences and Lexical Pronoun Sentences**



On the contrary Chinese speaking adults, tested as controls, demonstrated a significant difference in their interpretations of lexical pronoun and null pronoun sentences. They gave more strict readings for null pronoun sentences (44%) than for the lexical pronoun sentences (19%) with the same pragmatic condition, while they gave fewer sloppy readings for null pronoun sentences (50%) than for lexical pronoun sentences (81%). The differences are statistically significant ( $p=0.013^*$ ).

**Figure 5. % Percentage of “Sloppy”, “Strict” & “Lexical Ungrammatical” Readings in Chinese Adults for Chinese Null pronoun Sentences and Lexical Pronoun Sentences**



## 8. Discussion:

The results in Table 2 and Figure 1 confirmed our predictions that in Chinese, as well as in English, the sloppy reading is unmarked, because local binding is always available through UG. On the other hand, the strict reading is pragmatically triggered: the long-distance across-the-board movement which yields the strict reading must be pragmatically motivated.

Chinese speaking children gave relatively more strict readings than their English counterparts. This asymmetry is predicted by our theory that the strict reading requires pragmatic motivation, and also by the fact that Chinese is a topic language which relies crucially on pragmatics. Chinese children are more accessible to pragmatics because of their specific language property as a topic language. This finding demonstrated basic properties of language-specific interaction between grammar and pragmatics in children's first language acquisition.

At the same time, Chinese children showed statistically significant development in acquiring strict readings ( $p=0.012^*$ ), but not for sloppy ones ( $p=0.715$ ), even though Chinese is a topic language. These results further support that the awareness of the grammar maybe fundamentally available, whereas the sensitivity to pragmatics is developed although Chinese is a topic language. There is no difference among groups on amount of ungrammatical readings, which shows that the grammatical constraint on operator-variable binding is continuously available in spite of pragmatics development.

Comparison of null pronoun sentences with lexical pronoun sentences with the same pragmatic factors showed that Chinese interpretation of these two types of sentences did not differ significantly (Figure 4). This finding was contrasted markedly with the pattern of adult interpretations in which sloppy readings were more closely associated with lexical pronoun sentences and strict readings were more closely associated with null pronoun sentences (Figure 5). These results corroborate those found by Lust et al (1996). They argued that Chinese children treat null pronoun sentences as phonetically null but apply UG based principles to them. Chinese children must learn the lexical pronoun "ta"(he) in order to distinguish the two structures. Therefore Chinese children treat null pronoun sentences as sentences without the pronoun "tade"(his/her)—they treat them as being in the same position in the syntactic tree, while while Chinese adults may represent the pronoun and null pronoun structures differently in the syntactic tree and at LF because of the master of the lexicon.

## 9. Conclusion

Overall the results reported in this paper support the theory that children have knowledge of operator-variable relations at LF. This knowledge characterizes UG and is continuous, even given language-specific variation with respect to the lexicon, the syntax of verb-raising, and the interaction between syntax and pragmatics.

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# **Children's Knowledge of Verbal Inflection and LF Raising: New Evidence from Elicited Production of VP Ellipsis Structures**

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## **1. Introduction**

In this paper, we present results on first language acquisition of VP ellipsis in English from a new experimental study of children's production. We argue that these results provide striking evidence in favor of the Strong Continuity Hypothesis, regarding the continuous availability of syntactic principles of language in the initial state (Boser, Santelmann, Barbier & Lust (1995), Foley, Nuñez del Prado, Barbier & Lust (1992a,b) ). In general, production results complement related studies of children's comprehension of VP ellipsis (Foley, Nuñez del Prado, Z., Barbier, I., & B. Lust this volume, Guo, Foley, Chien, Chiang & Lust (1996) ). In particular, we argue that this evidence supports a model of integration of inflectional morphology with syntactic rules (specifically V-to-I raising), in deriving the LF representation involved in VP ellipsis.

In Section 2, we hypothesize that the need for IP reconstruction at LF critically distinguishes the elided sentence in (2) from the expanded one in (1).

(1) Bert licks his ice cream and Count licks his ice cream too.

(2) Grover licks his ice cream and Big Bird does too.

In Section 3, implications of the hypotheses in Section 2 for the theory of early child grammar are discussed. In addition, we offer predictions about young children's linguistic performance based upon these hypotheses. In Section 4, the methodology and design of an experimental Elicited Imitation test of the predictions in Section II are laid out. Section 5 includes the major results of this test, which are discussed in Section 6. In Section 7, we consider possible alternative explanations. Finally, in Section 8, we discuss the conclusions from this study and their importance for our understanding of first language acquisition.

## **2. Logical Form Representations of IP in Elided and Expanded Structures**

We focus on children's production of the verb complex in both clauses in these two structures. For these, we assume a Spell-Out representation, [V-I], by which the inflectional affixes form a single complex with the verb at the level of PF, but are visible to syntax (Chomsky (1995), cf. p.113f). The same verbal complex characterizes the first clause in both expanded and elided sentences, as shown in Table 3, and exemplified below in (3) and (4). In accord with Chomsky (1995), we

can assume that this complex verb at PF derives from a structure in which  $I^0$  is head of  $I'$  in underlying phrase structure and some form of affix association rule occurs.

We assume no difference at surface structure in the representation of the first clause verbs in expanded (e.g. (3)) and elided (e.g. (4)) sentences. The critical difference between these is that in the second clause of the elided sentence, the auxiliary 'do' is inserted in  $I^0$ <sup>1</sup>, thus forming the English 'do too' or what is commonly termed a "VP ellipsis" structure on the basis of the complex verb, [do-I]. Furthermore, we assume (e.g. Pollock (1989)) that the LF representations for English clauses with and without an auxiliary verb are different. The (simplified) LF representation for the second clause in (3) involves LF movement of the lexical verb; by contrast, the (simplified) LF representation in (4) with an auxiliary verb does not involve such movement.

- (3) EXPANDED (= (1) above and (2b) in Table 1 below)

[Bert [licks his ice cream]] and [Count [licks his ice cream too]]

LF representation of second clause:

$_{IP}$ [Count [ $_{I}$  lick<sub>1</sub>+ Infl]  $_{VP}$ [[ $_{V}$  t<sub>1</sub>] [ $_{DP}$ <sub>D</sub> his] [ $_{NP}$  ice cream]]]] ...

- (4) ELIDED (= (2) above and (6a) in Table 1 below)

[Grover [licks his ice cream]] and [Big Bird [does too]]

LF representation of second clause:

$_{IP}$ [Big Bird [ $_{I}$  do+ Infl]  $_{VP}$ [[ $_{V}$  lick] [ $_{DP}$ <sub>D</sub> his] [ $_{NP}$  ice cream]]]] ...

We hypothesize here that derivation of the LF representation of the second clause in elided sentences such as (4) involves reconstruction<sup>2</sup> of the second IP where the VP is elided, on the basis of the information about IP and VP given in the first clause. In contrast, the second clause in the expanded sentences presumably does not differ from the first clause in representation of the verbal complex, and therefore does not involve such reconstruction. This is because not only is the VP in the second clause of expanded sentences overt, but, as discussed above, the LF representation of the second IP in expanded clauses is different due to the lack of an overt auxiliary in  $I^0$  and the need for LF raising of the verb. It follows that if IP reconstruction<sup>3</sup> critically distinguishes elided sentences like (4) from expanded ones

<sup>1</sup> Whether 'do' is inserted in  $I^0$  or raised from a lower position is not crucial to our argument. We assume insertion for simplicity here, but take no stand on the issue.

<sup>2</sup> We do not take a stand on the details of reconstruction other than that it must take place at LF, but never at phonetic spell-out.

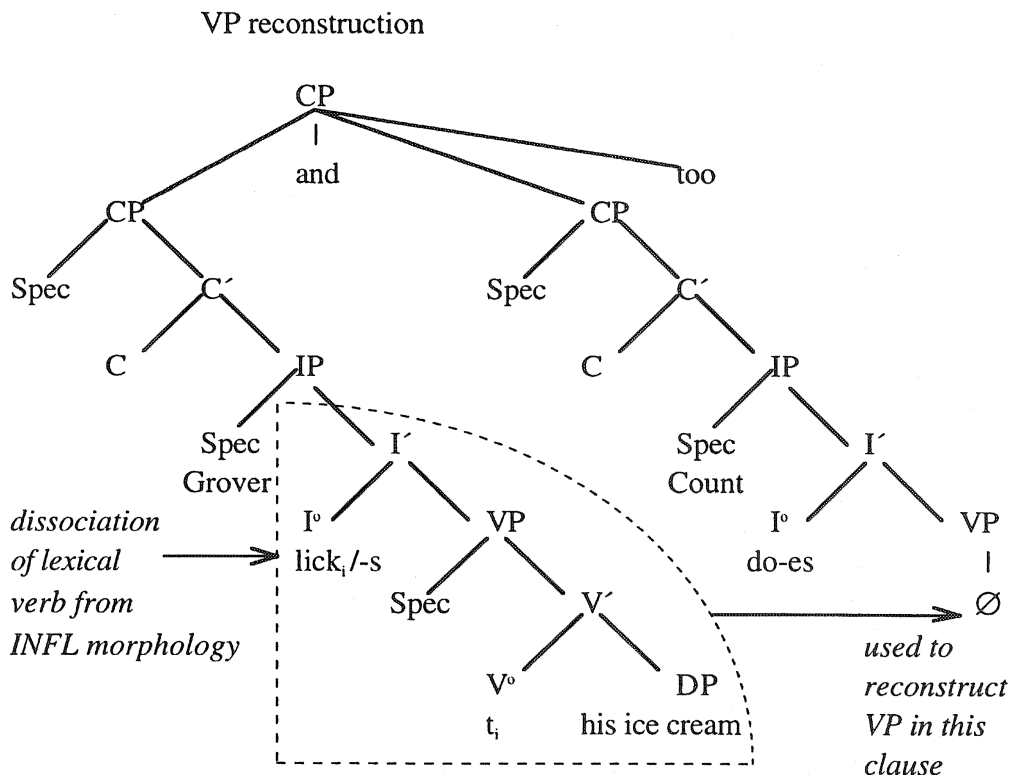
<sup>3</sup> The reader may ask why we claim that it is IP, and not simply VP, reconstruction which is a property distinguishing elided and expanded structures. While the LF operation (depicted in (5)) involves VP reconstruction in the second clause based on the VP in the first clause, more generally this is also IP reconstruction, as this operation crucially depends on the content of  $I^0$  in the second clause, as described above.

like (3), and if verbal morphology integrates with syntax proper, then these, i.e. the syntax underlying the verbal morphology and the syntax underlying IP reconstruction, are critically linked in the elided structure in a way that they are not in the expanded structure.

### 3. Hypotheses

The assumptions lead to important hypotheses about children's knowledge of grammar. If the child has the competence for the representations of these structures, then s/he must know about the LF representation of IP. Crucially, s/he must know that the LF representation of IP is different in an elided clause with an auxiliary and an expanded clause without an auxiliary. Thus, the child must not only understand the LF representation of the first clause in order to reconstruct the second clause of a VP-ellipsis construction, but must also be able to dissociate the inflectional features from the lexical verb in the first clause and construct an entirely *different* IP structure on the basis of that information, as shown in the (simplified) representation in (5).

(5) LF Operation: dissociation of inflection features from lexical verb, allowing



As the content of I° in the second clause, namely 'does' in the surface form, is given, the child must *deconstruct* the first-clause IP, that is, separate the inflectional (tense and agreement) features from the lexical verb. This will enable the

child to discover the “bare” verb that must be reconstructed at LF in the second clause (as well as its complement<sup>4</sup>).

If children’s grammar does distinguish the underlying representations of the two sentences types, expanded and elided, and their production does reflect their knowledge of grammar, then one might predict that their production of the verbal complexes of expanded and elided sentences could differ. This would occur in spite of the fact that in the first clause itself, there is no reason for the child to distinguish these verbs; they are identical in surface structure. Such differential treatment could only be due to the child’s knowledge of the underlying differences between these sentence types in the grammar which links the two clauses at LF.

#### 4. METHOD AND DESIGN

The results we report here derive from a segment of a comprehensive study of young English-speaking children’s comprehension and production of co-ordinate VP ellipsis structures (for comprehension study, see Foley et al. this volume). In this paper we investigate results which have emerged from a test of children’s production of the selected structures shown in Table 1. This experimental study did not anticipate the results regarding verbal inflection nor design precisely for them. They emerged from analyses of children’s errors in this experiment.

**Table 1. Test sentences according to experimental conditions**

<b>EXPANDED SENTENCES</b>	
<b>1. inalienable pronoun</b>	a. Count rubs his arm and Ernie rubs his arm too. b. Bert wipes his nose and Mickey wipes his nose too.
<b>2. alienable pronoun</b>	a. Big Bird drinks his milk and Grover drinks his milk too. b. Bert licks his ice cream and Count licks his ice cream too.
<b>3. transitive definite</b>	a. Grover hits the ground and Barney hits the ground too. b. Donald pets the dog and Oscar pets the dog too.
<b>4. transitive indefinite</b>	a. Barney bites a peach and Count bites a peach too. b. Kermit smells a rose and Bert smells a rose too.
<b>ELIDED SENTENCES</b>	
<b>5. inalienable pronoun</b>	a. Grover scratches his arm and Barney does too. b. Kermit washes his face and Oscar does too.
<b>6. alienable pronoun</b>	a. Grover licks his ice cream and Big Bird does too. b. Kermit bites his banana and Bert does too.
<b>7. transitive definite</b>	a. Ernie touches the ground and Grover does too. b. Mickey washes the floor and Donald does too.
<b>8. transitive indefinite</b>	a. Barney smells a cookie and Big Bird does too. b. Bert touches an apple and Oscar does too.

<sup>4</sup> As we are focusing on the verbal complexes and not the NP complements in each clause, we ignore the issue of variable binding. Besides, the proposal of reconstruction of the elided VP here does not have implications for how variable binding operates. For in-depth discussion of children’s comprehension of VP ellipsis and bound variable structures, see Foley et al. (this volume).

The experimental design involved the factors of expanded vs. elided coordinate sentence structure. In the expanded sentence types (types 1-4 in Table 1), both clauses were redundant with respect to the VP, whereas in the elided sentence types (types 5-8 in Table 1), the second clause contained the auxiliary “does” without an overt VP. All sentences contained third person singular present tense verbs<sup>5</sup>. There were other factors in the design such as presence or absence of pronoun in VP, alienable or inalienable possession of pronoun, and definite and indefinite determiner<sup>6</sup>. For the purposes of this paper, however, we focus on the factor of sentence structure (expanded vs. elided). Sentences were balanced for syllable length (range: 10-12 syllables per sentence) and for semantic and pragmatic properties as well as for all other aspects of syntax.

Using an elicited imitation method (cf. Lust, Flynn, & Foley (1996)), 28 native English speaking, monolingual children from 2;7 to 3;11 years of age (see Table 2 below for groups, means and range) were tested for each of the eight conditions displayed in Table 1.

**Table 2. Subjects**

<b>Group 1</b>	(N=10)	age range 2;7-2;11	mean= 2;9
<b>Group 2</b>	(N=8)	age range 3;0-3;5	mean= 3;3
<b>Group 3</b>	(N=10)	age range 3;6-3;11	mean= 3;9

## 5. RESULTS

We analyzed both the amount of elicited imitations which maintained the stimulus in its exact form (‘matches’) as well as the nature of the changes on the stimulus which the children made.

### 5.1. More match responses for elided than for expanded model sentences

Across all three age groups the child subjects were more successful in imitating elided rather than expanded model sentences (see Figure 1).

(6) Examples of match responses to expanded (a-c) and elided (d-f) sentences:

a. Model: Bert wipes his nose and Mickey wipes his nose too.

MM (2;8): Bert wipes his nose and oh Mickey wipes his nose too

b. Model: Grover hits the ground and Barney hits the ground too.

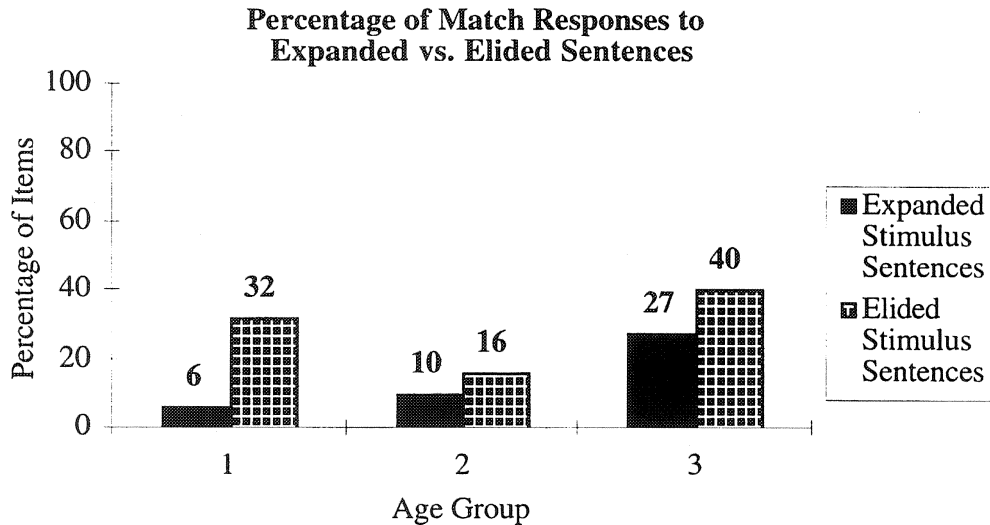
PT (3;3) Grover hits the ground and Barney hits the ground too

<sup>5</sup> See below and Appendix for discussion of non-effects of frequency, regularity, and phonological properties of the verbs included in the design.

<sup>6</sup> See Appendix for other sentence types included in the experimental design but not analyzed here.

- c. Model: Kermit smells a rose and Bert smells a rose too.  
 HM (3;7): Kermit smells a rose and Bert smells a rose too
- d. Model: Barney smells a cookie and Big Bird does too..  
 EF (2;9): Barney smells a cookie and Big Bird does too
- e. Model: Grover licks his ice cream an Big Bird does too.  
 EB (2;10): Grova licks his ice cream an Big Bird does too
- f. Model: Mickey washes the floor and Kermit does too.  
 DC (2;11): Mickey washes the floor and Kermit does too

Figure 1



## 5. 2. More conversions to elision than to expansion

It should not be misconstrued from the previous result that the subjects simply failed to imitate expanded sentences. Rather, they exhibited an ability to convert the expanded model sentences into elided structures, often in ways that were never modeled for them, as in the examples in (7) below.

(7) Examples of spontaneous elisions by child subjects:

- a. Model: Count rubs his arm and Ernie rubs his arm too.  
 AW (2;7): Ber rubs his arm and **so Ernie** too
- VW (2;11): Count rubs his arm and **Ernie** too
- AS (3;4): Ernie rubs his arm and **then Grover does** too

b. Model: Big Bird drinks his milk and Grover drinks his milk too.

MM (2;8): and Gro and Grover drink his milk and **Big Bird does**

c. Model: Bert wipes his nose and Mickey wipes his nose too.

EF(2;9): Bert wipes his nose and **Mickey does it** too

LL (3;11): Bert wipes his nose and **Mickey does** too

d. Model: Donald pets the dog and Oscar pets the dog too.

MR (3;8): Donald pets the dog and **Oscar does** too

e. Model: Grover hits the ground and Barney hits the ground too.

HM (3;7): Grover hits ground and **Barney does** too

Furthermore, while the child subjects did sometimes expand the elided model sentences, such as in (8) below, these expansions were infrequent in comparison with their spontaneous elisions, as shown by the percentages of children's conversions from expanded to elided structures and vice versa in Figure 2<sup>7</sup>.

(8) Examples of spontaneous expansions by child subjects:

a. Model: Ernie touches the ground and Grover does too.

JS (3;0): Ernie touches the ground and Gr and **Bert touch the ground** too

b. Model: Barney smells a cookie and Big Bird does too.

DC (2;11): Barney smells a cookie and **Big Bird b-smells a cookie** too

DB (3;10): Bert smells a cookie and **Ernie sells a cookie** too

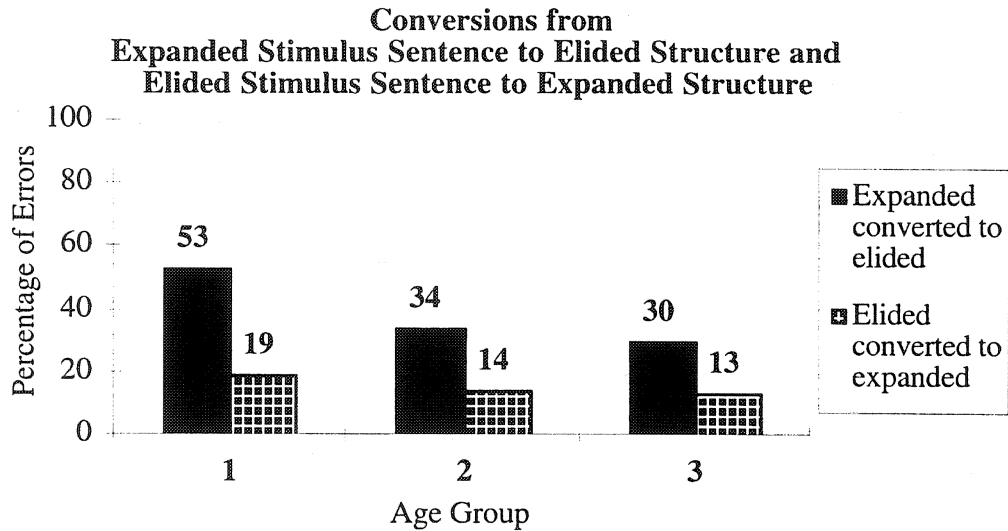
c. Model: Kermit bites his banana and Bert does too.

HC (3;10): Kermit the Frog bites his banana and **Ernie bites his banana**  
too

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<sup>7</sup> The percentages presented here are over 2-clause responses only, as 1-clause utterances are irrelevant for the comparison of elided versus expanded structures. Only 24% of all analyzable responses were 1-clause utterances.

Figure 2



The subjects' frequent conversions to the elided form and their greater success in imitating elided sentences (Section 5.1) are important to bear in mind when considering the results presented in Section 5.3, where we show that there were more verbal inflection changes to the elided sentences. By contrast, there were almost no verbal inflection changes when children produced expanded sentences.

### 5.3. Association of verbal inflection changes with elided sentences

We present findings of the subjects' treatment of the verbal complexes in the first clause of their two-clause responses in 5.3.1, and the second clause of their two-clause responses in 5.3.2.

#### 5.3.1. Verbal inflection changes in first clause

First clause main verb inflection mistakes were more than twice as likely on the elided sentences as on the expanded. For elided sentences 20% of items, (27% of errors) involved first clause main verb inflection changes, while for expanded sentences only 8% of items (13% of errors) involved first clause main verb inflection changes. This difference replicated across all three age groups, as shown by the percentages of errors in Figure 3.

Figure 3

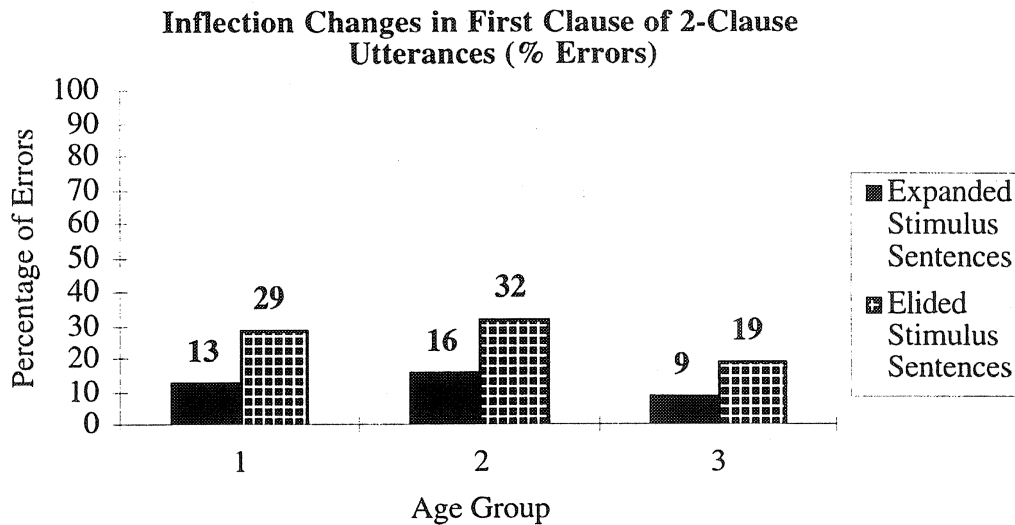


Table 3. Types of Errors on Verbal Inflection

<b>Inflection Omission in First Clause of Subjects' Elided Sentences</b>
a. omission of inflectional morphology <i>Model: Grover licks his ice cream and Big Bird does too</i> VW (2;11): Grover <b>lick</b> his ice cream and Big Bird too <i>Model: Bert touches an apple and Oscar does too.</i> KS (3;3): um um Bert <b>touch</b> a apple and ands and Bert too NW (3;1): Bert <b>touch</b> a apple an Oster does too <i>Model: Grover scratches his arm and Barney does too.</i> CW (3;6): Grover <b>scratch</b> his arm and Grover does too RH (3;10): Grover <b>scratch</b> his arm and Barney does too
b. omission and movement of inflectional morphology <i>Model: Count rubs his arm and Ernie rubs his arm too.</i> JJ (3;3): Ernie Big Birds <b>rub</b> him arm and Ernie does too
c. omission of inflectional morphology and addition of auxiliary <i>Model: Barney smells a cookie and Big Bird does too.</i> AS (3;4): Big Birds <b>does does</b> smell a cookie and Big Birds does Big Bird does too <i>Model: Kermit washes his face and Oscar does too.</i> AS (3;4): Kermin <b>does wash</b> his face and Ostar does too
<b>Inflection Change in First Clause of Subjects' Elided Sentences</b>
a. addition of inflectional morphology <i>Model: Ernie touches the ground and Grover does too.</i> SH (3;5): Ernies <b>touches</b> the ground and and Grover does too <i>Model: Grover licks his ice cream and Big Bird does too.</i> KS (3;11): Grovers um <b>moves</b> ice cream too and Big Bird did too
b. change of inflectional morphology to past tense <i>Model: Barney bites a peach and Count bites a peach too.</i> JJ (3;3): Grover touch the <b>ate</b> the peach and Rover does too

The children altered the inflection on the verb in the first clause of two-clause sentences in several ways, exemplified in Table 3. Omission of present tense third person singular '-s' occurred both with and without addition of auxiliary 'does'. Also, enclitic '-s' was sometimes moved from the verb to the subject.<sup>8</sup> Likewise they occasionally added enclitic '-s' while maintaining the inflection on the verb, producing what has been called "overmarking" of inflection. Finally, there were rare utterances where present tense was changed to past tense.

Importantly, 47% of responses to expanded stimulus sentences with verbal inflection changes in the first clause were conversions to elided form. For instance, subjects AW (2;7), VW (2;11), MM (2;8), and SH (3;5) produced only one inflection change in response to an expanded stimulus, and this response was also their *only* conversion of the expanded stimulus to an elided structure, given in (9). These examples are more evidence of the tight association of this type of error with the elided structure.

(9) a. *Model: Big Bird drinks his milk and Grover drinks his milk too.*

AW (2;7): Gwover **drink** his milk and Big B--

VW (2;11): Grover **drink** his milk uh and Big Bird too

MM (2;8): and Gro and Grover **drink** his milk and Big Bird does

SH (3;5): Big Bird **maked** him milk n Grover does too

The differential treatment of expanded and elided structures is strikingly revealed by examples like (10) and (11). In (10) subject (JJ 3;3) employed the same verb "eat" in all three sentences. The child omitted the inflection on "eat" in two elided responses, yet preserved it in a conversion of the elided stimulus to an expanded structure. It is striking that the child treated verbal inflection differently according to sentence type even on the same verb. In (11), subjects made an inflection change on the elided but not on the corresponding expanded sentence, which contained the same pronoun, determiner, or semantic variable. This finding is

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<sup>8</sup> The addition of '-s' on the subject in examples like (9b) was analyzed as auxiliary addition because it occurred regardless of the presence of pronoun 'his' (exactly 50% of responses containing enclitic '-s' also contained pronoun "his"). Thus it may not indicate a possessive feature in these utterances. More evidence in favor of interpreting '-s' on the subject as an auxiliary comes from an example such as the following, in which the child has contracted "does" into "-s":

*Model: Mickey washes the floor and Donald does too.*

(JS 3;0): Mickey washes the floor and Donalds too

There were almost no inflection changes to 'does' in the entire set of responses. These are given below, and it should be noted that both children did correctly use 'does' in other responses:

NW (3;1): Grover mells a cookie and Big Bird do too

KS (3;11): Grovers moves ice cream too and Big Bird did too

KS (3;11): Berk um uh touches apple and Ern do too

important, because it shows that the crucial factor involved in the observed inflection changes can only be phrase structure.

(10) a. *Model: Barney smells a cookie and Big Bird does too.*

JJ (3;3): Big Birds um or Tutty Monter **eat** a tuttie and Big Bird does too

b. *Model: Grover licks his ice cream and Big Bird does too.*

JJ (3;3): Gwover **eat** him ice cream too and Bi Bird does too

c. *Model: Kermit bites his banana and Bert does too.*

JJ (3;3): um Bert **eats** him biana and Ernie um eats a biana

(11) a. Pronoun Inalienable

Expanded:

*Model: Bert wipes his nose and Mickey wipes his nose too.*

SH (3;5): Mickey wipes his nose n Bert wipes his nose

Elided:

*Model: Kermit washes his face and Oscar does too.*

SH (3;5): Kermit **wash** his face and Ostar does too

b. Pronoun Alienable

Expanded:

*Model: Bert licks his ice cream and Count licks his ice cream too.*

JJ (3;3): Bert licks him ice cream and Ernie licks him ice cream too

Elided:

*Model: Grover licks his ice cream and Big Bird does too.*

JJ (3;3): Gwover **eat** him ice cream too and Bi Bird does too

c. Non-pronoun Transitive Definite

Expanded:

*Model: Grover hits the ground and Barney hits the ground too.*

LH (2;9): Gover hits gown and Barney hits the ground

Elided:

*Model: Ernie touches the ground and Grover does too*

LH (2;9): and he **touch** the ground and he does does it too

Since both expanded and elided stimulus sentences contained both relatively frequent and infrequent verbs (see Table A2 in Appendix), it cannot be argued that children made more inflection changes on elided sentences because there were more relatively infrequent verbs in these. Beyond this, verb frequency is ruled out as an explanation of the results because within the elided sentences, there was exactly the same number of inflection changes (over entire pool of subjects' responses to elided stimulus sentences) on the verbs 'wash', 'touch', and 'scratch', despite the fact that 'wash' and 'touch' are both at least four times as frequent as 'scratch' (see Appendix).

It may also be disputed that 'the word-final sound of 'wash', 'touch', and 'scratch' is sibilant, whereas there were no verbs ending in sibilants in the expanded stimulus sentences. It is possible that subjects may have omitted inflection more often in elided sentences because they were more likely to omit morpheme /s/ from verbs ending in sibilant sounds<sup>9</sup>. It is important to remember that this possibility can only account for the omission types of inflection error, but not the addition types of error, both exemplified above in Table 3. Consequently even if this were the case, it could not explain all of the results. This possibility also cannot account for inflection errors made by children when they spontaneously converted expanded stimulus sentences (which contained no sibilant-ended verbs) to elided form. In fact, within the set of responses to elided stimulus sentences, 56% of inflection changes occurred with verbs ending in sibilant sounds ('wash', 'touch', 'scratch'), and 44% occurred with verbs ending in non-sibilant sounds ('bite', 'lick', 'smell'). This slightly uneven percentage of inflection changes reflects the greater number of target sentences containing sibilant-ended verbs (there were five elided stimulus sentences with sibilant-ended verbs, and 3 without). Since it appears that the subjects were not more likely to drop '-s' in sibilant-ended verbs, this phonological explanation of the results is excluded.

Finally, one might object that the fact that there were more irregular verbs in the expanded stimulus sentences (there were 3: 'bite', 'drink', and 'hit') than in the elided stimulus sentences (there was 1: 'bite'), could have had an effect on the results. It is possible that children are less likely to make inflection errors on irregular verbs, which may be stored by memory and used in a different way from regular verbs. If this is the case, then the reason children made fewer inflection changes on verbs in expanded sentences than elided sentences is that there were more irregular verbs in the former. However the average number (over entire pool of subjects' utterances) of inflection changes on the irregular verbs was virtually identical to the average number of inflection changes on the regular verbs (approximately 3.5 changes/verb). Consequently, an explanation based on verb regularity is also ruled out.

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<sup>9</sup> This possibility was raised by Prof. Ron Smyth at University of Toronto, to whom we are grateful for comments.

### 5.3.2. Verbal inflection changes in second clause

We have compared the subjects' treatment of inflection on the verbs in the first clauses of their two-clause utterances. This comparison is important because on the surface, the first clause of the expanded and elided sentence structures are identical. We now move on to comparison of subjects' production of lexical verbs in the second clause of their responses. Recall that the IP representation of the second clause in the expanded sentence structure involves lexical verb raising to I, whereas in the IP representation of the second clause in the elided sentence structure, inflectional features are represented on a separate item from the lexical verb, namely auxiliary 'does'. In this section we consider subjects' two-clause responses in which the second clause contained a lexical verb instead of auxiliary 'does' exclusively.

#### 5.3.2.1. Overall pattern of verbal inflection changes in second clause

Subjects sometimes changed the inflection on the main verb in the second clause when they responded with an expanded sentence. 21% of all expanded responses, including expanded responses to expanded stimulus sentences as well as VP-redundant (i.e. with 2 overt VPs) responses to elided stimulus sentences, contained second clause main verb inflection changes<sup>10</sup>.

(12) Examples of main verb inflection changes in second clause

a. Changes in both clauses:

*Model: Kermit bites his banana and Bert does too.*

LH (2;9): Bert **bite** hi nanna an Grova **bite** his nanna

KS (3;11): Kerm um **bite** his banana and Berk um **bite** his banana too

b. Change in second clause only:

*Model: Bert licks his ice cream and Count licks his ice cream too.*

KS (3;11): um Berk un uh licks ice cream Donald Duck **lick** his ice cream

Second clause inflection changes, like first clause inflection changes, were more closely associated with the elided than with the expanded structure (see Figure 4). Percentages of these errors were higher for VP-redundant responses to elided stimulus sentences than for expanded responses to expanded stimulus sentences.

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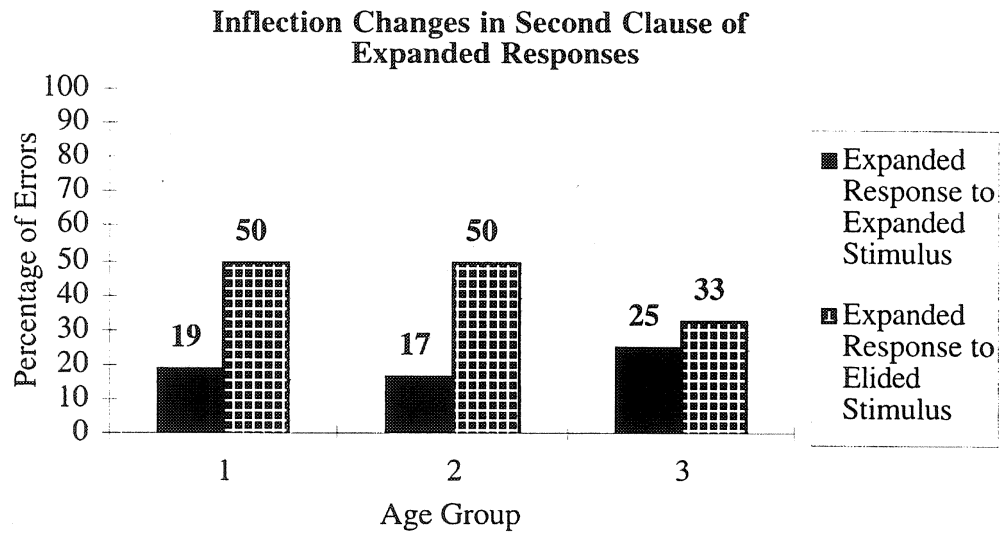
<sup>10</sup> There were almost no inflection changes to auxiliary 'does' in the entire set of responses. These are given below, and it should be noted that both children did correctly use 'does' in other responses:

NW (3;1): Grover mells a cookie and Big Bird do too

KS (3;11): Grovers moves ice cream too and Big Bird did too

KS (3;11): Berk um uh touches apple and Ern do too

Figure 4



- (13) a. Example of second clause error in response to expanded stimulus

*Model: Bert wipes his nose and Mickey wipes his nose too.*

EB (2;10): Bert wipes his nose an Mickey **wipe** his nose too

- b. Example of second clause error in VP-redundant response to elided stimulus sentence

*Model: Ernie touches the ground and Grover does too.*

MM (3;8): Ernie **touch** the ground and Grover **does touch** the ground

We now turn to analyses of utterances with inflection changes in both the first and second clauses in Section IV.C. 2b, and utterances with inflection changes in the second clause only in Section IV.C. 2c.

### 5.3.2.2. Inflection changes in both clauses

Interestingly, 82% of utterances with inflection changes on both the first and second verbs were instances of omission of inflection morphology from both verbs, exemplified in (14).

- (14) Examples of omission of inflection in both clauses

a. *Model: Kermit washes his face and Oscar does too.*

LH (2;9): Kermit **wash** his face and Kermit **wash** his face

JJ (3;3): Osar **wash** him face and Tootie Monster **wash** him face too

b. *Model: Barney bites a peach and Count bites a peach too.*

RH (3;10): Barney **bite** the peach and Count **bite** the peach pea too

The important question to ask is whether these utterances constitute evidence of lack of inflection in the children's representations, or rather evidence of their highly sophisticated analyses linking the inflection in both clauses. Before answering this question, let us consider the other pattern of inflection changes in both clauses: omission in the first clause and use of an auxiliary in the second. In examples (15 a,b), the subjects transferred inflection to an auxiliary or onto the subject, producing a (presumably) more complex sentence than the stimulus sentence.

(15) a. *Model: Bert wipes his nose and Mickey wipes his nose too.*

JJ (3;3): Mickey **wipe** him nose and Bert **does wipe** him nose too

b. *Model: Big Bird drinks his milk and Grover drinks his milk too.*

KS (3;11): Big Bird **drink** drin um um his milk and Grovers **drink** his  
milk too

### 5.3.2.3. Inflection changes in second clause only

There were utterances in which the child subjects changed the inflection in the second, but not the first clause. In the examples below, inflection is preserved in the first clause, whereas it is omitted in the second clause *on the same verb*. Any explanation of the children's performance on this task must account for why, on the *same* verb within the *same* sentence, they treated the inflection differently in both clauses.

(16) *Model: Ernie touches the ground and Grover does too.*

VW (2;11): Ernie touches the ground and Grover **touch** too

JS (3;0): Ernie touches the ground and Gr and Bert **touch** the ground too

## 6. Discussion

Each of the findings described above has serious implications for our understanding of children's knowledge of verbal inflection and LF raising. To recapitulate, the findings are: 1) children more successfully produced exact imitations of elided than expanded stimulus sentences; 2) children both converted expanded stimulus sentences to elided form and elided stimulus sentences to expanded form, but the former phenomenon was much more common; 3) they made a variety of inflection changes on the verb in the first clause much more often with elided than expanded sentences, and these changes included not only omission of inflection, but also

movement, addition, and use of auxiliary as well; 4) there were more inflection errors on verbs in the second clause of VP-redundant responses to elided stimulus sentences than on expanded responses to expanded stimulus sentences; 5) there were sometimes inflection changes in both clauses and sometimes inflection changes in the second clause only.

### **6.1. Preference for elided structure**

The fact that subjects showed greater success in imitating the elided stimulus sentences than the expanded stimulus sentences, and the fact that they frequently converted the expanded stimulus sentences to elided form, indicate clearly that they did not have more difficulty with the elided structure. This suggests that the elided structure was preferred, contrary to what one might expect from the point of view of processing difficulty. The expanded sentences should be easier to process as more information about their meanings is made explicit (in the speech stream). However, with the elided sentence, the child must interpret 'does' and know its semantic association with the first clause. Thus there is more "work" for the child to do in order to discover the meaning of the elided sentence (but see possible alternative explanations below).

### **6.2. Evidence of deconstruction and reconstruction of IP**

The finding that children made overwhelmingly more inflection changes in the first clause of elided sentences than in the first clause of expanded sentences cannot be evidence of failure to properly inflect the verb. Since the first clause is identical on the surface for both structure types, an explanation of alleged lack or underspecification of inflectional morphology on the part of the child could not account for why this type of error was so tightly associated with the elided structure but not the expanded one. If children's knowledge and use of inflectional morphology is simply qualitatively inferior to those of adults, why should this type of error be structure dependent at all? Why wouldn't the subjects have simply shown random changes of verbal inflection, regardless of type of phrase structure? These findings reveal children's analysis, *not* lack or underspecification, of verbal inflection, in a way that is dependent upon syntactic structure.

We take this structure-dependent error to be evidence of the IP analysis that children must represent at LF for the elided structure. The fact that subjects' inflection errors occurred much more often in their elided responses than in their expanded responses is evidence that they had abstracted away from the surface structures of the first clauses of elided and expanded sentences (which are the same), and considered representations of the entire sentence structures (which are distinct) in their production. These errors reveal that they must have known that the representations of the second clause IP structures and the relationship between the IPs in the first and second clauses are distinct between the sentence types.

Interpretation of the results requires understanding of the relationship between the subjects' phrase structure representations and their production. Crucially, the changes that the subjects made to the verbal inflection morphology should not be considered errors. We have argued that the pattern of results and types of "errors" warrant the assumption that their abstract representations are involved in their production. Specifically, we assume that children's productions reflect the form of their representations for the sentences they are asked to imitate, in that they made overt their analysis and reassembling of the IP of each clause.

### **6.2.1. Inflection changes in first clause are evidence of IP deconstruction**

We have argued that the result that subjects changed the inflection on first clause verbs much more frequently in their elided responses and not their expanded responses merits a structure-based explanation. What are the properties of the elided structure that render it vulnerable to such errors? We hypothesized that unlike the expanded structure, the elided structure requires dissociation of inflection features from the lexical verb in the first clause to discover the bare verb that is used in the reconstructed representation of the second (elided) clause. The children's performance on this imitation task clearly shows that they are doing exactly this dissociation. In their consultations of the abstract (LF) representation of elided sentences, they must have known to associate the IPs in each clause, by deconstructing the first IP to reconstruct the second IP. By contrast, in their consultation of the LF representation of expanded sentences, they must have known that there is no need to associate the IPs in each clause (at least not in the same way as with the elided sentences), as information about the content of IP and VP is given on the surface (in the stimulus sentence).

That inflection changes occurred more frequently in their elided responses implies that in this task, a child's production of a bare verb must be considered in the larger context of the utterance as a whole. For example in (17a), we claim that RH (3;10) has not produced a sentence lacking inflectional features; rather the child has shown the verb separated from the inflectional morphology (which is not realized in surface form<sup>11</sup>) as part of the operation necessary for processing and producing the sentence (formalized as the simplified LF representation below). Compare this with similar examples in (17b,c), in which subjects have also pulled apart inflection morphology from the lexical verb, but in these cases, inflectional features realized as auxiliary "does" or enclitic "-s".

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<sup>11</sup> Sentence items that we argue must have been part of the children's processing and representations of the sentences, despite not being phonetically realized, are shown in parentheses.

- (17) a. *Model: Grover scratches his arm and Barney does too.*

RH (3;10): Grover **scratch** his arm and Barney does too

LF representation (omission of inflection morphology from lexical verb)<sup>12</sup>:

$_{IP}[G. [_I \text{scratch}_I / (-es)_{VP} [_{VT} \text{his arm}]]]$  and  $_{IP}[B. [_I \text{does}_{VP} [_V (\text{scratch his arm})]]]$  too

- b. *Model: Kermit washes his face and Oscar does too.*

AS (3;4): Kermin **does wash** his face and Ostar does too

LF representation (dissociation of lexical verb and inflection morphology):

$_{IP}[K. [_I \text{does}_{VP} [\text{wash his face}]]]$  and  $_{IP}[O. [_I \text{does}_{VP} [_V (\text{wash his face})]]]$  too

- c. *Model: Count rubs his arm and Ernie rubs his arm too.*

JJ (3;3): Ernie Big Birds **rub** him arm and Ernie does too

LF representation (dissociation of lexical verb and inflection morphology):

$_{IP}[BB. [_I -s_{VP} [\text{rub him arm}]]]$  and  $_{IP}[O. [_I \text{does}_{VP} [_V (\text{rub him arm})]]]$  too

Likewise, this account of children's analysis of the first clause inflection phrase includes the type of error involving inflection overmarking. Examples such as (18) provide evidence that children can not only analyze the verbal morphology as separate from the lexical item it is attached to on the surface, but they can also move this morphological item around. SH (3;5) moved the inflection morpheme to the subject<sup>13</sup>.

- (18) *Model: Ernie touches the ground and Grover does too.*

SH (3;5): Ernies **touches** the ground and and Grover does too

We have argued that the association of verbal inflection changes in the first clause with the elided structure supports the view that these are not haphazard errors indicating lack of competence for verbal inflection. On the contrary, subjects' treatment of inflection in this task reveals their analysis of IP structure and their integration of this analysis with phrase structure. We now turn to inflection changes in the second clause (which contained an overt VP) of subjects' responses. We

<sup>12</sup> We admit that the issue of whether verb raising takes place in English grammar remains controversial. Hence the highly simplified representations that we attribute to the children's productions here may or may not be correct. Nevertheless, this issue is not crucial to the representations offered here, as what is important is that these examples clearly show the children analyzing the verbal complex into lexical item (the verb) and inflectional item (the morphology).

<sup>13</sup> Another possible piece of evidence in favor of children's analysis and movement of the inflectional bound morpheme is the following, in which it appears that KS (3;3) may have moved it to the conjunction "and" during production of the response.

KS (3;3): um um Bert **touch** a apple and ands and Bert too

argue that these changes show the children’s reassembling of the second clause IP based on their analysis of the first clause IP.

**6.2.2. Inflection changes in second clause are evidence of IP reconstruction**

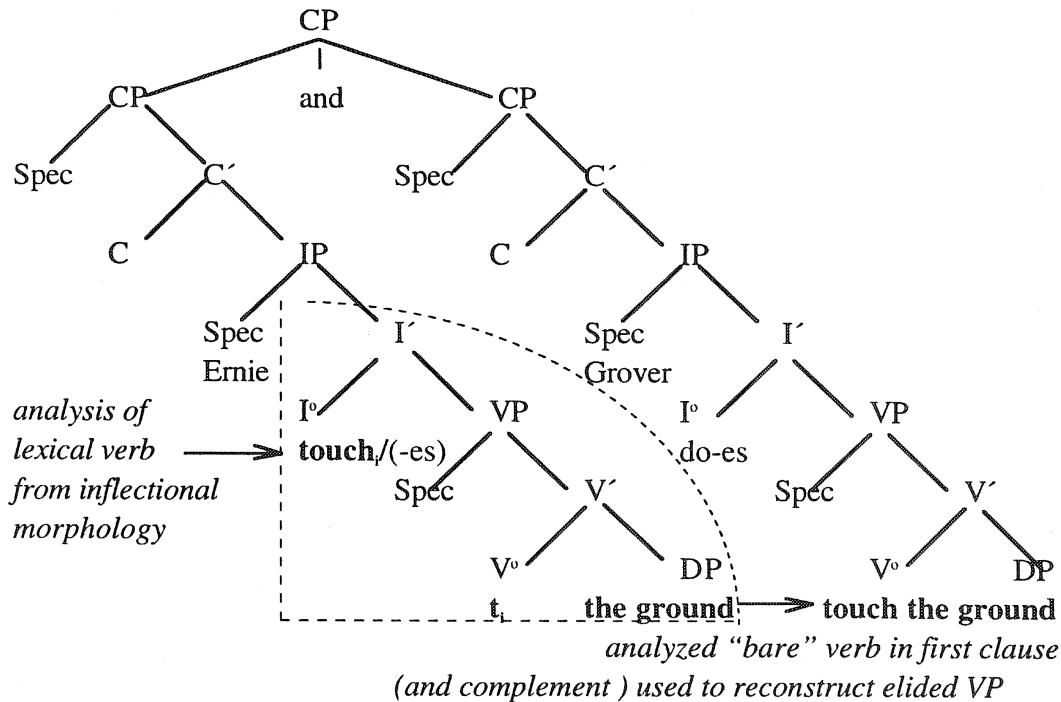
In the ellipsis structure, since the child is overtly given tense and agreement features (represented on the auxiliary) in the second clause, the major task for the child is twofold. First, s/he must deconstruct the IP in clause one, separating inflectional features from the lexical verb stem. In the previous section we argued that the inflection changes found in the first clause show that the child is doing just this. But furthermore, s/he must then assemble the new second clause IP, using the new inflectional features given in the second clause (rather than the inflectional features dissociated from the verb stem in the first clause) as well as the information about the verb stem. Here we argue that the inflection changes observed in the second clause of children’s responses in which the VP is overt, are utterances in which this reassembling is made visible.

In a beautiful response to an elided stimulus sentence shown in (19a), MM (3;8) omitted inflection morphology from the verb “touch” in the first clause and used the same VP in the second clause, while maintaining “does” from the elided model sentence.

(19) a. *Model: Ernie touches the ground and Grover does too.*

MM (3;8): Ernie **touch** the ground and Grover **does touch** the ground

b. Formalization of IP analysis and reconstruction:



How can this complex response be explained? The child appears to have displayed exactly the LF operation described in the hypothesis. In the first clause, the child has deconstructed the IP, and in the second clause, reconstructed the IP with “does” in I<sup>o</sup> using the bare verb discovered in the first IP, as formalized in (19b).

An important question to ask is whether responses to elided stimulus sentences such as (19), in which there were overt VPs in both clauses, constitute conversions to expanded phrase structure. It may seem paradoxical to analyze a response with two overt VPs as an elided structure. Notwithstanding, the separation of inflectional morphology from the verb in the second clause as in (19) indicates that the IP structure within was still that of an elided clause, with “does” in I<sup>o</sup> dominating a bare verb. Hence it is reasonable to interpret such responses as maintenance of the elided structure with the reconstructed second clause VP made overt<sup>14</sup>.

Two responses by JS (3;0) reinforce the conclusion that responses to elided stimulus sentences in which there is an overt VP in the second clause were not necessarily attributed expanded phrase structure. Even though both clauses contain full VPs, the underlying structure of (20b) may have been different from that of (20a). In (20a), the child’s treatment of verbal inflection in each clause is identical, as indicated by the expanded stimulus sentence. By contrast, in (20b), the child’s use of a bare verb in the second clause indicates that although “does” is not overt, this auxiliary must have been part of her processing and representation of the stimulus sentence and her response. Indeed, this assumption is natural as here she was given an elided sentence using auxiliary “does” to imitate. We take the fact that she has used inflected verb “touch” in the first clause but the *same* verb without inflection in the second clause as evidence that the child has knowledge of the distinctive representations of IP in each clause: the first involves lexical V-to-I syntax, but in the second, the content of I<sup>o</sup> is given, forcing reconstruction of a bare verb.

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<sup>14</sup> This claim has serious implications for subjects’ interpretation of pronouns in the elided sentences. If children freely converted the elided model sentences to expanded structures, they converted a structure in which interpretations of the pronoun are restricted (Williams, (1977)), to a structure in which these restrictions are lifted. However if they maintained the elided phrase structure even when they made the second VP overt, then it can be argued these responses cannot be taken as evidence that they were unaware of the structurally imposed restrictions on pronoun reference. In fact, there were 1.5 times as many “expansions” of elided nonpronoun stimulus sentences as elided pronoun stimulus sentences. Moreover, 60% of VP-redundant responses with pronoun “his” contained verbal inflection changes, whereas only 47% of VP-redundant responses with “the”, “a”, or a null determiner contained verbal inflection changes. We believe that these differences are significant in that they reveal that presence of pronoun and phrase structure were factors that interacted in the children’s production. Of course, production data can never inform us about children’s interpretations, but it is interesting that this result correlates with the comprehension results presented in Foley et al. (this volume).

- (20) a. *Model: Barney bites a peach and Count bites a peach too.*

JS (3;0): Barney bites the peach and and Count bites the peach too

$_{IP}[B. [_I \text{ bite}_i\text{-s}_{VP}[_V t_i \text{ the peach}]]]$  and  $_{IP}[C. [_I \text{ bite}_i\text{-s}_{VP}[_V t_i \text{ the peach}]]]$  too

- b. *Model: Ernie touches the ground and Grover does too.*

JS (3;0): Ernie touches the ground and Gr and Bert **touch** the ground too

$_{IP}[E. [_I \text{ touch}_i\text{es}_{VP}[_V t_i \text{ the ground}]]]$  and  $_{IP}[B. [_I (\text{does})_{VP}[_V \text{ touch the ground}]]]$  too

It follows from these arguments that responses such as (12a) and (14a), where inflection is omitted in both clauses, cannot be taken as conclusive evidence that the children sometimes lacked inflection in their production. Rather these may be utterances where their operation over IP in both clauses, including analysis and reconstruction, is made evident on the surface. An example is formalized in (21).

- (21) a. *Model: Kermit washes his face and Oscar does too.*

JJ (3;3): Osar **wash** him face and Tootie Monster **wash** him face too

$_{IP}[\text{Osar}[_I \text{ wash}_i\text{(-es)}_{VP}[_V t_i \text{ him face}]]]$  and  $_{IP}[\text{T. M.} [_I (\text{does})_{VP}[_V \text{ wash him face}]]]$

too<sup>15</sup>

Finally we consider some of the responses to expanded stimulus sentences in which there was an inflection change in the second clause. To be sure, it would be vacuous to claim that every expanded response in which verbal inflection has been changed was analyzed by the child as an elided sentence. Nevertheless, given the overwhelming preference for the elided structure, it is reasonable to assume that in examples like (15a,b), repeated below as (22a,b), the children were “getting ready” to elide the expanded stimulus sentences. For how else could one explain the differential treatment of inflection with the same verb in both clauses? Why would they have used “does” or inflection on the subject in the second clause when there was absolutely no indication to do so in the model sentences? It appears that these two children have pulled apart the inflectional features from the lexical verb in the first clause, and reconstructed the second IP according to the LF representation of the elided structure, with a bare verb in VP and inflectional features represented separately.

<sup>15</sup> Notice that our formalization of the first IP is identical to that of (19), and our formalization of the second IP is identical to that of (20), to mark our analysis of the responses in (19), (20), and (21) as comparable.

(22) a. *Model: Bert wipes his nose and Mickey wipes his nose too.*

JJ (3;3): Mickey **wipe** him nose and Bert **does wipe** him nose too

LF Representation:

$_{IP}$ [Mickey [ $_{I}$ wipe $_{I}$ /(-s)  $_{VP}$ [[ $_{V}$ t $_{I}$  him nose]]]] and  $_{IP}$ [Bert [ $_{I}$ does  $_{VP}$ [ $_{V}$ wipe him nose]]]] too

b. *Model: Big Bird drinks his milk and Grover drinks his milk too.*

KS (3;11): Big Bird **drink** drin um um his milk and Grovers **drink** his milk too

LF Representation:

$_{IP}$ [Big Bird [ $_{I}$ drink $_{I}$ /(-s)  $_{VP}$ [[ $_{V}$ t $_{I}$  his milk]]]] and  $_{IP}$ [Grover [ $_{I}$ -s  $_{VP}$ [ $_{V}$ drink his milk]]]] too

## 7. Possible alternative explanations

We considered a possible processing account above, in which the elided structure is more difficult to process than the expanded structure, because of the need for discovering the meaning implied by the second elided clause. However, it is also possible to argue that it is the expanded structure which is more complex, because it contains more words than the elided structure<sup>16</sup>.

Since the issue of greater processing difficulty may not be resolved on theoretical grounds, we argue against alternative processing explanations on empirical grounds. If the elided sentences are easier to process, the greater number of verbal inflection errors in elided sentences cannot be explained. The reason is that a sentence that is easier to process should contain fewer errors of any sort. Why would a child, who at least sometimes produced correctly inflected verbs, make more inflection changes in sentences that are relatively easy than in ones that are more difficult? On the other hand, precisely because of the finding of subjects' preference for the elided form, it cannot be argued that they made more verbal inflection changes on elided sentences because these were more difficult for them to process. If the elided sentences are more difficult to process, than this preference cannot be explained.

Note that do not argue that no processing is involved in the production of expanded and elided sentences. Our argument is that processing of linguistic

<sup>16</sup> While there may be more words in the expanded sentences, expanded stimulus sentences were not consistently longer than elided stimulus sentences. In our design syllable length was balanced across sentence types (10-12 syllables).

information and the use of that information in linguistic production crucially consults syntactic knowledge.

### 8. General significance of results

The results document the analytic quality of verbal inflection, including (some form of) V to I raising. They signify the child's representation of VP ellipsis as requiring IP analysis and reconstruction. This production difference in verbal morphology across the two sentence structures provides evidence that the child is actively computing over the two IP projections, which must be linked in the IP reconstruction in the elided sentence. It shows that the child has abstracted from the surface form of the verbal complex in both clauses, and analyzed the inflection in the IP structure in the first clause in order to accomplish the necessary reconstruction in the second clause. The changes they made to verbal inflection in both clauses are evidence that knowledge of LF representations of IP and how these may differ according to presence or absence of auxiliary, must be available to the child. Therefore in this task, children's "errors" on verbal inflection, even their elimination of this inflection, reflect their knowledge of abstract coordinate IP structure and V-to-I syntax involved as computation over this. Consequently their verbal inflection "errors" do not necessarily signal faulty grammar. Here they signify precise knowledge of syntax.

It is this mapping from underlying structure (the child's LF representation) to surface structure (the child's production) that develops in child language. Our results show that the source of development cannot be children's competence for creating rich and complex linguistic representations. Rather, it is the mapping from these representations to their surface manifestations, including the language-specific properties of the target grammar, which must be learned. In this manner we have turned the traditional way of thinking about child language on its head. Previously it has been assumed that deviances in child language production relative to adult's constitute evidence of children's inferior grammatical capacities. On the contrary, our results motivate the idea that these deviances are evidence *in favor of* their competence for constructing rich and complex (indeed, adult-like) phrase structure representations.

The results also motivate new theoretical questions, such as calling into question the necessity of a link between LF and PF. They also show that there must be a link between V-I syntax and VP ellipsis. Since the interpretation of VP ellipsis is at LF, this raises the question of at what level of representation this link is represented.

The Elicited Imitation results make more precise the syntactic representation which the comprehension results implied. In addition, the Elicited Imitation results are evidence of a more intimate relation between competence and performance than previously acknowledged, as it can be seen from the examples given above, that the

subjects' processing in comprehending and producing expanded and elided structures consults knowledge of grammar, specifically, LF representations.

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## Appendix

**Table A1. Other test sentences included in design**

<b>1. expanded no variable</b>	a. Big Bird eats ice cream and Grover eats ice cream too. b. Mickey eats popcorn and Donald eats popcorn too.
<b>2. elided alienable pronoun non-self</b>	a. Barney moves his penny and Ernie does too. b. Donald touches his peach and Mickey does too.
<b>3. elided intransitive</b>	a. Big Bird jumps up and down and Ernie does too. b. Mickey runs back and forth and Donald does too.

**Table A2. Verb frequencies (from Francis & Kucera 1982)**

EXPANDED SENTENCES ONLY		ELIDED SENTENCES ONLY		BOTH EXPANDED AND ELIDED SENTENCES	
verb	total frequency (frequency of 3rd pers. sing. pres.)	verb	total frequency (frequency of 3rd pers. sing. pres.)	verb	total frequency (frequency of 3rd pers. sing. pres.)
drink	93 (3)	scratch	22 (NA)	bite	26 (2)
hit	126 (6)	touch	91 (5)	lick	14 (NA)
pet	4 (NA)	wash	83 (NA)	smell	43 (7)
rub	34 (NA)				
wipe	35 (NA)				

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**Principles of Pronominal Interpretation in Hindi *Jab* Clauses:  
Experimental Test of Children's Comprehension**  
Shamitha Somashekar, Barbara Lust, James Gair,  
Tej Bhatia, Vashini Sharma and Jyothi Khare, Cornell University

### 1. General Introduction

The theory of Universal Grammar (UG) proposes both a theory of the human language faculty in general and a theory of the "Initial State".

1. a) *"In a highly idealised picture of language acquisition, UG is taken to be a characterization of the child's prelinguistic initial state"* (Chomsky 1981, 7).

b) *"...  $S_0$  is the 'initial state', prior to any language learning..."* (Chomsky, 1975, 119).

c) *"...we assume that the closer to the "Initial State" this child language is, the less it is mediated by specific language grammar, and thus the more closely its grammar will reflect UG."* (Lust, to appear, 3).

In this paper, we provide evidence that principles of Universal Grammar appear more strongly the closer to the "Initial State" we measure these principles.

There has been extensive study of one module hypothesized to characterize UG:-The Binding Theory, which regulates "relations of anaphors, names, and variables to possible antecedents" (Chomsky 1981), and involves:

2. Principle A: *An anaphor is bound in a local domain.*

Principle B: *A pronoun is free in a local domain.*

Principle C: *An r-expression is free.*

where r-expressions are names, expressions or variables.

Principle C captures a crucial property of UG, namely 'Structure Dependence'.

3. Structure Dependence : *"The rules of language do not consider simple linear order but are structure-dependent,... the rules operate on expressions that are assigned a certain structure in terms of a hierarchy of phrases of various types."*

*"... the child knows without experience or instruction that the linear rule ... is not a candidate and that the structure-dependent rule... is the only possibility. This knowledge is part of the child's biological endowment, part of the structure of the language faculty. It forms part of the mental equipment with which the child faces the world of experience."* (Chomsky, 1988, 45)

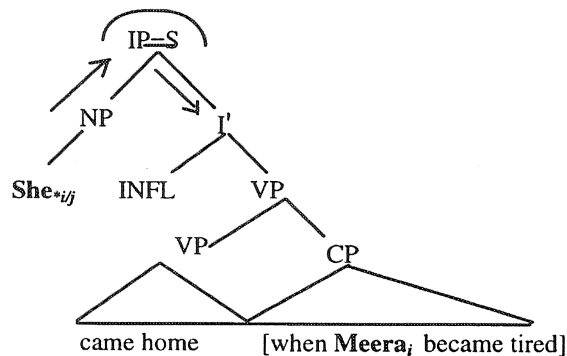
In this paper we report new cross-linguistic results from a study of this principle in the acquisition of Hindi and we also compare these to previous results on the acquisition of English (e.g., Lust, Eisele, and Mazuka, 1992, Eisele and Lust, 1996). Although there has been substantial evidence for children's early knowledge of Principle C, based on English, there has been almost no cross-linguistic study of this principle hypothesized to be universal.

While there has been little cross-linguistic study of child language acquisition with regard to Principle C, there has been some cross-linguistic study of the principles of the Binding Theory in Universal Grammar, on the basis of adult languages, including South Asian Languages<sup>1</sup>, Hindi provides a particularly interesting test of this principle because Hindi appears to have a mixed “head direction”. We can test linearity effects by experimentally varying the direction of adjunction of the subordinate clause (left or right adjoining). We can vary the type of pronominal (as Hindi has both lexical as well as null pronominals) in addition to varying the direction of pronominal coreference (whether the pronominal follows or precedes its antecedent).

### 1.1 Principle C

Principle C entails that a name cannot be bound (c-commanded and co-indexed) by a pronominal. Binding is defined in terms of c-command<sup>2</sup>, a principle of structure-dependence, which defines when a pronominal and a name cannot be coindexed. We exemplify Principle C in the diagrams below. In the example 3a, by definition, the pronominal ‘she’ c-commands the name ‘Meera’. Principle C determines that the pronominal ‘she’ and the name Meera cannot corefer, Meera is not the antecedent of ‘she’. The pronoun in the structure 3a must refer to an external antecedent, presumably pragmatically derived.

3a. She<sub>\*i/j</sub> came home [when Meera<sub>i</sub> became tired.]



**Tree 1. Showing c-command (coindexation of the c-commanding pronominal and name is not possible)**

<sup>1</sup> The following are some publications related to the Binding Theory in Hindi:

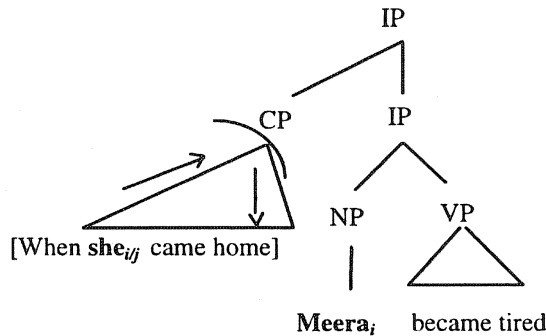
- a) Lust, B., K. Wali, J. Gair, and K. V. Subbarao (eds.) *Lexical anaphors and pronouns in some South Asian languages: A principled typology*. Berlin: Mouton de Gruyter.
- b) Gurtu, M. (1992) *Anaphoric Relations in Hindi and English*. New Delhi: Munshiram Manoharlal Publishers Pvt. Ltd.
- c) Davison, A. (to appear). ‘Lexical Anaphora in Hindi/Urdu.’ in Lust, B., K. Wali, J. Gair, and K. V. Subbarao (eds.) *Lexical anaphors and pronouns in some South Asian languages: A principled typology*. Berlin: Mouton de Gruyter.

<sup>2</sup> C-command: We assume a simple version of this concept: Node A c-commands node B if the first branching node dominating A also dominates B, and A and B do not dominate each other. (after Reinhart 1983,18)

This constraint by Principle C is based on the structure or configuration of the tree, not merely on the linear order; i.e., the lack of coreference is not based on the fact that the pronoun precedes the name (i.e., a backward pronoun).

Note that backward pronouns can occur with coreferential interpretation, if the pronoun does not command the name, even though it precedes the name, as Tree 2 demonstrates:

3b. [When *she<sub>ij</sub>* came home], *Meera<sub>i</sub>* became tired.



**Tree 2. Coindexation of the preceding pronominal and name (where the pronominal does not c-command the name)**

Here a backward pronominal is coreferential in the configuration “When she came home, Meera became tired”.

Though both these sentences have backward pronominals, Principle C blocks coreference in 3a while allowing it in 3b.

**2. Cross Linguistic Studies, with Reference to Hindi**

Initial cross linguistic research has produced debate on the existence of and the nature of the Binding theory principles.

In particular, it has produced debate on the existence and nature of Principle C. For example, it has been argued that Principle C may not hold the same way in all languages. Lasnik, (e.g., Lasnik, 1989, on Thai), theorizes that there may be two forms of Principle C, only one of which is universal. The first type is the Pronominal-NP type (type i), which he claims is universal, and the second is the NP-NP type (type ii).

- 4. Principle C    a) Type i. (Pronominal-NP)    **He** thinks that **John** is tired
- b) Type ii. (NP-NP)            **John** thinks that **John** is tired

Note that the examples in 4a (type i) are the kind of sentences that we looked at in the tree in 2a.

In Hindi too, it has been questioned whether Principle C holds for the NP-NP type (type ii). In fact, there has been only an initial investigation into this Principle in Hindi. Gurtu and Davison argue in accord with Lasnik, that Principle C

can account for Type i of Principle C (Pronominal-NP) in Hindi, but does not hold for Type ii.

### 5. Principle C in Hindi

#### a. (Pronominal-NP):

\**us-ne jOn ko dekhaa* ( from Gurtu 1992, page 81)

he-erg John to saw

“He saw John”

“...*Principle C can account for pronominal non-coreference in Hindi.*” (Gurtu 1992, p. 82). Davison (to appear) also cites Gurtu and agrees with this conclusion.

#### b. (NP-NP):

*raani-ne kaha ki raani-ne merii ko dekhaa*

Rani-erg said that Rani-erg Mary to saw

“Rani said that Rani saw Mary.” ( from Gurtu 1992, page 79)

“...*it is primarily pragmatic considerations that decide when and in what circumstances two full NPs will be assigned the same reference ...*” “*Hindi does not observe Principle C in this respect; that is, in Hindi two full NPs can be anaphorically related*” (Gurtu, 1992 page 79)

This issue, however, is still being debated; i.e., whether c-command and structure dependence hold at all in coreference or whether simple linear precedence is all that matters. For example, Mohanan (1981) has proposed the precedence principle, detailed in 6. This has been argued against by Gurtu (1992).

### 6. Precedence Principle

a) Mohanan (1981): “*The principles governing pronominal noncoreference in languages like English and languages like Malayalam is obvious: the parametric choice is between c:command and precedence as the relevant principles:..In terms of the referential theory of pronouns, however, pronominal noncoreference in these two types of languages would be totally unrelated. ...The explanation that I am suggesting is the following: Assume that principle 51, namely that pronouns cannot precede their antecedents, is the unmarked universal principle governing pronominal antecedentship. One might say this has its roots in the discourse principle of precedence (“antecedents of pronouns must be available in the discourse when a pronoun is used”) which has become crystallized into a syntactic principle.*”

b) Gurtu (1992): “*Hindi facts...argue that a precedence principle does not seem to be the unmarked principle underlying pronominal non-coreference.*” (page 83)

In this paper we will test these two independent factors, namely, precedence principle and structure dependence.

## 2.1 Pragmatics and Principle C

Principle C is known to be particularly sensitive to pragmatics, sometimes allowing pragmatics to override it. The example below demonstrates this phenomenon in English.

7. Speaker 1: “Nobody is happy when John sings”

Speaker 2: “But HE is happy [when John sings].”

We expect this phenomenon to be an issue in South Asian Languages. Much literature in Hindi too has implicated the role of pragmatics as being particularly influential in the interpretation of the language.

## 2.2 Nulls vs. Lexical Pronouns

There is also debate on whether languages with null pronominals would behave in the same way with regard to Principle C. Montalbetti proposes that null and lexical pronominals are fundamentally equivalent in grammar.

8. The Null Hypothesis (Montalbetti, 1984): *In a classical 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)*

But this hypothesis has not yet been tested for Principle C in Hindi (or many other languages).

The following examples demonstrate that the null pronominal as subject in Hindi is just as acceptable as the lexical pronoun *vo*.

8a. Bandar *baithta hai,* *jab* θ/vo *rumal* *uthata hai*  
*monkey* sits down, when θ/he handkerchief picks up.

“The monkey sits down when θ/ he picks up the handkerchief.”

8b. *Jab* gadha *baithta hai,* θ/vo *chaklet* *khata hai.*  
 when donkey sits down, θ/he candy eats.

“When the donkey sits down, θ/he eats candy”

### 3. Principle C in Acquisition

If UG is a model of the ‘Initial State’<sup>3</sup>, then we can test first language acquisition for evidence on the nature and existence of Principle C.

There has been a comprehensive review of Principle C in studies of first language acquisition (Lust, B., Eisele, J., and Mazuka, R., 1992). In this review, it has been argued that Principle C exists in the initial state (cf. footnote on Initial State). The studies reviewed here are mainly English, and to a small degree, Japanese.

9. *“These studies provide converging evidence that children acquiring English respect Principle C of the Binding Theory - specifically a form of Principle C in which an r-expression is pronoun free. Principle C is respected continuously across overt syntax development (from 3 to 7 years). Although knowledge of Principle C interacts significantly with both directionality and pragmatic context, it is independent of these... early knowledge of Principle C may prove to be universal.”* (Lust, B., Eisele, J., and Mazuka, R., 1992)

However the existence of Principle C has also been debated in acquisition. As in crosslinguistic literature, in acquisition, there have been proposals like the one below, that children may abide by linear precedence alone.

10. Forward Directionality Constraint: Children have a universal preference for forward patterns of anaphora. (O’Grady, Suzukei-Wei and Cho, 1986).

If a principle like 10 were correct, children would be predicted not to be ‘structure-dependent’, but to follow linear precedence alone in the interpretation of pronouns coreferentially.

In addition, if children do not abide by Principle C, they might also be predicted to be at first highly dependent on pragmatics for pronoun interpretation, reference and coreference.

### 4. The Present Study

We have designed and conducted a study to test these issues in the acquisition of Hindi as a first language.

In this study, we experimentally tested Indian children’s comprehension of various forms of pronominals in Hindi complex sentences involving *jab* clause adjuncts. *Jab* clauses are adverbial ‘when’ clauses which can occur either to the left or right of the main clause as in Table 1, making it possible to test Branching Direction as a variable.

We will present here only a few critical results dealing with the debates outlined earlier. More complete results appear in publications of a preliminary

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<sup>3</sup> The term “Initial State” is used here as an abstraction implying a prelinguistic state before any language learning. In this paper, we approximate this concept to mean as early as we can test the children.

study with the same children, which had been conducted to test their production, using an imitation task<sup>4</sup>

### 4.1 Design

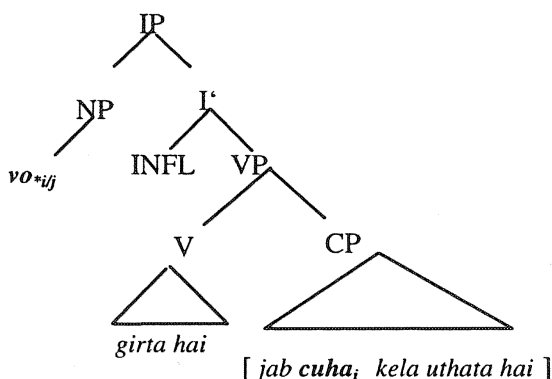
The design of the set of experimental sentences was developed by Lust (1983) as part of a series of cross-linguistic studies. The sentences are designed to vary along the following independent factors:

- a) Pronominal Type (Null or Lexically overt Pronominal),
- b) Pronominal Direction (Forward or Backward Direction of Pronominal in relation to its antecedent),
- c) Branching Direction of the sentences (Right Branching or Left Branching, i.e. whether the jab clause is adjoined to the right or the left of the main clause).

Table 1 on the following page shows the entire set of experimental sentences, varying by these three factors. Here, we are particularly interested in sentences 5, 6, and 13, 14, which violate Principle C if they are coreferential.

For example, in sentence 13 on the table, coreference violates Principle C. If sentence 13 in Table 1 is given a structure like Tree 3, then an interpretation of coreference between pronoun and name should be blocked by Principle C.

11. *vo\*<sub>ij</sub> girta hai, [jab cuha<sub>i</sub> kela uthata hai.]*  
*He falls down [when rat banana picks up]*  
 'He falls down when the rat picks up the banana.'



**Tree 3. Schematic Representation of the C-Commanding Relationship Between Antecedent and R-Expression for Example 11.**

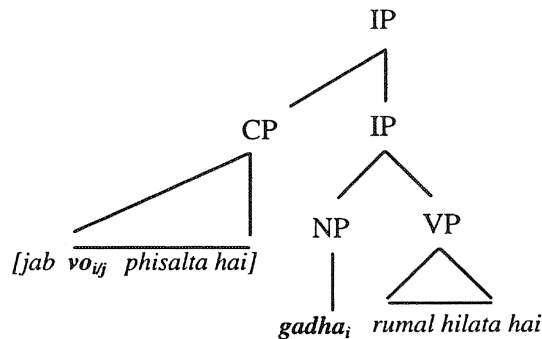
<sup>4</sup> The following are publications on the parallel imitation task  
 Lust, B., Bhatia, T., Gair J., Sharma, V., and Khare, J. (1988). 'A Parameter setting Paradox: Children's Acquisition of Hindi Anaphora' in *Cornell University Working Papers in Linguistics*. Vol 8.  
 Lust, B., Bhatia, T., Gair J., Sharma, V., and Khare, J. (1995). 'Children's Acquisition of Hindi Anaphora: A Parameter setting Paradox'. In Vijay Ghambir (ed.), *The Teaching and Acquisition of South Asian Languages*. Penn Press. 172-189.

Table 1. Experimental sentences for the Act-out Task

Branching Direction	Forward Pronominal		Backward Pronominal	
	Null	Null	Null	Null
<i>Right</i>	1. bandar baiṭhtā hai, jab θ rūmāl uṭhātā hai. monkey sits down, when θ handkerchief picks up The monkey sits down, when (he) handkerchief picks up.	5. θ uchalātā hai, jab kuttā biskuṭ phēktā hai. θ jumps up when dog cookie throws (He) jumps up when the dog throws the cookie.	6. θ baiṭhiā hai, jab gadhā cāklet girātā hai. θ sits down, when donkey candy drops (He) sits down, when the donkey drops the candy.	
	3. jab hāthī phisaltā hai, θ bas pakarātā hai. when elephant slides down, θ bus holds When the elephant slides down (he) holds the bus.	7. jab θ leṭtā hai, cūhā biskuṭ khātā hai. when θ lies down, mouse cookie eats When (he) lies down, the mouse eats the cookie.		
	4. jab gadhā baiṭhtā hai, θ cāklet khātā hai. when donkey sits down, θ candy eats. When the donkey sits down, he eats the candy.	8. jab θ uchalātā hai, sher rūmāl phēktā hai. when θ jumps up, lion handkerchief throws When (he) jumps up, the lion throws the handkerchief.		
<i>Left</i>	9. hāthī baiṭhtā hai, jab vo kēla girātā hai. elephant sits down, when he banana drops The elephant sits down when he drops the banana.	13. vo girātā hai, jab cūhā kēla uṭhātā hai. he falls down, when mouse banana picks up He falls down, when the mouse picks up the banana.		
	10. bandar leṭtā hai, jab vo patthar uṭhātā hai. monkey lies down when he stone picks up The monkey lies down when he picks up the stone.	14. vo phisaltā hai, jab sher patthar pakarātā hai. he slides down when lion stone holds He slides down when the lion holds the stone.		
	11. jab bandar patthar phēktā hai, vo uchalātā hai. when monkey stone throws he jumps up When the monkey throws the stone, he jumps up.	15. jab vo phisaltā hai, gadhā rūmāl hilātā hai. when he slides down, donkey handkerchief shakes When he slides down, the donkey shakes the handkerchief.		
	12. jab kuttā kēla uṭhātā hai, vo baiṭhtā hai. when dog banana picks up, he sits down When the dog picks up the banana, he sits down.	16. jab vo phisaltā hai, cūhā bas pakarātā hai. when he slides down, mouse bus holds When he slides down, the mouse holds the bus.		

On the other hand, if the sentence 15 on the table, which also involves a backward pronoun, is given a structure like Tree 4, then, like English, coreference should be possible.

12. [jab vo<sub>ij</sub> phisalta hai], gadha<sub>i</sub> rumal hilata hai.  
 [when he slides down], donkey handkerchief shakes  
 ‘When he slides down the donkey shakes the handkerchief.’



**Tree 4. Schematic Representation of the C-Commanding Relationship Between Antecedent and R-Expression for Example 12.**

**4.2 Method**

This study used an act-out task, which tests the comprehension of the children. The child was presented with 3 dolls and several props and asked to act out the meaning of each sentence read out to them. When the child manipulated the dolls and props to act out the sentences, transcribers noted down the child’s actions.

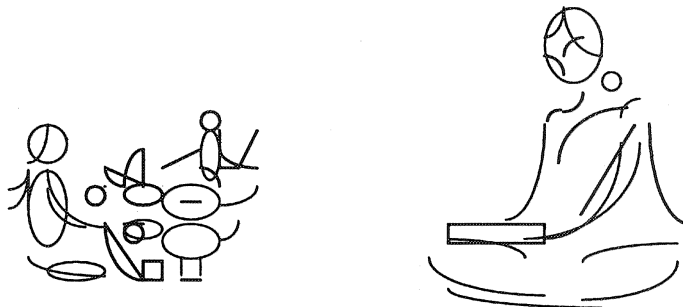


Figure 5. Schematic representation of the task

**4.3 Pragmatic Lead (PL)**

There were two conditions in the study dealing with Pragmatic Lead. These two conditions were varied between subjects.

In the condition with Pragmatic Lead (+PL) the child was first told that this would be a little story about x (the doll named in the sentence).

For example, the experimenter first before the experimental sentence

13. '*Jab bandar patthar pheakta hai, vo uchalta hai*' (sentence 11 in Table1)

"When the monkey throws the stone he jumps up"

with : " This is a little story about a monkey. Now listen carefully and show me the story." Then the experimenter administers the sentence.

In the condition without Pragmatic Lead (-PL), the children were simply administered the sentences without this preliminary introduction. By adding this condition, we could test to what degree Pragmatic Lead determined coreference judgment, possibly overriding structure.

#### 4.4 Coding And Analysis

The data was systematically scored using established Scoring Criteria and then analyzed statistically in the Cornell Language Acquisition Laboratory using Systat.

With regard to scoring a response as a coreferential one, if a child caused the doll named in the experimental sentence to act out the actions of both the clauses, it would mean that the child interpreted the doll named in the sentence to be the referent of the pronoun as well. This would constitute a coreference judgment and only such responses were scored as coreferential.

For example, for the experimental sentence 11 (example 13 in section 4.3), the child would be scored as making a coreference judgment only if the child made the monkey throw the stone as well as jump up.

#### 4.5 Subjects

The children were monolingual Hindi speakers from Hyderabad, Delhi, and Agra, and the majority were from Hyderabad.

Table 2 gives us the subject summary table with relevant subject details. The subjects ranged in age from 3 to 7 years and were divided into 4 age groups. In each age group, around half the group was given a pragmatic lead.

**Table 2. Subject Summary**

GROUP	- PL	+ PL	TOTAL	AGE RANGE	MEAN AGE
1	22	15	37	3;01 - 4;00	3;07
2	17	18	35	4;01 - 5;00	4;06
3	17	18	35	5;01 - 6;00	5;07
4	16	16	32	6;01 - 7;00	6,04
TOTAL	72	67	139	3;01- 7;00	4;09

#### 4.6 Hypotheses And Predictions

Our fundamental hypothesis is that from the very beginning, i.e., when we can first measure comprehension of syntax, the course of first language acquisition is constrained by UG-determined principles.

We hypothesize in particular that structure interacts with linear order in the acquisition of anaphora, i.e., there is no independent linearity/precedence principle. We will focus on the critical test of Principle C versus precedence which this design allows.

Specifically, we make the following predictions

4.6.1. Children will not make coreference judgments based on linear precedence alone. Rather, we expect to find that the effects of linear precedence will be modulated by the Principle of Structure-Dependence.

4.6.2. Coreference with backward pronominals<sup>5</sup> will be blocked by the children to a significantly higher degree in the Right Branching backward sentences (sentences 5, 6 and 13, 14 in Table 1) in accord with Principle C.

4.6.3. If nulls represent pronominal forms, as generally assumed in languages of this type, the two predictions stated above should hold over both pronominal types.

#### 4.7 Results

In the following sections, I will briefly summarize the results dealing specifically with each of the predictions that we have listed above in section 3.1.7.

##### 4.7.1 Prediction 1

Fig.1 gives us the overall results which considers all the data for each branching direction, over all the age groups, over both conditions of Pragmatic Lead, and over both the pronominal types (null and lexical).

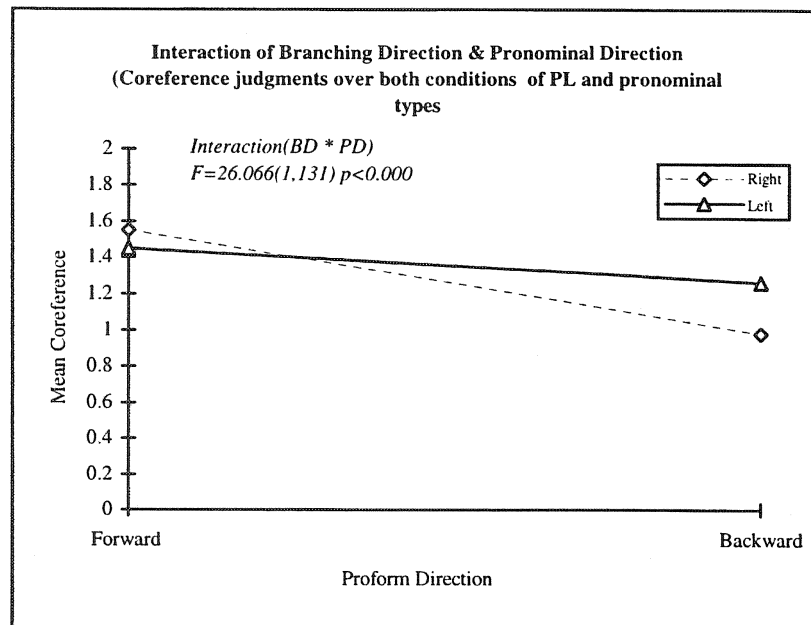
This set of results deal with the prediction that children's coreference judgments will not be based on precedence alone, but modulated by their knowledge of structure.

The figure illustrates the statistically significant interaction of Branching Direction with Proform Direction which, in general, lends evidence for children's knowledge of configuration and their use of this knowledge in computing interpretation of pronominals.

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<sup>5</sup> Definition of backward and forward pronominals in section 4.1

Fig.1. Overall Coreference Judgments (over all age groups)



Initially though, it seems that there is some kind of precedence effect, i.e., there seems to be overall more coreference for forward direction of proform than for the backward.

But this seeming effect of precedence is modulated by structure, i.e., the precedence effect is seen only in the Right Branching sentences, not in the Left Branching sentences.

If precedence is all that mattered, then both the left and right branching sentences should have similar slopes with overall higher scores for forward than backward and we should have no real interaction between Branching Direction and Proform Direction. But this interaction is found to be extremely significant with  $p < 0.0001$ .

It is the sentences with backward direction of proform (sentences 5, 6, 7, 8, 13, 14, 15, and 16 in Table 1) that really interest us here. The reason for this is that, as expected, Principle C blocks coreference only in the right branching sentences with backward direction of proform (sentences 5, 6, 13, and 14), not the left branching sentences with backward direction of proform (sentences 7, 8, 15, and 16). In fig.1, the difference in mean coreference between the right and left branching sentences for the Backward direction of proform is significant with  $p < 0.05$ . Thus we have evidence for prediction 1 that the effects of linear precedence will be modulated by children's knowledge of configuration.

#### 4.7.2 Prediction 2

The next set of figures deal with the second prediction: Principle C will block coreference to a significantly higher degree in right branching sentences with backward proform than in the other types of sentences.

Figures 2a through d show the interaction of Branching Direction with Proform Direction for each of the 4 age groups for the neutral condition, i.e., without Pragmatic Lead.

The pattern of interaction between of Branching Direction and Proform Direction is continuous in all the age groups, though it is most pronounced in the youngest group. In fact, in group 1, Left branching sentences have more coreference for Backward direction of proform than forward.

In particular, note that the Right Branching sentences with Backward Pronominal have been interpreted with the lowest amount of coreference by all the age groups. There is no other point that is lower in all four figures.

This lends evidence to prediction 2 that Principle C will block coreference to a significantly higher degree in right branching sentences with backward proform.

The figures 3a through 3d, show the interaction of Branching Direction with Proform Direction for each of the 4 age groups for the condition testing the effects of Pragmatic Lead.

These figures show that Pragmatic Lead doesn't override structure in the first 3 age groups. The youngest group is least affected by Pragmatic Lead, but the effects of Pragmatic Lead get stronger with age in a systematically incremental manner. In the oldest group, Pragmatic lead overrides the effects of structure seen in the figures 2a to 2d to the greatest extent and this group interprets all sentence types regardless of Branching Direction or Proform Direction as being coreferential.

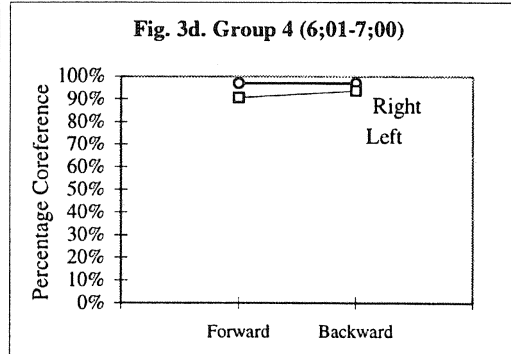
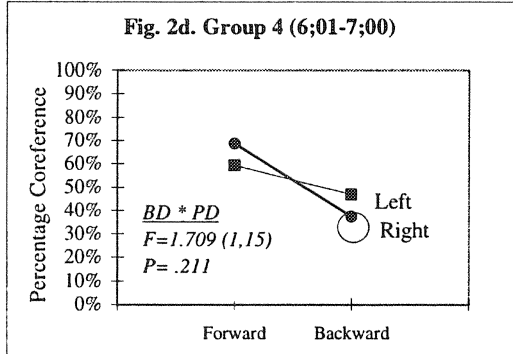
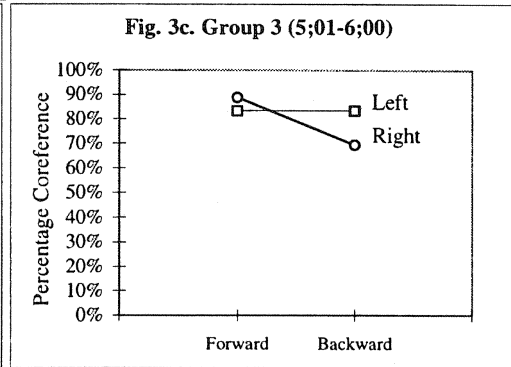
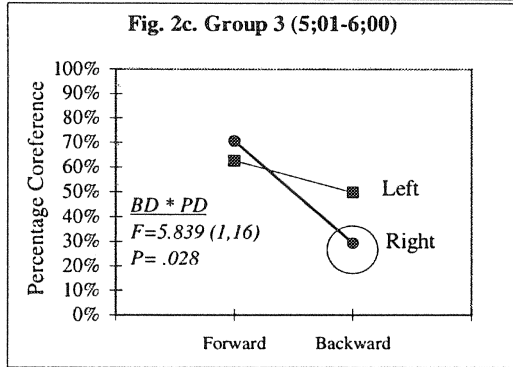
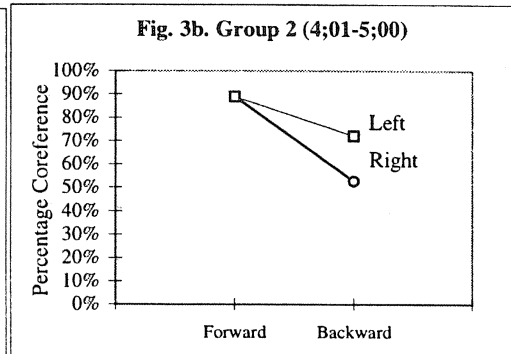
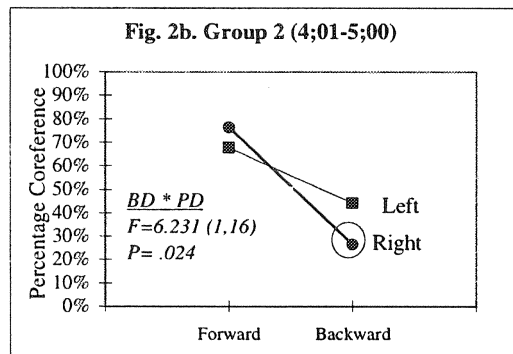
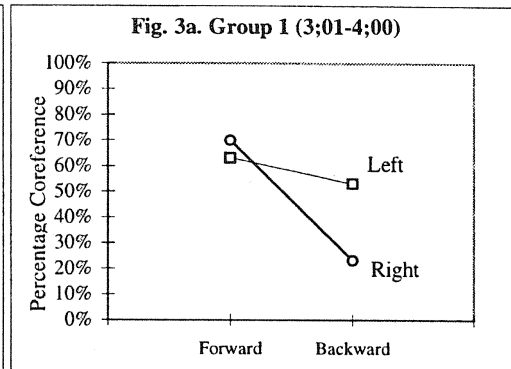
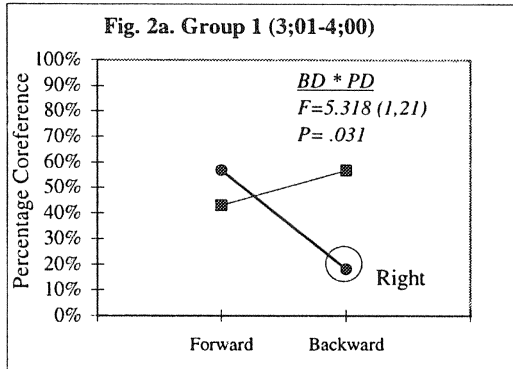
What we are seeing here is this increasing use of Pragmatic Lead, and not just the overriding of structure. The overall effect of pragmatic lead is also seen in groups 2 and 3, showing the tendency of children to become increasingly more aware of the effects of Pragmatic Lead.

While we have evidence for prediction 2 here, we also see interesting interactions with development and Pragmatic Lead.

% COREFERENCE JUDGMENT FOR LEXICAL PRONOMINAL BY PL AND AGE GROUPS

Without PL

With PL



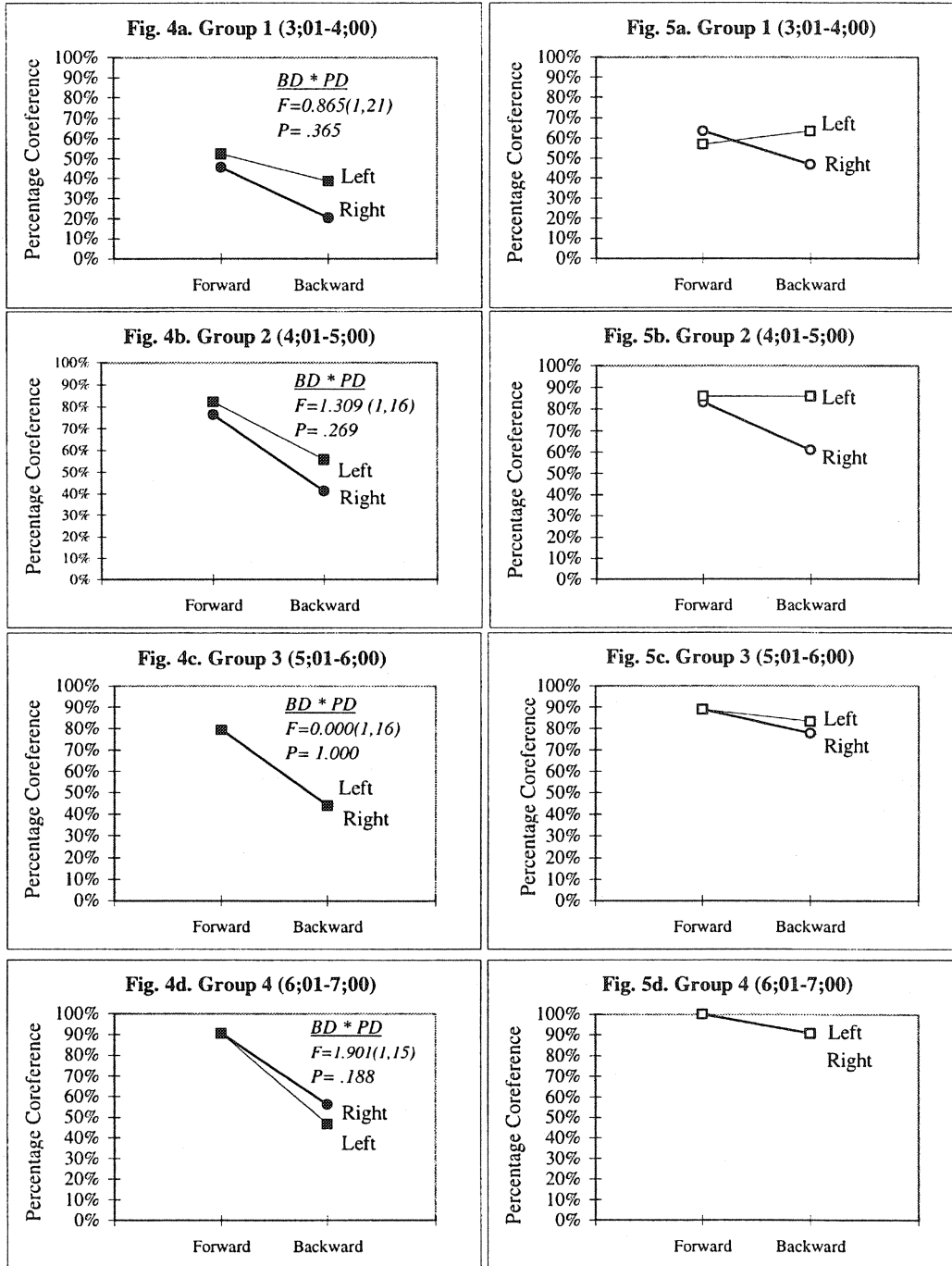
4.7.3 Prediction 3

The next group of figures 4a through 4d and 5a through 5d, show similar results for the null pronominal.

% COREFERENCE JUDGMENT FOR NULL PRONOMINAL BY PL AND AGE GROUPS

Without PL

With PL



These results have to do with prediction 3: If nulls are equivalent to lexical pronominals, predictions 1 and 2 should hold over both pronominal types equivalently.

First, we again see the interaction of precedence with structure in these figures for the null pronominal, though it is weaker here than for the lexical proform.

Second, Right Backward is again the lowest point in the first 2 groups, providing evidence for Principle C.

Third, the effect diminishes with age, which seems to again suggest that language specific effects are at play, with pragmatics playing a role.

Fourth, Pragmatic Lead again doesn't eliminate the effect of principle C, and the influence of Pragmatic Lead increases with age, as it did for lexical pronouns (seen in figures 3a through 3d.).

But again, the overall effect of Pragmatic lead manifests itself even in groups 2 and 3 as seen in figures 3a through 3d, with the strongest effect on the oldest group.

## 5. Specific Conclusions

With regard to the 3 hypotheses listed earlier, we can conclude that:

- 1) In Hindi, there is clear evidence for 'structure dependence' in general and for Principle C in particular, in the "Initial State" (an idealization, cf. footnote 1). A universal 'precedence principle', without structure-dependence, is disconfirmed. Although there is evidence for the effects of pronominal precedence, this precedence is modulated by structure, i.e., by branching direction, or 'jab' clause pre or postposing. In particular
  - a) Precedence has a significantly higher effect on Right Branching structures than on Left Branching ones.
  - b) Principle C effects show that backward pronouns are interpreted significantly more often with coreference in Left Branching sentences.
- 2) Evidence is seen for the first type of Principle C, pronominal-NP. Pragmatic context is not the sole determinant of children's pronominal interpretation in the Initial State. In fact, the effects of pragmatic context on pronominal interpretation appear to increase with development. Pragmatic context does not cancel out the effects of structure in the youngest group although it may do so in the older children.
- 3) The effects of Pr C are stronger for the lexical pronominal 'vo' than for nulls in Hindi; although in general, the effect can be seen for both pronominal types.
- 4) The effects of Principle C were seen the strongest in the youngest group though in group 4 the effects of Principle C were seen to be overridden by Pragmatic lead.

### 5.1 Cross-Linguistic Comparison

Finally, we would like to conclude with a brief comparison of the above mentioned results in Hindi with previous results of similar experiments in English by Lust, Loveland and Kornet (1980).

We will restrict ourselves to those conditions of the present Hindi study in which the pronominal type is lexical and the pronominal direction is backward. This will allow us to compare the backward lexical pronominal in the right branching sentences (where Principle C does not permit coreference) to those in the left branching sentences (where coreference is possible).

We will also take into consideration the factor of Pragmatic Lead. So we will be comparing backward lexical pronouns in left and right branching sentences in Hindi and English in the conditions both with Pragmatic lead and without Pragmatic Lead.

The Hindi sentences which concern us here are sentences 13 to 16 on Table 1. The relevant sentences used in Lust, Loveland and Kornet (1980) are as follows.

- a) When *he* closed the box, *Cookie Monster* lay down. (Left Backward Lexical Pronoun, Coreference possible)
- b) *He* turned around when *Snuffles* found the penny. (Right Backward Lexical Pronoun, Coreference not possible)

The two figures 6a and 6b show the results for Hindi and English respectively across age. In these figures, we are comparing only the lexical proform 'vo' in Hindi in the first chart, to the proform 'he' in English in the second chart below.

On the X axes, we have the age groups. In both the figures, the age range is from about 3 years to about 7 years.

On the Y axes are the percentages of coreference judgments made for right and left branching sentences with backward direction of proform (lexical).

The one commonality to be noted between the two figures is that the RBP (Right Backward Pronoun (lexical)) is the lowest line in both the graphs.

But the figures also bring up several differences.

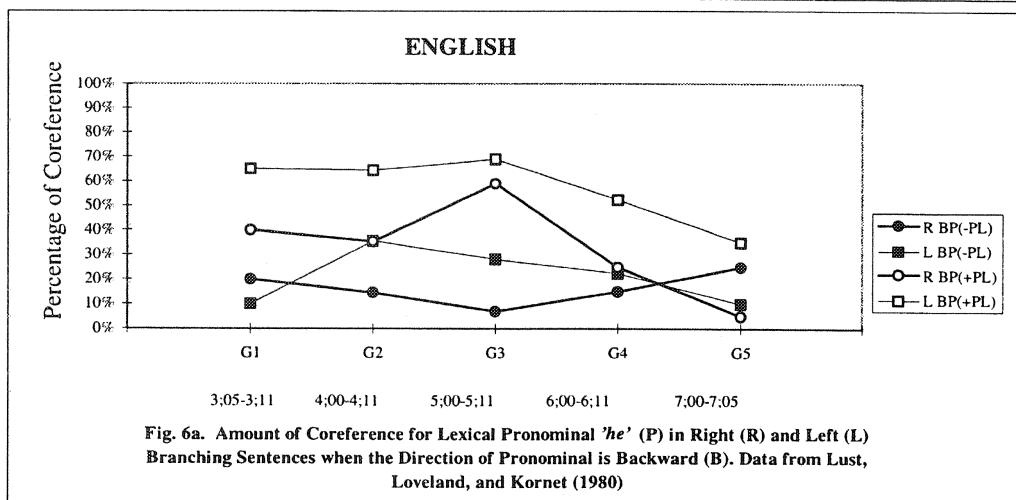
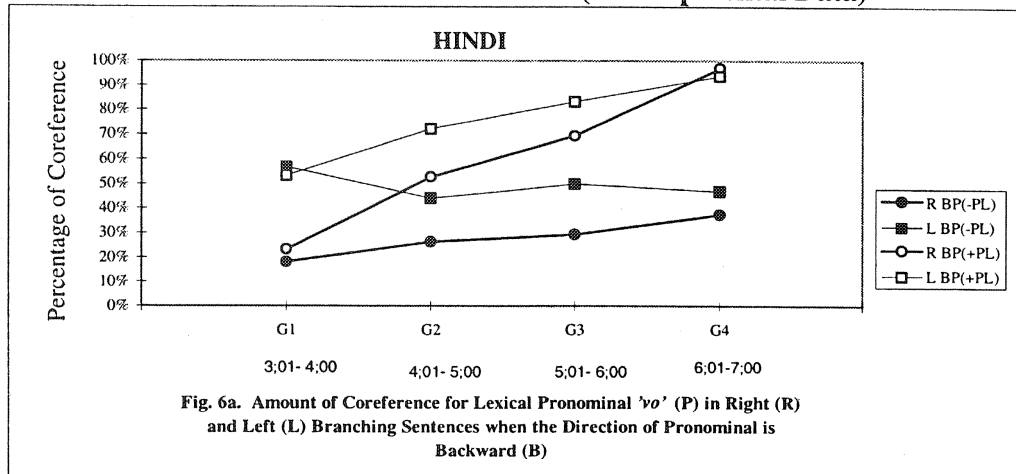
First, the total amount of coreference is much lower for the English speaking children than for the Hindi speaking ones.

Second, in the Hindi results, the younger children are not influenced by Pragmatic Lead, but the older children are. In English, the opposite trend is observed, i.e., the younger children are influenced by Pragmatic Lead, not the older children. This could be due to Language Specific factors, with Hindi adult speech being more dependent on pragmatics than is the case in English, and this is being reflected in the children's data.

Third, in English, Pragmatic Lead never overrides Principle C, whereas it does so in Hindi. In Hindi, from the second group onwards, there is a clear trend where the children in the condition with PL are increasingly interpreting more

coreference than those without PL. In English however, PL does not have this effect; Group 3 does seem to be more influenced by PL, but that does not seem to be the case with the older groups.

### Cross-linguistic Comparison of Coreference Judgments for Backward Direction of Pronominals (Developmental Data)



## 5.2 General Conclusions

These crosslinguistic results lead us to three general conclusions. The first conclusion is that we have initial crosslinguistic evidence that Principle C (Type 1 NP Pronominal) is universal. Secondly, Principle C is seen in the initial state in Hindi as well as English and is not something that is learnt over time. In fact, in Hindi, the clearest effects of Principle C are seen in the youngest group. Thirdly, in Hindi, as opposed to English, age and development override the effect of Principle C. Also, Pragmatic context has a significantly greater effect on Hindi pronominal interpretation than on English.

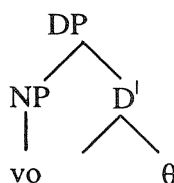
We end with some general questions and speculations about what could account for the crosslinguistic differences, and the overriding of Principle C with development in Hindi.

The first question concerns the cross-linguistic differences seen. To account for these differences, several properties of the pronominal system in Hindi, which differ from English, could be implicated:

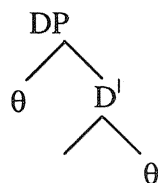
- (a) Principle C initially holds only 'partially' (type 1 only). Does this eliminate some of the positive evidence confirming the application of this principle?
- (b) The pronominal 'vo' has [+DEM] features. This may in principle force deictic (not anaphoric) reference to pragmatic context.
- (c) Null pronominals have wider, less differentiated reference to pragmatic context.
- (d) The lexicon is learned over time. Children may discern a relationship between null and lexical pronominals as argued in Lust, Chien, Chiang and Eisele (1996) for Chinese acquisition. Both types of pronominals may be related structurally.

For example,

**Tree 5. Phrase structure  
for pronominal *vo***



**Tree 6. Phrase structure  
for null pronominal**



The children may set up a contrastive system across the null and lexical types depending on the specifier type (null or lexical). (cf. Lust *et al*, 1996).

Another question that arises is: what is the reason for the overriding of Principle C effects with development in Hindi? To account for this, we can conclude that Pragmatic Learning overrides Principle C, while UG is continuous. The child has access to UG from the very beginning that we can test this. The child learns over time to take pragmatic context more fully into account, even in the neutral condition. This overrides the Principle of Grammar over time.

One may wonder whether these results could mean that UG disappears in adulthood, and is no longer available once a Specific Language Grammar is acquired. The answer to this speculation would be that UG does not disappear in adulthood (cf. Flynn and Martohardjono, 1994). What the evidence in this study shows is a strong, developing effect of pragmatic context which overrides Principle C.

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**Remarks on Anaphora in Japanese Adverbial Clauses**<sup>1</sup>  
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Barbara C. Lust, Cornell University

## 1. Introduction

In these remarks we wish to draw attention to certain properties of Japanese adverbial constructions like those in 1 and 2 below. We suggest that differences between these two constructions, hitherto unnoticed, have implications for the nature of empty categories (EC) in UG, and in particular, for a universal theory of control.

On the surface, sentence types 1 and 2 appear similar except for the fact that the adverbial constructions marked by the *to* particle in sentence 1 involve a present tense verb form, while those with *nagara* in 2 involve a non-tensed verbal stem inflection (a continuative form).<sup>2</sup> Semantically, both constructions involve temporality; i.e., an approximation of one sense of English 'when' (succession or simultaneity) in the case of *to*, and an approximation of English 'while' (simultaneity) in the case of *nagara*.<sup>3</sup>

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<sup>1</sup> James Gair provided motivation and direction for the analyses of Japanese on the basis of similar constructions in Sinhalese. James Huang provided essential theoretical and editorial comments. Reiko Mazuka and Wendy Snyder Nakajima provided critical data analyses. Zelmira Nuñez del Prado provided essential reviewer's comments. We also thank Alice Davison, John Whitman, Wayne Harbert, Louis Mangione, Tatsuko Wakayama, Akio Kamio, and Kazuyo Otani for insightful comments.

<sup>2</sup> Whether or not the 'present tense' verb form in Japanese actually reflects 'tense' is at issue (e.g. Kitagawa 1986). A past or future tense inflection is not permitted in the *to* construction regardless of main clause tense. However, this verb form can occur sentence-finally and independently in root sentences. The verbal stem of the *nagara* construction cannot. Similarly, previous research (e.g. Huang 1989, George and Kornfilt 1981) has raised the issue of whether 'tense' and 'finiteness' must be distinguished, and of what constitutes 'finiteness' universally. Huang (1989: 189) has recently suggested i:

i. "In Chinese, there is a fairly systematic distinction between finite and non-finite clauses which may be made on the basis of the potential occurrence of any element of the AUX category (such as aspect marker or a modal)."

In accord with this definition of its finite character, *to* may be inflected for potential. *Nagara* may not.

ii. Gyuunyuu ga nom-e-ru to, karada ga *zyoobu ni naru.*  
milk -nom drink-can-present when body -nom healthy become  
'(One) will become healthy if (one) can drink milk.'

iii. \*Gyuunyuu ga nom-e nagara, karada ga *zyoobu ni naru.*  
milk -nom drink-can while body -nom healthy become  
'(One) will become healthy while (one) can drink milk.'

<sup>3</sup> For sentences in 1, we initially assume an intonation wherein there is no intonational break between the sentence initial NP and the predicate immediately following it. See further discussion below. Note also that our examples, e.g. 1a, include an initial NP *ga* marking. This is intentional and consistent, given that a distinct configurational structure may characterize topicalized structures (cf. Saito 1985, Kuroda 1986, and Lust and Mazuka 1989, for example) and given that subordinate clause subjects may not involve *wa* and in some cases must involve *ga* (e.g., Inoue 1969). Although NP *ga* marking may not exclude possible topicalized status of the initial NP, it at least makes it possible that the initial NP is in adverbial clause subject position in 1a. Accordingly, in fact, NP *ga* may not be in topic position. This manipulation was necessary as we are particularly interested in relations between adverbial and main clause constructions here.

- (1)a. *Masayuki-ga gohan-o tabeowaru to,*  
 Masayuki-NOM meal-ACC eat-finish-PRESENT when  
*otya-o ireta.*  
 tea-ACC pour-PAST  
 'When Masayuki finished eating the meal, Masauki/someone else poured tea.'
- b. *gohan o tabeowaru to, Masayuki ga otya o ireta.*
- (2)a. *Masayuki ga otya o nomi nagara, okasi o*  
 Masayuki-nom tea-acc drink while sweets-acc  
*tabeta.*  
 eat-past  
 'While Masayuki was drinking tea, Masayuki ate sweets.'
- b. *otya o nomi nagara, Masayuki ga okasi o tabeta.*

## 2. The Problem

However, the sentences involving the temporal *to* construction differ from sentences involving the temporal *nagara* construction in their anaphoric possibilities in several ways.

- (i) Sentences with *to* permit lexically overt subjects to occur, as in 3.
- (3) *Masayuki ga gohan o tabeowaru to, Tosi ga/?Masayuki ga otya o ireta.*  
 'When Masayuki finished eating the meal, Tosi/?Masayuki poured tea.'

Sentences with *nagara* require empty subjects. They do not allow lexical subjects as in 4.

- (4) *\*Masayuki ga otya o nomi nagara, Tosi ga/Masayuki ga okasi o tabeta.*  
 'While Masayuki was drinking tea, Tosi/Masayuki ate sweets.'

These facts regarding the possibility for lexical subjects extend to lexical pronominals.<sup>4</sup>

- (5) a. *Masayuki<sub>i</sub> ga gohan o tabeowaru to, kare<sub>i</sub>/zibun<sub>\*i,j</sub> ga otya o ireta.*  
 'When Masayuki finished eating the meal, he/myself poured tea.'

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<sup>4</sup> Redundancy is unnatural in any case. This fact may explain the '?' on 3. "Backward" lexical pronouns may involve a pragmatically preferred noncoreferential reading, depending on the feature context and structure of the lexical pronouns. See Kuno, 1986, Huang, 1982, Lust, Chien, Chiang and Eisele, 1996, for discussion of the issue of linearity regarding lexical pronouns.

- b. *Kare<sub>i</sub> /zibun<sub>i,\*j</sub> ga gohan o tabeowaru to, Masayuki<sub>j</sub> ga otya o ireta.*

'When he/myself finished eating the meal, Masayuki poured tea.'

- (6) a. *\*Masayuki<sub>i</sub> ga otya o nomi nagara, kare<sub>i,j</sub> ga/zibun<sub>i,j</sub> ga okasi o tabeta.*
- b. *\*Kare<sub>i,j</sub> ga/zibun<sub>i,j</sub> ga otya o nomi nagara, Masayuki<sub>i</sub> ga okasi o tabeta.*

(ii) Sentences with *to* like 1, allow optional coreference between the name in the sentence and a null subject. They allow pragmatic control. Sentences with *nagara* like 2, on the other hand, require obligatory coreference with the name subject. They do not allow pragmatic control.

The above set of facts would appear to cohere with a straightforward application of the theory in Chomsky 1982, regarding a differentiation between empty category types, 'pro' and 'PRO'. That is, in Japanese, tensedness appears to instantiate finiteness. In conjunction with case theory, and the assumption that tense in INFL assigns nominative case to the subject, 1-6 follow. The EC subject in tensed *to* adjuncts behaves as a free pronoun. The EC subject in the untensed *nagara* behaves as 'PRO', and thus reflects control. The *nagara* subject in 2 would thus be thought to resemble the null subject in a paradigmatic control structure like 7.

- (7) [<sub>S</sub>Taroo<sub>i</sub> ga [[<sub>S</sub>PRO<sub>i,\*j</sub>/\*zibun-ga/\*kare-ga dekake] yooto] sita.  
 Taroo-nom self-nom he-nom to leave comp do-past  
 'Taro tried to leave.'

It would also resemble the English participle in 8a or b.

- (8) a. John saw Bill while PRO eating the meal.  
 b. While PRO eating the meal, John saw Bill.

This explanation of the facts in 1-6 is not sufficient in its simple form, however. This is because Japanese also allows control in structures which involve *pro* in governed positions ([+Tense] INFL), as in 9 (cf., Oshima 1979, 1985, 1986); (cf. also Suñer, 1984, for Spanish, and Huang, 1984, 1989, 1990 for Chinese).

- (9) [<sub>S</sub>John<sub>i</sub> ga [[<sub>S</sub>PRO<sub>i,\*j</sub>/\*zibun/\*kare ga taiheiyoo o  
 John-nom self he -nom Pacific-acc  
 oodansuru ] koto o] kokoromita] (koto...)  
 cross-present Nominal-acc attempt-past Nominal  
 '(That) John attempted to cross the Pacific (...).'

In addition, a lexical subject may appear in nonfinite, though tensed, (putative 'control') structures. In 10, for example, the embedded verb *ik* (go) cannot contain

potential *e*, and so the embedded clause can be characterized as '-finite' (cf. Huang, 1989).<sup>5</sup>

- (10) [<sub>S</sub> *Katyoo*<sub>i</sub> *ga* *Tanaka*<sub>j</sub> *ni* [[ *pro*<sub>\*i,j,\*k</sub> /  
 section chief -nom Tanaka-dat  
*kare*<sub>\*i,j,\*k</sub> (-*zisin*) *ga* *iku* ] *yooni*] *meizita*].  
 he (self)-nom go-present COMP order-past

'The section chief ordered Tanaka (for him(self)) to go.'

These facts suggest that although a distinction between control and noncontrol must be captured in Japanese, it cannot simply be explained by a simple, primitive 'PRO/pro' *ec* distinction.

### 3. A Proposed Solution

The range of facts above can be explained by postulating a configuration shown in 11 for the Japanese adverbial clause structures, and a 'Generalized Control Theory' (GCT) such as formulated in Huang 1989. Under this treatment, the two *ec* types 'PRO' and 'pro' are treated alike as members of a single category [+pronominal], with a notion of 'control domain' defined similarly for both. Whether a subject, 'pro/PRO,' is subject to control or not "is treated as a configurational matter" (Huang 1989, 201). (In 11 we do not represent an 'articulated INFL' (Pollock 1989), or an 'internal subject' (e.g., Kuroda 1986), but leave most details of structure aside which are not critical to our argument here.)

As figure 11 suggests, if the finite *to* clause is base-generated outside of IP (i.e., outside of 'Tense Phrase'), then the *ec* subject in this clause does not have a control domain, according to the definition of Control Domain in GCT. We assume here the definition of 'control domain' in Huang 1989, 193 (cf. Manzini 1983, Nishigauchi 1984; also Williams 1980, Koster 1984, Hasegawa, 1985a, b). In accord with the Binding Theory applying at S-structure and/or at LF, this *ec* is free (in a local domain). The *ec* subject in the *to* sentence may thus be assumed to be free in either 1a or 1b.

In the analysis in 11, the *nagara* clause is base-generated below IP, as an adjunct to V-bar. In this analysis, the name subject *Masayuki ga* is the subject of the main clause, but is not the subject of the *nagara* clause in a sentence like 2a. 2a is not analogous to 1a. The subject of the *nagara* clause in 2a (11) is null. If this is so, then, as the figure 11 suggests, the *ec* subject in the *nagara* clause occurs in a control domain. In this example, *Masayuki ga* c-commands the *nagara* clause subject in this domain, and thus 'controls' it. Although the analysis in 11 explains 2a in a straightforward manner, 2b is also possible. 'Control' applies either at D-structure (as Huang 1989 proposed), or at LF in accord with more recent theory, e.g., Chomsky, 1993. We may assume that *nagara* clause preposing is optional in Japanese (cf. Saito 1985 and 1990, and Fukui and Saito to appear on PP preposing,

<sup>5</sup> [+Tense] in Japanese is related to, but not identical with, [+Finite]. While a [+Finite] clause is redundantly [+Tense], allowing a lexical subject to occur, a [-Finite] clause is either [-Tense], disallowing a potential form of the verb and a lexical subject, or [+Tense], disallowing a potential form of the verb but not a lexical subject, in Japanese. [-Finite] concerns control. The control verb *kokoromiru* 'attempt' in 9 is a rare exception in that it does not allow a lexical pronoun. Verbs like *susumeru* 'recommend,' *settokusuru* 'persuade,' *iitukeru* 'tell,' *yakusokusuru* 'promise' all behave like *meizuru* 'order' in 10 in this respect.

and Kuroda 1986 on Japanese scrambling). In 2b, we assume that the *nagara* clause has been preposed from an initial position as in 11, by Chomsky-adjunction to IP-initial position, above spec of IP, where the PRO subject is no longer c-commanded by the main clause subject of IP, *Masayuki ga*. Then we can explain why the null subject maintains obligatory control in 2b as well as 2a.<sup>6</sup> Japanese 2b then provides an analogue to English 8b (cf. Huang 1989, 196-7).

#### 4. Internal Evidence for 11

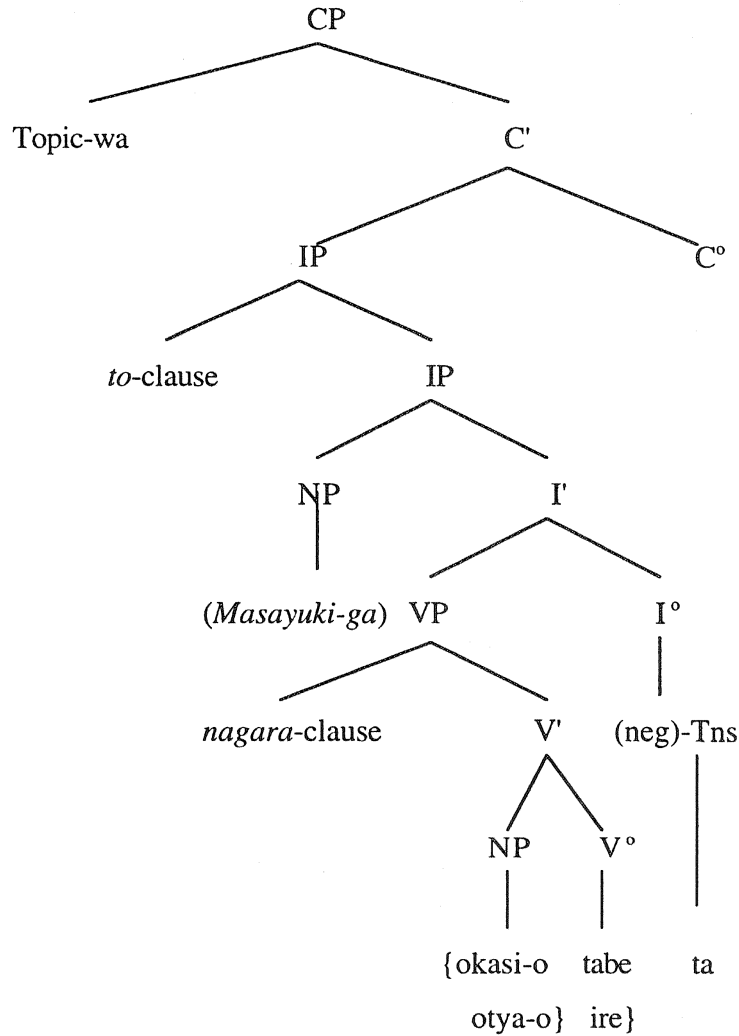
(i) A clear distinction in negation scope between *to* and *nagara* constructions can be seen in a contrast of the well-formed discourse in 12 with *nagara*, and the ill-formed one in 13 with *to*.<sup>7</sup>

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<sup>6</sup> Presumably in current linguistic theory, "control" like "binding" concerns the interface between syntax and logical form (eg., Chomsky 1993). However, the details remain to be specified concerning how reconstruction such as proposed here for 2b, or the configurational distinctions we describe, can be represented at this interface.

<sup>7</sup> Example 12 means "Tosi did not do this, namely, drinking tea while eating a meal." That is, he did not do the two activities concurrently. There are four possibilities: (a) He may have drunk tea after he ate a meal; (b) he may have eaten a meal after he had tea; (c) he did not eat a meal but he had tea; or (d) he did eat a meal but he didn't have tea. In the discourse given in 12, the second sentence excludes a, b, and d.

11.



(12) *Tosi wa/ ga gohan o tabe nagara otya o noma-naka-tta.*

Tosi-top/nom meal-acc eat while tea-acc drink-not-past

'Tosi did not drink tea while eating a meal.'

*Nani mo tabe-zu-ni otya dake nonda.*

anything eat-not tea only drank

'He drank the tea without eating anything.'

(13) *Gohan o taberu to (moo) otya o noma-nakatta.*

\**Nani mo tabe-zu-ni otya dake nonda.*

The facts in 12 and 13 can be accounted for by a plausible assumption that scope of negation is limited to the minimal S in which it is located. Negation of the main clause in 13 cannot extend beyond the main clause itself, while such negation in 12 extends to the *nagara* clause, because this is contained within the minimal S.

(ii) Further evidence for 11 is provided by the fact that Japanese native speakers judge 1a to be ambiguous. They judge it to allow an alternative analysis like 14, which involves an intonational pause after the initial NP.

(14) *Masayuki, ga, # pro<sub>i,j</sub> gohan o tabeowaru to, t<sub>i</sub> otya o ireta.*

'Masayuki, when Masayuki/someone else finished eating a meal, poured tea.'

14 allows optional coreference between subjects, although a coreferential reading with the initial NP is now strongly preferred, in contrast to 1a (where the initial reading is disjoint reference in the absence of pragmatic context). *Nagara* constructions like 2a are judged not to involve this ambiguity. (Although an intonational pause is possible after the initial NP in a structure like 2a, no distinction in preferred coreference judgement corresponds to this intonational variation). The structure in 11 allows string vacuous restructuring of the initial *to* clause subject in 1a by adjunction of the main clause subject to higher adjoined IP (or Spec of CP). The initial NP<sub>i</sub> presumably now receives a topic interpretation, explaining the preferred reading in 14.

### 5. Learnability/Acquisition: External Evidence for 11

Independent evidence for the configurational distinction between *to* and *nagara* clauses represented in 11 has been provided by previous experimental study of the first language acquisition of Japanese (Lust, Wakayama, Snyder, Mazuka and Oshima, 1985, Lust, in preparation). Experimental study of the comprehension and production of sentences like 1 and 2 by controlled factorial designs with 96 Japanese children from 3 to 5 years of age acquiring Japanese in Japan was conducted. Standardized Actout and Elicited Imitation Tasks were used. Results have shown that the young Japanese child shows early knowledge of the structural distinctions between the *to* and *nagara* constructions and the consequences for anaphora which they involve.

Briefly, in a test of comprehension, the Japanese children made significantly more coreference judgments (between the name and the null subject) for the *nagara* sentences than for the *to* sentences. This would follow if the child treated the *nagara* sentences as involving obligatory coreference (control), but the *to* sentences as optional (free). In accord with this, the presence or absence of a 'pragmatic lead' factor significantly affected the pattern of responding to the *to* sentences but not the *nagara* sentences. This would also be predicted if the children knew that the *nagara* sentences were a control structure, and *to* were not. Both of these results suggest that the child did distinguish the *to* and *nagara* sentences in terms of their control properties, or lack of them.

Even more remarkably, the Japanese children distinguished these sentence types (1 and 2) in terms of the relation between the 'a' and 'b' forms of them which we have proposed above. If 11 is correct, then the *nagara* sentence in 2b is a grammatically 'marked' construction, derived by PP preposing, where 1b is not. 2b does not differ from 2a only in surface directionality between antecedent and pronominal, but in fact involves restructuring. On the other hand, 1b, like 1a, reflects an unmarked left-branching structure (cf. Lust, in prep.). It differs from 1a only by involving 'backward' directionality of antecedent and pronominal subject. In their production, the Japanese children showed a statistically significant preference for the

"nagara" type 2a over that in 2b. In their comprehension, they also provided significantly more coreference judgments in sentences like 2a than in 2b. On the contrary, in the *to* construction, 1b was at least as unmarked as 1a in production, and there was no difference between these in coreference interpretation.

If children did not distinguish these *to* and *nagara* sentence types (1 and 2) structurally, there is no reason why they would not have treated them equivalently, given their surface similarity. If there were no structural difference between these types, it is not clear how the child could have distinguished them, given their surface similarity. If the structural differences (between 1 and 2) were not as we proposed above in 11, it is not possible to explain why the child's differentiation of the sentence types took just the form it did.<sup>8</sup>

## 6. Conclusions

Both the theory internal and external evidence above argues for the analysis in 11 in order to explain the *nagara/to* clause differences observed. At the same time it suggests that the contrast between these adverbial structures with respect to obligatoriness of control does not follow from a PRO/*pro* difference *per se*, but from a structural difference between them. It is consistent with previous proposals that have recognized that both PRO and *pro* may be subject to control (Oshima 1985, Huang 1989). The evidence is consistent with a universal GCR which derives the major properties of PRO and *pro* with regard to the configuration in which they appear (Huang 1989, 205).<sup>9</sup>

The new question raised by our analysis is: What explains the particular configuration proposed in 11? Correspondingly, what are the principles by which the child knows to establish the configuration in 11? Although the answer to this question goes beyond the scope of these remarks, we briefly speculate here. Essentially, there are two approaches to this issue. One approach is to force the finite S out of the initial IP by some form of extraposition, e.g., by a form of Stowell's 'Case Resistance Principle' (Stowell 1981, 146); cf. also Davison 1990's formulation of a 'government resistance principle' for Hindi. The CRP has been shown not to be universal, however (e.g., Plann, 1986). In Japanese some control verbs do take a tensed CP as in 10. Here the tensed CP must be c-commanded by the controller *Tanaka*, since this is a case of obligatory control. Hence the tensed CP is not extraposed out of V'/VP as in: [<sub>VP</sub>[<sub>V</sub>Tanaka<sub>j</sub> ni [<sub>CP</sub>[<sub>IP</sub> *pro*<sub>j</sub>/kare<sub>j</sub> (-zisin) ga ik-u]yoon<sub>i</sub>] meizita]], a violation of the CRP.

<sup>8</sup> In fact, it was the results of our experimental study of first language acquisition which motivated us to further linguistic study of the *to/nagara* distinctions and to the reanalysis of these structures which we report here. See also Gair et al. 1989 for similar results and motivation in Sinhalese.

<sup>9</sup> Oshima, 1986, has argued that GCR appears not to hold in Japanese, due to data like the following in Japanese, which suggests the presence of an object 'pro' in Japanese. Since Japanese does not have object agreement, it does not provide a control domain for the object in Huang's proposal, and thus the object (eg in i) should be required to be a variable, as in Chinese.

i. Tanaka-san<sub>i</sub> ga [<sub>s</sub> sensei<sub>j</sub> ni [<sub>VP</sub> *pro*<sub>i</sub> sikar]]-are -ta.  
Tanaka-Mr.-nom teacher dat scold-have (Passive) past

'Mr. Tanaka<sub>i</sub> had the teacher scold him<sub>i</sub>,' or 'Mr. Tanaka was scolded by the teacher.'

Huang (pc) has argued, however, that the fact that Japanese has scrambling would allow i to be analyzed as ii, where the object is in fact a variable:

ii. Tanaka-san<sub>i</sub> ga [<sub>PRO</sub><sub>i</sub> [<sub>s</sub> sensei<sub>j</sub> ni [<sub>VP</sub> *t*<sub>i</sub> sikar]]-areta].

Alternatively, a more general theory involving 'functional' determination of empty categories (eg., Bouchard 1984) may be correct.

In fact, extraposition of the finite S need not be stipulated or derived for Japanese, if we simply assume that Japanese has base-generated pre-IP adverbial clauses, while English has base-generated post-IP adverbial clauses in keeping with its head direction (cf., Haegemann, 1984 for specific analysis of the English structure, Kuno 1973; Huang 1989, and Fukui and Saito to appear for relevant discussion).<sup>10</sup>

Another approach is to force the nonfinite clause by some form of 'intraposition' within IP to its unmarked position. Intuitively, the nonfinite, tenseless *nagara* clause may in some sense 'require' tense specification in a way which requires its adjunction to a verb projection (or tense assigner). If we may assume a feature content to Infl, as proposed recently by Huang (1990), then a type of INFL feature agreement may determine the structural positions we have identified for both finite and nonfinite clauses. In this case, the child need only 'match' INFL features in order to establish the tree in 11 as unmarked.

The question would remain, however: why is such feature matching forced in Japanese?<sup>11</sup>

### \*8. Postscript

The analysis of *nagara* in this paper consistently involves the temporal *nagara* construction meaning 'while' with implied simultaneity between the clauses. It has been pointed out (Mazuka, pc.) that a distinct *nagara* construction exists in Japanese with the adversative or concessive meaning of 'even though' or 'although.' This adversative *nagara* is distinct in its syntactic properties, although like the 'simultaneous *nagara*' it is apparently tenseless. For example, it allows distinct NP subjects as in 15 or 16 and overt pronoun as in 17. It is not restricted to subject antecedents for its null subject.

- |      |                  |                 |                       |                |                   |
|------|------------------|-----------------|-----------------------|----------------|-------------------|
| (15) | <i>Musume ga</i> | <i>nusumi o</i> | <i>hataraitte oki</i> | <i>nagara,</i> | <i>hahaoya wa</i> |
|      | daughter-nom     | theft-acc       | committed             | while          | mother-top        |

<sup>10</sup> In English, "the view that such clausal adjuncts are base-generated postverbally, (is) a view consistent with the fact that English is essentially a head-initial language" (Huang 1989, 197). Correspondingly, the view that clausal adjuncts are base-generated preverbally in Japanese is consistent with the head-final nature of this language (cf. Fukui and Saito to appear). (The proposed structure for *to* clauses corresponds to that proposed for Japanese by Kuno 1973, 1986, and to that proposed for English preposed adverbial subordinate clauses by Reinhart, e.g. 1976).

<sup>11</sup> Here we can only speculate further. For example, consider Kuroda's (1986) analysis of Japanese as a language in which, parametrically, 'Agreement' and case marking as a special form of agreement, "is not forced". In this case, Spec of V is not required to move to Spec of I, in either finite or nonfinite sentences, and Spec of I (subject) may be left open. At the same time, by UG, base categories Agree with (or Case-mark) a position (either a Spec position for the nonlexical base categories, C and I, or an 'object for lexical categories V and P') (19). "...if the language is not a forced Agreement language, that position may be left vacant or may be occupied by a maximal category devoid of the expected Agreement (case-marking)" (19). The '*nagara* clauses' may reflect a maximal category occurring in Spec of VP. The *nagara* clauses then may be subject to 'abstract agreement' determined by UG, assigned by the head, i.e., V Zero (bound to Infl, -Tense). They may "occupy a structural position for agreement" (36) which involves matching of Infl features. This would force their adjacency to the main clause verb in unmarked position.

Alternatively, if Japanese differs from English in that "nominative case is not licensed in a spec-head agreement in Japanese" "but contextually in any argument phrase immediately dominated by a projection of I," (Fukui and Saito, to appear p. 14) then a completely different approach may be necessary.

*hazukasige mo naku kyookai e itta.*  
 without shame church-to went

'Even though the daughter committed theft, the mother went to church  
 shamelessly.'

- (16) *Daitooryoo ga zyooyaku ni tyooiin site oki nagara, Amerika wa*  
 president-nom treaty-dat signing did while U.S. -top  
*zyooyaku o mamoranakatta.*  
 treaty-acc observe-not-past

'Even though the president signed the treaty, the U.S. did not observe the  
 treaty.'

- (17) *Tuma ga wairo o uketotte oki nagara, kare wa*  
 wife -nom bribe-acc received while, he -top  
*muzitu o syutyoosita*  
 innocence-acc insisted

'Even though his wife received the bribe, he insisted on his innocence.'

The adversative/concessive 'nagara,' which involves a continuative/ perfective verb stem, may also be inflected for potential, as in 18, in contrast to the simultaneous 'nagara,' suggesting that it here takes on [+finite] features.

- (18) *Mada takusan wa tabe rare nai nagara, sukosizutu*  
 yet much -top eat neg while gradually  
*syokuzi mo dekiru yooni narimasita.*  
 meal can COMP became

'Even though (I) cannot eat much yet, (I) have become able to eat meals  
 gradually.'

On our analysis, this complementary set of facts suggest that the adversative/ concessive *nagara* must involve a distinct configurational structure from the simultaneous temporal *nagara* we have studied above. Its [+finite] features motivate an IP-adjunction similar to our analysis for *to* clause. The distinction in the two *nagaras*' shows clearly that the syntactic phenomena we have identified cannot

be based on lexicon alone.<sup>12</sup> (Gair et al 1989 discuss a similar effect with the *la* construction in Sinhala, another left-branching language.)

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<sup>12</sup> This issue of two 'nagaras' deserves further study. An analysis of *nagara* which does not distinguish these two types of *nagara* construction (e.g., Perlmutter, 1984), however, must be qualified accordingly. It has come to our attention that Dubinsky 1985 does distinguish these. Dubinsky refers to a 'DO-nagara' (i.e., the control (simultaneous) *nagara* we have identified); and a 'BE-nagara' corresponding to the latter absolutive/concessive type. In a relational grammar framework he identifies the obligatory subject control for the 'DO-nagara': "the controller of equi in a DO-nagara clause must be a P-final 1" (214). He identifies the 'BE-nagara' as less constrained: "The controller of equi in a BE-nagara clause must head a term arc" (52). Dubinsky proposes a correlation between stative properties of main clause verb and choice of *nagara* type. For example, he suggests that "a *nagara* clause of any morphological type will be interpreted as a *BE-nagara* clause if the main predicate is stative or punctual in meaning. One cannot 'understand something' or 'be able to do something' while doing something..." (52, fn. 20). (We thank John Whitman for pointing out this analysis to us.) In our remarks, we have presented a structural explanation for these control facts. This structure explains not only the choice of controller, but the range of syntactic facts connected with this choice. Examples like 15-17 above, which do not involve stative main clause predicates, but do involve what Dubinsky has called, 'Be *nagara* predicates' would suggest that a semantic correlation does not hold absolutely; but a full consideration of this issue would require further study beyond these remarks.

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## Why Japanese Object to L2 Objects

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### 1. Introduction

Recently, there have been some promising, if still exploratory efforts to incorporate insights and findings of current linguistic theory, and particularly the principles and parameters approach as exemplified in Chomsky (1981) and subsequent work, into research in second language acquisition (as represented, for example, in Flynn (1984, 1987), White (1989), and several papers in Flynn and O'Neil (1988)). Two fundamental questions facing such research are the availability of Universal Grammar (UG) to L2 learners and the nature and extent of "interference" or "transfer" i.e., the manner in which the specific first language (L1) affects the acquisition of second language (L2).<sup>1</sup>

Even among those who acknowledge the function of UG in first language acquisition, there is a difference of opinion in regard to its availability to L2 learners. One group, including those cited above, holds that UG is indeed available and forms the basis of L2 acquisition. Others, such as Schachter (1988), Bley-Vroman (1989), and Clahsen and Muysken (1986) hold that it is not, and that L2 acquisition is thus fundamentally different from L1. The view that UG is present, but in some way attenuated, has also been expressed (Johnson (1988), Johnson and Newport (1989)). For those who argue that UG is indeed available, L1 interference, i.e., differential effects of L1 correlating with different L1s, would appear to be an embarrassment, since at the very least such effects would suggest that the L1 and L2 acquisition processes are distinct in a fundamental way. When such L1 linked differences relate to the acquisition of features relating to fundamental principles of UG, such as subadjacency or the content and binding properties of empty categories, the question naturally arises as to why they should occur if UG is available and functional.

Among the attempts to reconcile this opposition by accounting for L1 effects within the continued availability of UG, two experimental studies are of particular relevance. Flynn (1984 and subsequent work) concentrated on the necessity to reset parameters,<sup>2</sup> especially with regard to head direction. Martohardjono and Gair ((1989), expanded in Martohardjono (1992)) propose that though UG is available to the learner, it cannot function with regard to some phenomena until the learner has made the necessary identification of L2 elements; in particular, the proper identification of empty categories, when these appear to differ from those of the L1. These proposals are clearly complementary not contradictory, and in this paper we report on some experimental results that seem to support even further their general approach.

### 2. Experimental data for this paper

The head direction explanation embodied in Flynn's work predicts, among other things, that speakers of Relative Clause (RC) + Head (head final) languages will

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<sup>1</sup> On the general nature of transfer see for example Odlin 1989, Gass and Schachter 1989, Cook 1991 and references therein.

<sup>2</sup> To reset parameters in this context means to assign a new value to a parameter when the L1 and L2 values do not match.

have more trouble learning English relative clause structures than Head + RC (head initial) speakers, and subsequent research has borne this out. One study in particular, by Flynn and Brown (1989) is relevant here, and forms the data for this paper. The experiment was designed using Japanese, Chinese and Spanish speaking learners of English as a second language so as to isolate the factors of branching direction (RC+head for Chinese and Japanese vs. head+RC for Spanish), and constituent order (VO for Spanish and Chinese vs. OV for Japanese). The subjects were ranked divided into high, medium and low groups on the basis of a widely used standardized placement test from the University of Michigan. The experimental procedure followed was an imitation task (for an analysis and justification of this procedure, see Lust, Chien and Flynn, 1987). Examples of stimulus sentences are given in (1) : The function of the head within the matrix sentence precedes the slash; that of the relativized element within the relative clause follows it.

- (1) a. S/S: The policeman who called the gentleman answered the student.  
 b. S/O: The policeman who the student called greeted the businessman.  
 c. O/S: The boss introduced the gentleman who questioned the lawyer.  
 d. O/O: The diplomat questioned the gentleman who the student called.

## 2.1. Results

The overall results came out as predicted, as reported in Flynn and Brown 1989. The essential data are shown in Table 1. The gross differences between the groups are instantly apparent by comparing the Overall cells in the lower right corner of each language group which show, as means for correct responses: Spanish L1: 1.40; Japanese L1: .41; Chinese L1: .70. It is clear that both Chinese and Japanese speakers perform less well than Spanish speakers, bearing out the prediction made on the basis of L1 vs. L2 head direction.

**TABLE 1**  
 Level Means for Amount Correct (Score Range 0-3)

LANGUAGE GROUP	SS	SO	OS	OO	OVERALL
<b>Spanish</b>					
Low (n=16)	.63	.69	.38	.75	.61
Mid (n=21)	2.19	1.33	1.00	1.76	1.57
High (n=14)	2.57	1.93	1.50	2.20	2.05
Overall (n=51)	1.80	1.32	.96	1.51	1.40

<b>Japanese</b>					
Low (n=7)	.14	.00	.29	.14	.14
Mid (n=25)	.64	.16	.20	.12	.28
High (n=21)	1.28	.48	.90	.67	.83
Overall (n=53)	.69	.21	.46	.31	.41
<b>Chinese</b>					
Low (n=11)	.00	.09	.09	.09	.07
Mid (n=20)	.55	.60	.55	.65	.59
High (n=29)	1.27	1.66	1.14	1.69	1.44
Overall (n=60)	.61	.78	.59	.81	.70

However, those averages show also that the Japanese speakers perform decidedly less well than the Chinese, and this is true for all competence levels except the lowest, where the numbers for both are small. This sharp difference is not accounted for by directionality of the head of the relative expression, which matches for these two L1s *vis à vis* Spanish and require explanation. When we look at the content of the difference more closely, however, in terms of different relativization structures as shown in the table, some interesting and suggestive differences appear. It is clear that a significant proportion of the gross difference in attainment is accounted for by a strong preference on the part of the Japanese speakers for subject gaps in relative clauses, and a corresponding difficulty with object gaps. This holds for SO and SS as well as OO/OS. It does seem to be modulated slightly by a preference for parallel grammatical functions (SS or OO), within each of XS and XO, but the difference between XS and XO is striking. We will see later that this preference for subject is carried over into the type of errors made as well as their number.

In contrast, Chinese speakers actually exhibit a bias toward object gaps over subject, but even a casual inspection of the table will reveal that the strength of this preference is nowhere near that of the subject preference for the Japanese speakers. At this point we note that the Spanish speakers exhibit a similar pattern to the Chinese at the earliest stages, but then develop a marked preference for parallel structures (SS or OO).

Thus we have a clear example of L1 interference in the general sense, since the obvious difference between the groups showing markedly different L2 learning characteristics is their L1. The question then arises as to what the crucial L1 differences are and what general principles are involved.

### 3. Discussion

Here, we will attempt to provide an explanation for those differences, showing that they cast further light on both the abstract nature of "transfer" and the relevance to L2 acquisition of some basic principles developed in current linguistic theory.

Some possible explanations can be rejected quickly: The order of head and relative clause cannot be a factor in the different performance of the Japanese vs. the

Chinese speakers, since the order of relative clause and head is the same for both sets of speakers, though as noted above it does operate for both *vis-à-vis* Spanish speakers. The difference also cannot be accounted for in terms of some sort of accessibility hierarchy in terms of grammatical function (as in Keenan and Comrie 1977), since that would, if extended to acquisition, predict that the subject is easier for all learners to acquire, which is true for the Japanese learners, but not the others; the very fact that we are attempting to explain.

Nor can the explanation hinge on a preference for parallel structure (that is, SS and OO *vs.* SO and OS), since it is clearly an intersecting factor WITHIN the Japanese preference for subjects and difficulty with objects. A simple explanation on the basis of surface linearity of elements within the relative clause will also not suffice. The order of lexically realized major constituents within a relative clause with a relativized object is [NP<sub>(subject)</sub> V] for the English target L2 as well as for both L1s; in fact for all three L1s in the experiment. However, as we shall see subsequently, something of the kind is a factor, but operating in a more complex way, linked with more abstract, UG related, processes.

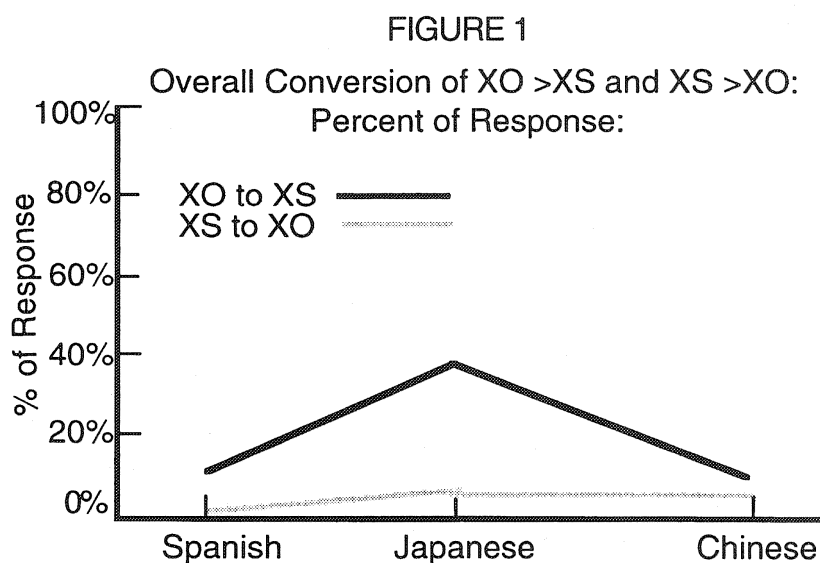
Before attempting an explanation for the general difficulty that Japanese learners have as compared to the Chinese in dealing with object relativization, we must note one other very interesting difference in the kinds of errors made: specifically in regard to conversion to other structures. Beginners of both backgrounds have difficulty in manipulating two clause forms, i.e., in maintaining two clause forms in their imitations, and may respond with a single clause. Thus the stimulus sentence "The policeman questioned the man who carried the baby" may elicit responses such as "The policeman questioned the man" or "Who carried the baby" (for examples, see Flynn and Brown 1989). The Spanish speakers have less of these at all levels, again reflecting the branching direction effect, and the Japanese learners do somewhat less well than the Chinese at all levels in terms of percent of response.<sup>3</sup>

When the learners do get to the two clause response stage, however, they make some interesting errors, particularly in conversions of relative clauses to other structures, especially coordinate structures. Thus the stimulus sentence "The policeman questioned the man who carried the baby" may elicit "The policeman questioned the man and the policeman carried the baby" or "The policeman questioned the man and carried the baby." We have nothing further to say about such conversions, here, beyond noting that all three groups of language learners do them (for details, see Flynn *in press*). Of special interest here, however, is another type of conversion: responding with different exemplars of the same structures, so that the grammatical relations of the stimulus are changed in the imitation; i.e., converting for example SX → OX, OX → SX, XO → XS, or XS → XO. Note that the first two of these conversions involve changing the grammatical relation of the head, and again we have nothing more to say about those. The second pair, however involve changing the grammatical function relation of the relativized item within the relative clause. Examples with matrix subject heads are given in (2):

<sup>3</sup> All three groups of speakers make more conversions on the XO relatives than on the XS relatives at the beginning levels: in terms of percent of response: Span. XS=22% , XO=26%/ Jap: XS= 60%, XO=86%/ Chin.: XS=46%, XO=72%. Note that at this level, the percentage of XO/XS errors is actually somewhat higher for the Chinese than the Japanese: 1.57 vs 1.43, though the total number is much higher for the Japanese: Jap:79%/Chin:65%. This is consistent with our claim, stated later in this paper, that a certain degree of attainment is a prerequisite for the kind of difference that primarily concerns us here.

- (2) a. Stimulus: Subject/Object: The policeman [who the student called] greeted the businessman.  
Response: Subject/Subject: The policeman [who called the student] greeted the businessman.
- b. Stimulus: Subject/Subject: The policeman [who called the gentleman] answered the student.  
Response: Subject/Object: The policeman [who the gentleman called] answered the student.

Here we find another sharp difference between Chinese and Japanese speakers, and between the performance of the groups on different kinds of conversions. Figure 1 shows the percentage of response for XO to XS and XS to XO conversions.



It is evident that while all L1 groups make a small number of XS >XO conversions and more XO > XS conversions, the Japanese make far more of the latter type than the others. Breaking it down more finely, the overall percentages by type within XO >XS for the Japanese speakers are: SO >SS 38%; OO >OS 20%. Again there is a bias for parallel structure, but even allowing for that, XO to XS errors are clearly much higher for the Japanese than the others. Note that such conversions represent a major change, since they involve changing the basic meaning. Also, these errors increase as the group is more advanced. Clearly, the learners have to have sufficient control over the embedding structure to produce their responses. However, although those responses are wrong as imitations, they are grammatically correct, both in themselves, and in terms of the general target

structure. Determining why this should be the case obviously requires a bit more complex explanation than a simple preference for subject relativization.

Though, as stated earlier, straight transfer maintaining the linear order of the L1 is ruled out, and in fact is strongly contra-indicated. However, when looked at differently, the internal order of elements within the relative clause can be seen as a factor. We note that the internal order of X/O relative expressions in the three languages is as in (3):

- (3) English: NP [who NP<sub>(subj)</sub> V]  
 Japanese: [NP<sub>(subj)</sub> V] NP  
 Chinese: [NP<sub>(subj)</sub> V de<sub>(COMP)</sub>] NP

Neither Chinese nor Japanese has an overt Wh form in relative clauses, but when we look at the internal order of the Relative clause in English, we see that when the Wh form is included, it is [NP NP V]. It is thus arguable that the Japanese learners are interpreting this in a Japanese fashion, taking it as representing S O V order, and thus reinterpreting the grammatical functions of the constituents on the basis of their L1. Also, even though Japanese lacks an overt Wh form in relative clauses, this would be the unmarked order of a Japanese question with a Wh subject, as in (4). Note that such interference in interpretation cannot be a factor for English subject relatives, which have an NP following the verb, a quite un-Japanese order.

- (4) Japanese Wh subject question  
*dare-ga hon-o kaimasita ka*  
 who-NOM book-ACC bought (Polite) Q  
 ‘Who bought the book?’

The situation for the Chinese learners is, of course, quite different. For them, the entire structure including Wh would be different from Chinese, but the difference lies in the occurrence of a Wh form, with the remainder of the constituents having the same order as in the L1. Thus ignoring Wh in both types of relatives would produce an internal order matching Chinese for both subject and object relatives, a cross-language match that is lacking for the Japanese speakers.

In sum, the account that we have offered so far suggests that the difference in performance between the Chinese and Japanese speakers on object relativization is a function of L1/L2 matching such that the Japanese apply an SOV interpretation strategy, while parallels between Chinese and English do not induce such errors in the Chinese speakers. This is inherently plausible, but it is actually little more than a description, requiring a further, more abstract explanation.

#### 4. Our proposal

Essentially, what we will claim is that there are more abstract properties that would help in the correct identifications of the relative clauses on the part of the Chinese speakers, or at least cause less difficulty for them than for the Japanese. For a full explanation, at least two questions in particular require answers. First, the account as it stands hinges on the Japanese speakers including the Wh form as an argument, while the Chinese speakers do not count it in or at least deal with it differently. Second, the Japanese learners making the XO>XS conversion, even if they make the suggested error of interpretation, do in fact produce a grammatically correct object-final English structure in their response.

The key to these problems appears when we repeat (3) above, but include the relevant empty categories, as in (5):

- (5) English: NP [who NP<sub>(subj)</sub> V *e* (obj)]  
 Japanese: [NP<sub>(subj)</sub> *e* (obj) V] NP  
 Chinese: [NP<sub>(subj)</sub> V *e* (obj) de<sub>(COMP)</sub>] NP

English and Chinese are head initial in VPs, and are thus standardly assumed to have proper government of objects (and thus also canonical government as in Kayne 1983) to the right, allowing *ecs* in that position without an ECP violation. For Japanese, however, the situation is precisely the reverse: it has leftward proper (and canonical) government, and thus object *ecs* to the left. Crucially, within Japanese such an *ec* to the right, would constitute an obvious ECP violation. What we would suggest here, then, is that the key to an explanation for the general difficulties that the Japanese learners exhibit with object relative clauses in comparison with the Chinese lies here. They can, in fact, produce a lexically realized NP in this position; they do so in their converted responses as well as in subject relatives. Here, however, there is ample surface evidence available, and they require only to learn that English overt objects are in that position; they have learned that English transitive verbs require objects to the right. Recall also that they are at a stage where they have managed to overcome difficulties with the order of relative clause and head. What they cannot do is deal with an empty category to the right of the verb, which from the perspective of Japanese would be illicit as an ECP violation. In short, in changing XO to XS, they do not so much as change the grammatical function of the gap within the object relative clause, but rather fail to recognize its existence. This could be a factor in their interpretation of the stimuli, forcing the S O V interpretation.

The Chinese, on the other hand, have no such problem with the same stimuli. They have no difficulty with the rightward *ec*, found also in Chinese, and can thus allow this to bear the object theta role. All that they need to acquire is the formation of a chain with the initial Wh, which is facilitated by general principles of UG relating to A-bar binding. The theta criterion is also relevant here. For the Chinese learners, this would be satisfied by that chain, and they have no need to count the Wh form as a separate argument. For the Japanese, however, the disallowing of the *ec* could be a factor in their counting both NPs as arguments, and in fact the theta criterion virtually forces that result.

While this latter point may at first glance seem speculative, it does seem plausible and consistent with the rest as an explanation. It is no surprise that learners would have more difficulty with invisible elements that differ from those in their language and thus we would find a disparity in their competence in structures involving them, in contradistinction to those involving lexically realized forms. Although it is indeed the case, that the presence and distribution of *ecs* must be inferred on the basis of lexically realized elements, that connection for L2 learners is not a straightforward, simple linkage, by which the distribution and nature of *ecs* is immediately and transparently accessible from the lexically realized forms and their positions. There is ample material in the theory-linked L2 literature that attests to this greater difficulty for *ecs* of various types than for surface forms (see, for example, the Martohardjono and Gair (1989) paper cited earlier).

Recall in this connection that the XO > XS conversions required a level of attainment sufficient to deal with two-clause structures. Also, the disparity between performance on XO vs XS relatives persists at all levels tested, though it decreases with level, as Table 2, shows in terms of the percentages of correct XO to XS by

level. What this suggests is that the Japanese speakers are sensitive to the fact that the object gap is not where it is in Japanese, and increasingly able to deal with a rightward *ec* requiring government in that position but it takes considerable time to work it out.

TABLE 2

Level Means for Amount Correct: Japanese Language Group (Score Range 0-3)

	XS	XO	% XO/XS
Low (n=7)	.215	.007	3.3
Mid (n=25)	.42	.14	33.3
High (n=21)	1.09	.57	52.3
Overall (n=53)	.26	.575	45.2

What we are proposing, then, is that the first language can influence the possible occurrence of *ecs* in L2, in this case specifically with regard to direction of government, thus leading to a kind of “cross language ECP” effect. Ultimately, of course, the successful learner does manage to recognize and deal with the *ecs* involved, in this case by setting the direction of government.<sup>4</sup> The experiment that provided the data here was not designed to test this specifically by seeking correlations with other linked phenomena, but we expect to pursue it further experimentally.

Looked at in these terms, the apparent interference showing up in the data is consistent with the presence of UG in the L2 acquisition process, and in fact our explanation requires it. Our analysis here involves the same general line of investigation and is consistent with the results in Martohardjono and Gair (1989). That study proposed, on the basis of experimental evidence from Indonesian L1 speakers learning English, that the apparent failure of UG was the result not of its absence in the L2 acquisition situation, but of the learners not yet making the necessary identification of empty categories (in that instance, *Wh* trace vs. *pro*) for the relevant principles could apply. In the present case, what the Japanese learners must acquire is the possible presence of a bound empty category to the right of the verb, which in turn hinges on dealing with a reversed government direction. On the other hand, the Chinese only require to identify the overt binder. What is common to

<sup>4</sup> One reviewer raised the question as to why, if Japanese speakers assign an SOV structure to the relative clause, don't they assign a similar SOV structure in dealing with the *ec*, thus simply generating the structure NP [who NP (subj) [e] (obj) V], and so satisfying their version of the ECP. There are three points to be made here. First, the SOV strategy was suggested for comprehension, thus explaining the interpretation of an object as a subject, and we can only guess as to the intervening steps to production, which produced grammatical, non-SOV outputs. Secondly, the conversions at issue are only a part of the comparative general difficulty with object relatives for which we are attempting to provide a general account. Thirdly, if a speaker were to employ the strategy suggested, there would have to be recognition that the *Wh* form was binding the (object) *ec*, even if the *ec* were in the wrong position. In that case, the interpretation would be correct, and so, presumably, would be the output, so that we would have no way of seeing the effects. What we are attempting to explain is the higher proportional number of errors that are indeed visible.

both the earlier and the present studies is the claim that UG may apply in L2 acquisition, but that there may be specific, L1 related prerequisites to its application. In the cases at issue, these prerequisites consist in identifying either the nature or the possible occurrences of empty categories within the target language, for which surface evidence is lacking or at best indirect. Thus these studies add to the growing body of evidence that demonstrates that the abstract elements and principles of the kind that current linguistic theory proposes are involved in L2 as well as L1 acquisition, but in ways that are at least partially different in that (at least in this case) the principle is being instantiated in one language (English) in a manner which is modulated by the knowledge of another language (Japanese).

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## A Note on the Acquisition of Scrambling in Japanese

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### 1. Introduction

In this paper, I argue that at least one type of intra-clausal scrambling in Japanese is available by at least at the age of two years, five months by comparing the results of Hayashibe (1975), Otsu (1994), Iwatate (1981), and Lakshmanan and Ozeki (1996).

The canonical word order in Japanese is SOV, but objects can be scrambled and other orders are also possible since Japanese has overt case marking. The examples are as follows:

(1) a. *Taroo-ga Naomi-o yonda.*

Taroo-NOM Naomi-ACC call-PAST

'Taroo called Naomi.'

b. *Taroo-ga Naomi-ni hana-o ageta.*

Taroo-NOM Naomi-DAT flower-ACC give-PAST

'Taroo gave a flower to Naomi.'

(2) a. *Naomi-o Taroo-ga yonda.*

Naomi-ACC Taroo-NOM call-PAST

'Taroo called Naomi.'

b. *Taroo-ga hana-o Naomi-ni ageta.*

*Hana-o Taroo-ga Naomi-ni ageta.*

*Hana-o Naomi-ni Taroo-ga ageta.*

*Naomi-ni Taroo-ga hana-o ageta.*

*Naomi-ni hana-o Taroo-ga ageta.*

In (1), the word order is SOV, which is canonical. Subjects are normally marked by the nominative case marker *-ga*, direct objects of transitive verbs are marked by the accusative case marker *-o*, and indirect objects are marked by the dative case

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marker *-ni*.

(2a) is a scrambled version of (1a), in which the direct object *Naomi-o* is scrambled before the subject *Taroo-ga*. The sentences in (2b) are scrambled versions of (1b). In this paper, I will only deal with the type of scrambling found in (2a).

It has been argued that there is a period in development where first language learners of Japanese tend to interpret scrambled sentences as nonscrambled sentences. Hayashibe (1975) reports that among the subjects he has tested, the oldest child who shows that tendency is 5;10 (years;months). This might suggest that a child's grammar until around the age of five lacks grammatical knowledge of scrambling.

Recently, however, Otsu (1994) gives different results from Hayashibe (1975) and argues that intra-clausal scrambling can be found in the grammar of three-year-olds, and possibly in that of younger children. In contrast, Lakshmanan and Ozeki (1996) argue that scrambling is probably available at the age of three, but according to their results, it is not available prior to 2;6.

In this paper, I will argue that scrambling is probably available by at least around 2;5, contrary to Lakshmanan and Ozeki's (1996) claim. First I will point out that the experiments and the results in Lakshmanan and Ozeki (1996) do not conclusively confirm a lack of grammatical knowledge of intra-clausal scrambling. Then, based on Iwatate (1981), I will show that intra-clausal scrambling can be seen in the natural speech of children around 2;5. This fact has already been pointed out in Otsu (1994) by using the data of Iwatate (1981).

The organization of this paper is as follows. In section 2, I will review Hayashibe (1975), Otsu (1994), and Lakshmanan and Ozeki (1996). In section 3, I will argue that intra-clausal scrambling is probably available by at least around 2;5 based on the production data shown in Iwatate (1981). Section 4 is the conclusion.

## **2. Review of Hayashibe (1975), Otsu (1994) and Lakshmanan and Ozeki (1996)**

### **2.1 Hayashibe (1975)**

Hayashibe (1975) tested 30 children between 3;1 and 5;10. Each subject was presented with 12 nonscrambled sentences like (3a) and 12 scrambled sentences like (3b), and was asked to show the meaning of these sentences in a toy-moving (act out) task.

- (3) a. *kame-ga ahiru-o osu*  
 turtle-NOM duck-ACC push  
 'A/The turtle pushes a/the duck.'
- b. *ahiru-o kame-ga osu*  
 duck-ACC turtle-NOM push  
 'A/The turtle pushes a/the duck.'

Among the 30 subjects he tested, 10 subjects seemed to understand nonscrambled sentences like (3a) (i.e., AGENT-PATIENT-VERB order) but gave wrong responses to scrambled sentences like (3b) (i.e., PATIENT-AGENT-VERB order). The average age of these 10 subjects was 4;9. The youngest was 3;4 and the oldest was 5;10. Hayashibe observes that this group includes almost the whole range of ages, and he argues that the results suggest that these subjects seem to prefer to use the cue of word order rather than the cue of particles.

These results have been taken to indicate that, as Otsu (1994) notes, there is a period during children's language development where children tend to interpret scrambled sentences like (3b) as nonscrambled sentences like (4).

- (4) *ahiru-ga kame-o osu*  
 duck-NOM turtle-ACC push  
 'A/the duck pushes a/the turtle.'

Otsu (1994) questions whether these results are reflections of the lack of grammatical knowledge of scrambling among the subjects. Otsu (1994) presents new data which show that at an earlier age, the children can understand scrambled sentences much better if the contexts are given in the previous discourse. He argues that intra-clausal scrambling constitutes part of the grammatical knowledge of Japanese three-year-olds, and possibly part of that of younger children. Let us next review Otsu (1994).

## 2.2. Otsu (1994)

Otsu (1994)'s primary purpose is to investigate whether scrambling is part of children's grammar by at least the age of three. Otsu (1994) discusses both production data and experimental data. In this section, I will focus on his experimental data, and I will deal with production data in section 3. Otsu (1994) argues that Hayashibe's (1975) subjects were not able to make use of their knowledge of scrambling because Hayashibe's test sentences were given in isolation without a discourse context. Otsu(1994) notes that a scrambled

sentence like (3b), which is one of Hayashibe's (1975) test sentences, sounds somewhat unnatural without a discourse context. (3b) is repeated below.

- (3) b. *ahiru-o kame-ga osu*  
 goose-ACC turtle-NOM push  
 'A/The turtle pushes a/the goose.'

Otsu (1994) shows that (3b) becomes perfectly natural if a sentence is added prior to (3b) with a minimal change in (3b) as in (5):

- (5) a. *Kooen-ni ahirusan-ga imashita.*  
 park-in duck-NOM is-POLITE-PAST  
 'There was a duck in a park.'
- b. *Sono ahirusan-o kamesan-ga osimasita.*  
 the duck-ACC turtle-NOM push-POLITE-PAST  
 'A turtle pushed the duck.'

Otsu (1994) explains (5) as follows. In (5), *ahirusan* 'duck' is introduced into a context as a discourse topic by the first sentence (5a). Once it becomes a discourse topic as a result of the first sentence, it is natural to begin the second sentence with *ahirusan* fronted by scrambling. *Sono* 'the' is inserted at the beginning of the second sentence because the initial noun phrase in this sentence becomes presupposed following the presentation of the first sentence. *Sono* plays no role in marking the agent or patient of the sentence. Otsu (1994) claims that there must be a discourse contextual reason to use scrambled sentences.

Taking the above argument into account, Otsu (1994) did an experiment by using scrambled sentences with a discourse context. 12 three-year-olds and 12 four-year-olds of mono-lingual native speakers of Japanese were tested. Half of the children in each age group were assigned to the experimental group and half to the control group. The task was act-out and essentially the same as that of Hayashibe's (1975). There were four test items, which contained scrambled sentences for each child. The test items given to the control group were essentially the same as those of Hayashibe's (1975), namely, scrambled sentences in isolation such as (3b). (For Hayashibe's (1975) test sentences, see APPENDIX). On the other hand, the test items given to the experimental group each consisted of two sentences like (5). The first sentence served to introduce an animal as a discourse topic, and the second sentence was a scrambled sentence with the expression referring to the discourse topic scrambled to the beginning of the sentence.

The results are surprising. Although there were a few wrong and egocentric responses in the experimental group, the overwhelming majority of responses (43 out of 48) were correct. In contrast, there were a fairly large

number of wrong responses (22 out of 48) in the control group with the tendency that older subjects made fewer errors. Basically, the control group responded in the same way as the Hayashibe's subjects.

This clear contrast between the control group and the experimental group is probably due to the addition of the discourse context, which apparently makes the use of scrambled sentences quite natural. Otsu's experiment is important in that it shows that if children at the age of three are given scrambled sentences with appropriate discourse contexts, they can understand intra-clausal scrambled sentences as well as non-scrambled sentences.

Otsu (1994) concludes that at least some kinds of intra-clausal scrambling can be found in the grammar of three-year-olds, possibly earlier, and that if this is correct, it is one of the earliest acquired movement rules in the acquisition of Japanese grammar.

Lakshmanan and Ozeki (1996), however, recently have argued that scrambling is probably not available prior to the age of 2;6 in Japanese children's grammar. Next we review Lakshmanan and Ozeki (1996).

## 2.3 Review and reconsideration of Lakshmanan and Ozeki (1996)

### 2.3.1 Review of Lakshmanan and Ozeki (1996)

Lakshmanan and Ozeki (1996) examine the acquisition of scrambling<sup>1</sup> by a two-year-old Japanese speaking child. Based on the evidence from this child, they argue that scrambling is probably not available prior to 2;6 in the child's grammar.

First, they argue that no instances of scrambled sentences were found among the child's spontaneous utterances.

Second, in order to elicit utterances with the scrambled order, an elicited imitation task was given to the child when she was 2;6. The test sentences contained non-reversible and reversible sentences with SOV order as well as OSV order. The NPs in all of the test sentences were overtly case marked. When the sentences were SOV order, the child retained the ordering but she consistently omitted the case particle *-o*. In the case of test sentences with OSV order, the child displayed problems in retaining the word order of the test sentences. When test sentences were non-reversible OSV sentences, the child typically employed the SOV order. She case-marked the subject NP with the case particle *-ga* and consistently omitted the case particle *-o* as in (6).

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<sup>1</sup> Lakshmanan and Ozeki (1996) also discussed scrambled sentences with stative predicates, but I will put this type aside. In this paper I deal with scrambled sentences with non-stative predicates.

- (6) Stimulus:            *mikan-o*      *papa-ga*      *tabeta*  
                                  orange-ACC    papa-NOM    ate  
                                  ‘Papa ate the orange.’

The child’s imitation: *Papa-ga*      *mikan-ϕ*      *tabeta*

When the test sentences were the reversible OSV sentences, the child tended to retain the same ordering of the NPs in her imitations as in the test sentences. However, in addition to omitting the accusative case particle, she dropped the case particle *-ga* from the subject NP and omitted the object NP as in (7):

- (7) a. Stimulus:            *Nicole-o*      *Taylor-ga*      *butta*  
                                  Nicole-ACC    Taylor-NOM    hit  
                                  ‘Taylor hit Nicole.’

The child’s imitation: *Nicole-ϕ* *Taylor-ϕ* *butta*

- b. Stimulus:            *Nanako-o*      *Nicole-ga*      *butta*  
                                  Nanako-ACC    Nicole-NOM    hit  
                                  ‘Nicole hit Nanako.’

The child’s imitation: *Nicole-ϕ* *butta*

From these results, Lakshmanan and Ozeki (1996) concluded that they could not tell from the child’s imitations whether the order of the elements in her imitation is in fact consistent with OSV order or with SOV order.

Notice, however, that all the test sentences in Lakshmanan and Ozeki’s (1996) experiments were given to the child without any discourse context. We saw in 2.2 that Otsu’s (1994) experiments show that a discourse context is important in order for children to accept and interpret scrambled sentences. If Otsu’s (1994) claim is right, the child studied in Lakshmanan and Ozeki (1996) would not show the knowledge of scrambling even if she had that knowledge. Thus, it seems premature to conclude that the child lacks the knowledge of scrambling from the results of these experiments.<sup>2</sup> In the next section, I would

<sup>2</sup> There is another issue which complicates interpretation of Lakshmanan and Ozeki (1996). Their subject is not a typical first language learner of Japanese. Their data were collected when the age of the child is 2;2-2;6 after she had started to be exposed to English. According to their descriptions, the subject began to attend a local day-care center where she was exposed to English. Until 2;4, the child did not produce any English, but around 2;4, the exposure to English increased, and she began to produce English from 2;5. What is noticeable is that the child gradually stopped producing Japanese

like to reconsider the results of Lakshmanan and Ozeki's (1996) experiments.

### 2.3.2 Reconsidering Lakshmanan and Ozeki's (1996) results

In this section, I will reconsider the results of Lakshmanan and Ozeki's (1996) experiments. Contrary to what they concluded, it seems that there is no direct evidence which show that the child does not have grammatical knowledge of scrambling.

First the child's response in (6) is interesting. (6) is a scrambled version of a non-reversible sentence:

- (6) Stimulus:            *mikan-o*        *papa-ga*        *tabeta*  
                                  orange-ACC    papa-NOM    ate  
                                  'Papa ate the orange'

The child's imitation: *Papa-ga*        *mikan-ϕ*        *tabeta*

In (6), the child was asked to repeat the scrambled sentence, and she corrected the word order in a canonical way, i.e. SOV. Lakshmanan and Ozeki (1996) concluded that the child could not repeat the scrambled sentence as administered because the knowledge of scrambling was not available to her. Notice, however, that (6) is given without any context. If an appropriate context was given, the child might have been able to repeat the scrambled sentence. In fact, (6) shows that first the child understood the grammatical relations of the subject and the object, and then she changed the order. The sentence she produced has the same meaning as the given scrambled sentence, and the only difference is its word order.<sup>3</sup> The child's imitation is also grammatical in adult speech, since the accusative marker *-o* is often dropped. This suggests that the child distinguished the canonical order (SOV) and the scrambled order of the above stimulus and that the child knew the relation between the canonical order and the scrambled order of the sentence (6). Therefore, this cannot be interpreted as evidence for the nonexistence of a knowledge of scrambling since she must have understood the grammatical relations of the scrambled sentence in order to reconstruct the order.

When the child was asked to imitate the scrambled version of reversible sentences, it seemed harder for the child to accept them. These test sentences in

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around 2;7, although she continued to receive input in Japanese from her mother at home. The fact that the child gradually stopped producing Japanese might suggest that the development of her Japanese speech reflects some influence from English.

<sup>3</sup> Lust and Wakayama (1981) show that the Japanese children from 2;5 to 4;3 tend to reconstruct the right-dislocated order to the standard order (SOV) in the elicited imitation task of right-dislocated sentences. This is quite similar to the child's imitation in (6).

(7) are repeated below.

(7) a. Stimulus:            *Nicole-o*        *Taylor-ga*        *butta*  
                                  Nicole-ACC   Taylor-NOM   hit  
                                  ‘Taylor hit Nicole.’

The child’s imitation: *Nicole-ϕ*        *Taylor-ϕ*        *butta*

b. Stimulus:            *Nanako-o*        *Nicole-ga*        *butta*  
                                  Nanako-ACC   Nicole-NOM   hit  
                                  ‘Nicole hit Nanako.’

The child’s imitation: *Nicole-ϕ*        *butta*

In (7a), the child dropped all the particles, i.e. *-o* for the object NP and *-ga* for the subject NP. What is noticeable is that the child kept the scrambled order of the stimulus. This suggests that the child distinguished the stimuli in (6) and (7a), since the child changed the order in (6), but she did not in (7a). In (7b), the child dropped the object NP, which is her own name in this test sentence. It is possible that the child dropped this NP because it is her own name. The sentence that the child produced by imitation makes sense even if it is without her name in this case, because the person hit by Nicole is the speaker herself, i.e., the child. In adult speech, we normally keep the nominative marker *-ga* in this case.

Reconsidering (6) and (7) in Lakshmanan and Ozeki (1996), it seems premature to conclude that the child lacks grammatical knowledge of scrambling. At least in (6), it seems that the child could interpret the scrambled sentence although she did not imitate it. In (7), there are good reasons for the child not to be able to imitate scrambled sentences, since the test sentences were given without a context and the child’s name was included in the test sentence. Thus, none of the errors conclusively shows that the child lacks the grammatical knowledge of scrambling.

Next I would like to show that children in fact produce scrambled sentences in production data around 2;5 based on Iwatate (1981).

### 3. Supporting evidence for the existence of knowledge of scrambling prior to the age of three: Scrambled sentences in production data in Iwatate (1981)

In Iwatate’s (1981) data, as Otsu (1994) has already pointed out, scrambled sentences are found in children’s productive speech before three years old. Iwatate (1981) reports that in more than 48 hours of recorded speech of a two-year-old, OSV order was found 6 times with the verb *kaku* ‘draw’ and 1 time

with the verb *kau* 'buy'.<sup>4</sup> Iwatate (1981) also reports the examination of the recordings of 5 two-year olds and 5 three-year olds. The results are in table 1.

Table 1. OSV order in Utterances of 5 Two- and Three Year Olds

Word order	Yuko	Jiro	Akiko	Jiro	Fumie	Taro	Total
with <i>ga/o</i>	(2;5)	(2;5)	(2;7)	(3;6)	(3;7)	(3;9)	
	f	m	f	m	f	m	
SOV	24	6	11	11	12	15	79
OSV	2	4	1		2	1	10
SVO	1		3		3		7
OVS	2	1			1		4
VSO							0
VOS					1		1
(hours)	8	6	8	6	8	6	

Table 1 shows that Japanese children before the age of three years actually produce scrambled sentences. With regard to OSV order, Yuko (2;5) produced 2 utterances, Jiro (2;5) produced 4 utterances, and Akiko (2;7) produced 1 utterance. It is hard to evaluate the above results since the total utterances or the percentages of scrambled sentences are not shown, but these results in Iwatate (1981) suggest that even the children around 2;5 do produce sentences with apparent scrambling in naturalistic contexts.

To sum up, reviewing Otsu (1994), we saw that children at the age of three years could understand scrambled sentences if proper contexts were given. By reconsidering Lakshmanan and Ozeki (1996), contrary to their conclusion, I have pointed out that their results do not conclusively show that the child lacks a grammatical knowledge of scrambling. Finally, I argued that the production data show that the children around 2;5 produced scrambled sentences in a naturalistic context.

#### 4. Conclusion

In this paper we have seen that grammatical knowledge of scrambling is available at early stages of language development (i.e., by at least at the age of two years, five months). First, we saw that Hayashibe (1975) showed that even children at the age of five years have difficulty in interpreting scrambled sentences without a discourse context. Second, we saw that Otsu (1994) demonstrated that children at the age of three years can interpret scrambled sentences if the sentences are given a proper context. This study might suggest

<sup>4</sup> The frequencies of other word orders are as follows. SOV order is found 16 times and OVS order is found 3 times.

that scrambling is a movement rule whose application is triggered by pragmatic factors. (cf. Miyagawa (1997)) The correct analysis of scrambling is still being debated, including the matter of optionality, and this deserves further study. Third, although Lakshmanan and Ozeki (1996) argued that scrambling is not available prior to 2;6, I pointed out that Lakshmanan and Ozeki's (1996) experiments allow alternative interpretations. Then, I have shown that, contrary to their claim, there is no evidence that the child lacks the grammatical knowledge of scrambling. Fourth, we saw that Iwatate (1981) showed that children at the age of 2;5 do produce scrambled sentences in a naturalistic context. These results suggest that occurrence of scrambling requires a pragmatic context even in early Japanese.

If we regard scrambling as a leftward movement, the results show that children at the age of around 2;5 are sensitive to the leftward movement. With regard to a rightward movement (i.e., right dislocation) in Japanese, Lust and Wakayama (1981) show that even children at the age of 2;5-2;11 distinguish right-dislocated sentences from standard order (SOV). This result coheres with our results, which suggest that Japanese children have knowledge of movement, i.e., scrambling, at quite an early age (by at least around 2;5).

The fact that Japanese children are sensitive to both leftward and rightward movements might be related to the issues discussed by Fukui and Saito (to appear). They claim that leftward movement such as scrambling is an optional operation in Japanese, while the rightward movement must be triggered by feature-checking since it is an exception to directionality. In their analysis, whether right-dislocation is a feature-checking movement is not clear. This issue needs further study.

Several issues remain unresolved in the question of scrambling in Japanese. First, the acquisition of scrambling with indirect object and direct object has not been pursued. Second, several factors such as the distinction between reversible and non-reversible sentences, and stative and non-stative predicates might have an influence on the occurrence of scrambling. These issues need to be studied further.

**APPENDIX: Hayashibe's (1975) test sentences**

Hayashibe's (1975) test items of intra-clausal scrambling are as follows: Otsu (1994) noted that the test items given to his control group were essentially the same as those of Hayashibe's (1975); namely, scrambled sentences in isolation, but he did not mention which specific sentences he used.

- a. *ahiru-o kame-ga osu*  
 duck-ACC turtle-NOM push  
 'A turtle pushes a duck.'
- b. *kame-o ahiru-ga osu*  
 turtle-ACC duck-NOM push  
 'A duck pushes a turtle.'
- c. *zo-o kirin-ga osu*  
 elephant-ACC giraffe-NOM push  
 'A giraffe pushes an elephant.'
- d. *kirin-o zo-ga osu*  
 giraffe-ACC elephant-NOM push  
 'An elephant pushes a giraffe.'
- e. *patokaa-o torakku-ga oikakeru*  
 police-car-ACC truck-NOM chase  
 'A truck chases a police car.'
- f. *torakku-o patokaa-ga oikakeru*  
 truck-ACC police-car-NOM chase  
 'A police car chases a truck.'
- g. *uma-o inu-ga oikakeru*  
 horse-ACC dog-NOM chase  
 'A dog chases a horse.'
- h. *inu-o uma-ga oikakeru*  
 dog-ACC horse-NOM chase  
 'A horse chases a dog.'

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The Object Agreement Rule in *Passato Prossimo* of  
Young Italian Children

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1. Introduction

In 1976, a paper from Antinucci and Miller on the development of past tense expressions in Italian children during their telegraphic speech phase reported an interesting phenomenon related specifically to the compound past tense called *passato prossimo* of transitive verbs [Antinucci and Miller 1976].

The *passato prossimo* of transitive verbs is formed by the auxiliary verb *avere* 'to have', which is properly inflected to agree in person and number with its subject, followed by the past participle of the main verb. If the object is lexicalized, the past participle takes the suffix *-o*, which makes it masculine in gender and singular in number. The suffix is constant, independent of the gender or number of the object or, for what matters, of the subject, like in (1)<sup>1</sup>.

- (1) *Le puffe hanno mangiato i biscotti.*

the-F.P. smurfs-F.P. have-3P. eaten-M.S. the-M.P. cookies-M.P.

The smurfs ate the cookies.

However, the children studied by Antinucci and Miller were reported to undergo a phase during which the past participle seemed to have been incorrectly marked for agreement with the lexicalized object of the verb, like in (2).

- (2) *A sioa ha chiuta a potta.* [=? *La signora ha chiusa la porta.*] (1;8;24)

the-F.S. lady-F.S. has-3S. closed-F.S. the-F.S. door-F.S.

The lady closed the door.

Up to now, three main explanations have been offered of the phenomenon.

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<sup>1</sup>In the following examples, I will parenthesize with (*text*) every item which has been dropped in the surface representation of the sentence.

- Antinucci and Miller supported a Cognitive Maturation Hypothesis [Antinucci and Miller 1976].

The *passato prossimo* describes a double relation: on one hand, past vs. present, and on the other hand, cause vs. effect. Through a gradual process, the child, by concrete experience, comes to understand this coordination. From age 1;6 to 2;6, a child's representation of the temporal dimension is underdeveloped. The child begins to use the past participle to describe the state of the object, and therefore treats the past participle essentially as an adjective. But in Italian an adjective is required to agree in gender and number with the noun to which it refers. This is why the child makes the past participle agree with the object.

- Borer and Wexler have recently proposed a Linguistic Maturation Hypothesis [Borer and Wexler 1992].

According to them, it is true that the child treats the participle as an adjective, but this is not due to cognitive underdevelopment. Instead, the child is in a particular maturational phase of UG. In a period ending between 2;0 and 2;6, the child is in the stage of the UNIQUE EXTERNAL ARGUMENT PROTO-PRINCIPLE (*UEAPP*), which requires every predicative element to have its own unique subject. In instances of *passato prossimo*, both the auxiliary and the main verb are treated as predicates. The auxiliary's external argument is the subject of the sentence. The main verb, needing one of its own, takes the object of the sentence as its argument and acts as its adjective.

- McKee and Emiliani have answered with a Performance Limitation Hypothesis [McKee and Emiliani 1992]. In brief, they claimed that the child's grammar and the target adult's grammar do not differ at all. However, the child has performance limitations: namely, she omits some elements in the surface representation. The clitics, which we sometimes do not see, really do exist. According to McKee and Emiliani, good sense tells us that we shouldn't use the maturation argument if we can avoid it. Even then, we should consider cognitive maturation before grammatical knowledge maturation.

What follows is a review of the three proposals above, focusing on the discussion between continuity hypotheses and maturational theories. I will propose a fourth explanation of the correspondence between the child's developing grammar and the target adult grammar which relies on a theory of

continuous UG. In my analysis, UG is mapped to a specific language grammar in such a way which requires experience and learning as well as en route theory construction.

I will support my proposal by re-examining the data offered by both Antinucci & Miller and McKee & Emiliani, plus data from Volterra [Volterra 1976] (see Appendix).

## 2. The Past Participle-Object Agreement Phenomenon

The *passato prossimo* is one of Italian's compound past tenses. It is formed by the indicative present tense form of an auxiliary verb followed by the past participle of the main verb. The auxiliary is *essere* 'to be' for intransitive verbs and *avere* 'to have' for all transitive verbs and for a few intransitive verbs as well. In the literature, the intransitive verbs which select *essere* as the auxiliary are the so-called 'unaccusatives', whereas the term 'intransitives' is reserved for the intransitives which select *avere*.

- (3) a. *I due puffi sono partiti insieme.*  
 the-M.P. two smurfs-M.P. are-3P. left-M.P. together  
 The two smurfs left together.
- b. *I puffi hanno assassinato la puffetta.*  
 the-M.P. smurfs-M.P. have-3P. murdered-M.S.  
 the-F.S. little\_smurf-F.S.  
 The smurfs murdered the little smurf.
- c. *I puffi l'hanno assassinata.*  
 the-M.P. smurfs-M.P. her-F.S. have-3P. murdered-M.S.  
 The smurfs murdered her.
- d. *Le puffe hanno telefonato.*  
 the-F.P. smurfs-F.PL. have-3P. called-M.S.  
 The smurfs called.

The past participle is inflected to agree in gender and number with the subject of an unaccusative verb (like in (3.a)), while the inflection is fixed for intransitive and transitive verbs which appear with the suffix *-o* (like in (3.d) and (3.b)), unless the object is expressed by a pronoun which occupies a pre-verbal position. In this case the past participle must agree in gender and number with the pronoun (like in (3.c)).

In the early seventies, Antinucci and Miller, studying the development of past tense expressions in the speech of children from 1;6 to 2;6, observed a phenomenon of past participle-object agreement, where the past participle

of a transitive verb was marked for agreement with the number and gender of the object of the verb, although the object was not pronominalized [Antinucci and Miller 1976].

For example<sup>2</sup> (4.a)<sup>3</sup> instead of (4.b).

- (4) a. *A sioa ha chiuta a potta.*  
 [=? La signora ha chiusa la porta.]<sup>4</sup> (1;8;24)  
 the-F.S. lady-F.S. has-3S. closed-F.S. the-F.S. door-F.S.  
 The lady closed the door.
- b. *La signora ha chiuso la porta.*

This seemed to persist until a certain age, varying from child to child and ranging roughly from 2;0 to 2;6. After this age, the adult non-agreement rule seemed to become gradually established.

### 3. The Cognitive Maturation Hypothesis

Antinucci and Miller, inspired by Piaget's theories, explained this phenomenon with a cognitive maturation hypothesis, which can be summarized as follows [Antinucci and Miller 1976].

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<sup>2</sup>Actually, this is not a particularly good example. In fact, since *signora* is a feminine singular noun, one could also say that the past participle agrees with the subject rather than the object. Nonetheless, I preferred this example because it is the only one I could find in which nothing had been dropped, and therefore there could be no doubt about what the child meant to say. The reason why this condition is particularly appealing will soon be clear. As far as the above ambiguity is concerned, the following examples should help dissipate any doubt (from [Volterra 1976], page 154, I 4-109, and from [Antinucci and Miller 1976], page 171, (23)).

- (I) a. *Uè messa la palla?* [=? Dove hai messa la palla?] (1;6;6)  
 where (have-2S.) put-F.S. the-F.S. ball-F.S.?  
 Where did you put the ball?
- b. *Chi gli ha levate le gamb e?* (2;8)  
 who to\_it/to\_him/to\_them has-3S. taken\_off-F.P. the-F.P. legs-F.P.  
 Who took the legs off it/him/them?

Whereas in (I.a) the gender invariant pronoun *tu* 'you' might still refer to a feminine entity, in (I.b) the subject is underspecified for gender and number.

<sup>3</sup>From [Volterra 1976], page 153, C 10-110: C = first letter of the child's first name, 10 = number of session, 110 = onehundredtenth utterance during the tenth session.

<sup>4</sup>The [=? text] is a CHILDES' scope symbol for **alternative transcription** [MacWhinney 1991].

The *passato prossimo* describes a double relation: on one hand, past vs. present, and on the other hand, cause vs. effect.

Through a gradual process, the child, by concrete experience, comes to understand this coordination.

From age 1;6 to 2;6, a child's representation of the temporal dimension is underdeveloped.

The child begins to use the past participle to describe the state of the object, and therefore treats the past participle essentially as an adjective. But in Italian an adjective is required to agree in gender and number with the noun to which it refers. This is why the child makes the past participle agree with the object.

#### 4. The Linguistic Maturation Hypothesis

The phenomenon of past participle-object agreement observed in Antinucci and Miller's data was reconsidered by Borer and Wexler in 1992 and reinterpreted as evidence for the linguistic maturation hypothesis [Borer and Wexler 1992].

For example, let us look at the utterance in (5)<sup>5</sup>.

In this utterance, the child was commenting on a pair of *pantaloni* 'pants', where *pantaloni* is a masculine plural noun.

(5) *Fatti la nonna.* (2;0)  
made-M.P. grandmother

Borer and Wexler make the following observations:

1. the above lacks both the auxiliary *ha* and the full *NP* object *i pantaloni*
2. the past participle *fatti* is inflected for agreement with a masculine, plural, lexicalized *NP*

Without bothering about the right dislocation of the subject, their conclusion is that the child's deep structure for (5) is (6).

(6) *La nonna (ha) fatti (i pantaloni).*  
the-F.S. grandmother-F.S. (has-3S.) made-M.P. (the-M.P. pants-M.P.)  
Grandmother made the pants.

<sup>5</sup>From [Antinucci and Miller 1976], page 171, (15).

Note the presence of *fatti* instead of *fatto*.

According to them, it is true that the child treats the participle as an adjective, but this is not due to cognitive underdevelopment. Instead, it is because the child is in a particular maturational phase of UG.

In a period ending between 2;0 and 2;6, the child is in the stage of the UNIQUE EXTERNAL ARGUMENT PROTO-PRINCIPLE (*UEAPP*), which requires every predicative element to have its own unique subject.

In instances of *passato prossimo*, both the auxiliary and the main verb are treated as predicates. The auxiliary's external argument is the subject of the sentence. The main verb, needing one of its own, takes the object of the sentence as its argument and becomes its adjective.

This means that the sentence above has the structure:

[*IP* [*NP* *La nonna*] [*VP* [*V* *ha*] [*AP* *fatti i pantaloni*] ] ]

instead of the adult form:

[*IP* [*NP* *La nonna*] [*I'* *ha*] [*VP* [*V* *fatto*] [*NP* *i pantaloni*] ] ] ]

## 5. The Performance Limitation Hypothesis

In 1992, McKee and Emiliani critiqued both maturational hypotheses, only by appealing to 'good sense logic' [McKee and Emiliani 1992].

First of all, they claimed that the reliability of Antinucci and Miller's data was weakened by uncontrolled and/or unrecorded factors in their collection<sup>6</sup>, and since the study lacked quantification, the two researchers could have been directed to the wrong conclusions by isolated examples.

Then, since Antinucci and Miller's data came from spontaneous production, McKee and Emiliani argued that negative evidence could not be used as an argument against the linguistic competence of the child. In other words, the fact that a child does not apply the correct agreement rule in a particular example of spontaneous speech does not mean that he does not know it, but only that in that particular moment he does not use it. The same is true

<sup>6</sup>“Unfortunately, the data turned out to be only partially adequate because no particular attention was paid to this matter” (past participle-object agreement) “at the beginning of the data-collection. For this reason, it was difficult to obtain a precise idea of some of the endings of the children's words, which were essential for the problem of agreement. Furthermore, the context which we had then collected appeared later to be insufficient in some places; for example, it was almost impossible to decide whether in some cases an expression should be considered as an adjective or as a participle” [Volterra 1976].

for instances of *passato prossimo* of intransitive verbs, whose existence would seriously compromise the two maturational hypotheses<sup>7</sup>.

Finally, McKee and Emiliani concluded that both the analyses of Antinucci & Miller and Borer & Wexler had misinterpreted the data. There was a more natural explanation, which McKee and Emiliani presented in their performance limitation hypothesis.

McKee and Emiliani reconsider the utterance in (7).

- (7) *Fatti la nonna.* (2;0)  
made-M.P. grandmother

They make four fundamental observations:

1. the above lacks both the auxiliary *ha* and the object
2. the past participle *fatti* is inflected for agreement with a masculine, plural *NP*
3. the subject, *la nonna*, is post-verbal
4. if the subject is focused and the object is pronominalized, the most common adult construction requires the subject in post-verbal position

Their conclusion is that the child meant to say:

- (8) (Li) (*ha*) *fatti la nonna.*  
(them-M.P.) (has-3S.) made-M.P. the-F.S. grandmother-F.S.  
Grandmother made them.

and this is actually his deep representation of the sentence. But, the child has dropped both the auxiliary *ha* and the pronoun *li* in the surface.

In brief, they claimed that the child's grammar and the target adult's grammar do not differ at all. However, the child has performance limitations: namely, he omits some elements in the surface representation. The clitics, which we sometimes do not see, really do exist. For example, pronouns sometimes surface in perfectly correct utterances<sup>8</sup>, like in (9).

- (9) *Questi l'ho stracciati.* [= *Questi li ho stracciati.*] (1;8;16)  
these-M.P. them-M.P. have-1S. tore-M.P.  
These ones, I tore them.

<sup>7</sup>See section on problems for a more detailed discussion.

<sup>8</sup>From [Volterra 1976], page 155, I 9-66.

Finally, since they still had to account for cases like the above mentioned:

(10) *La signora ha chiusa la porta.*

where there is past participle-object agreement but no omission, McKee and Emiliani argued that these utterances occur rarely and that they are the kind which we would call 'slips of the tongue' in adult speech.

McKee and Emiliani believe that good sense tells us that we shouldn't use the maturation argument if we can avoid it. Even then, we should consider cognitive maturation before grammatical knowledge maturation.

## 6. Maturation and Performance Limitation Hypotheses: The Problems

McKee and Emiliani supported their theory with data of their own (see Appendix).

The only exception they encountered was (11).

(11) *Lubatte sue ciliege.* (2;8)  
stolen-F.P. her-F.P.3S. cherries-F.P.

The two researchers explained this as a case of what can be called the Italian double-object construction or, more technically, object right-dislocation. In a construction of this kind, the object is both pronominalized and lexicalized: the pronoun appears pre-verbally, while the full *NP* is post-verbal and functions as the post-sentential topic. According to McKee and Emiliani, the child dropped the pronominalized form<sup>9</sup>, but correctly made the past participle agree with it, like in (12).

(12) (Le) (*hanno*) *rubate*, (*le*) *sue ciliege.*  
(them-F.P. have-3P.) stolen-F.P. (the-F.P.) her-F.P.3S. cherries-F.P.  
They stole them, her cherries.

This interpretation seems enforced by the fact that, as the data show, such constructions are not unknown to young children<sup>10</sup>:

<sup>9</sup>Together with the auxiliary *hanno* and the determiner *le*.

<sup>10</sup>From [McKee and Emiliani 1992], page 423, (7), and [Volterra 1976], page 156, C 15-168. It might be objected that these two children are already in the age at which the non-agreement rule should become established. Therefore, no wonder they possess 'sophisticated' structures as well! Unfortunately, the four papers I studied for this critique, [Antinucci and Miller 1976, Volterra 1976, Borer and Wexler 1992, McKee and Emiliani 1992], present

- (13) *L'hanno vuotata , l'acqua ...*  
*la vuotano ... l'hanno vuota ... vuotata.* (2;2)  
 it-F.S. have-3P. emptied-F.S. the-F.S. water-F.S. ...  
 it-F.S. empty-3P. ... it-F.S. have-3P. empty-F.S. ... emptied-F.S.  
 They emptied it, the water ... they empty it ... they empty it ... emptied.
- (14) *Mamma te l'ha data la tua pistola.*  
 [= Mamma te l'ha data la tua pistola.] (2;0;7)  
 mom-F.S. to\_you it-F.S. has-3S. given-F.S. the-F.S. your-F.S.2S gun-F.S.  
 Mom gave it to you, your gun.

Borer and Wexler rejected this explanation by observing that that kind of construction is typical of questions and emphasized affirmatives and, as such, is always marked by special intonation.

As a native speaker of Italian, I don't completely agree with them. Nonetheless, it is true that information about intonation would be helpful. Unfortunately, intonation was not included in the data, because of the questionable accuracy of its coding in utterances missing so many elements [McKee and Emiliani 1992].

McKee and Emiliani were correct in stressing that some of the crucial interpretations of the maturationalists appear unpleasantly forced and unnatural to any Italian native speaker.

They collected their data by elicited imitation, thus eliminating the problem of absence of evidence. Moreover, the specific methodology they used allowed them to control the context, so that the experimenters were able to determine unambiguous interpretations of the sentences, e.g. pronominalized vs. lexicalized objects.

However, the two researchers used a group of children whose age ranged from 2;2 to 2;11, clearly beyond the critical age range, which is from 1;6 to 2;6. Therefore, their data are rather inconclusive.

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their theories by means of examples selected cross-sectionally from the data. Since I had not access to the complete corpus, and sometimes no information of the kind I needed from the authors, I was forced, in those rare occasions, to judge with the instinct of the Italian native speaker and a grain of 'common' salt. In this particular case, since as an Italian I indeed found more natural the dropped-pronoun interpretation of a few of the sentences from the 'past participle-object agreement phase', and actually I was able to find at least one example of explicit use of pronoun in a child supposedly in that critical age, I judged that it was not such a big jump to expect double-object structures as well, and I thus concluded that the above examples can safely be considered representative of the behavior of younger children as well. Again, as far as those data are concerned, negative evidence cannot be used to stigmatize my hypothesis as hazardous.

In addition, there are examples that contradict the performance limitation hypothesis, unless we consider them slips of the tongue.

Take, for example, sentence (15.a)<sup>11</sup>, which McKee and Emiliani interpret as in (15.b).

- (15)a. *Ho sbagliata strada.* (2;4)  
 have-1S. mistaken-F.S. street-F.S.  
 I took the wrong street<sup>12</sup>.
- b. *La ho sbagliata, la strada.*  
 it-F.S. have-1S. mistaken-F.S. the-F.S. street-F.S.  
 I took the wrong it, the street.
- c. *Ho sbagliato strada.*  
 have-1S. mistaken-M.S. the-F.S. street-F.S.  
 I took the wrong street.

Borer and Wexler say that (15.b) is ungrammatical. Moreover, they say that it is an idiomatic expression (a kind of "to lose one's way"). Actually, all of the Italian native speakers I asked, including myself, judge it to be perfectly grammatical and, moreover, not idiomatic at all. In other words, (15.a)<sup>13</sup> means you took route 13 whereas you should have taken route 45, and not that you devoted yourself to a life of crime and lust.

However, this is not the point. The point is that McKee and Emiliani's interpretation, though grammatically correct, is not natural. As far as I know, a plain *Ho sbagliato strada*, like in (15.c), is what Italians usually say in such an unfortunate event. In fact, (15.b) sounds rather pompous, and it seems unlikely that it would come out from a little child.

Moreover, other observed behaviors might cast some doubts on the performance limitation hypothesis.

For example, I previously stated that there is a case in which the subject is almost always in post-verbal position, namely when the object is pronominalized and we want to focus the subject.

Now, the data collected by Volterra show that children use post-verbal subjects also with overt lexicalized objects [Volterra 1976], a context in which,

<sup>11</sup>From [Antinucci and Miller 1976], page 171, (22).

<sup>12</sup>The translations are a little awkward because of the necessity to reflect the Italian structure of the sentence.

<sup>13</sup>Or rather its grammatical counterparts (9.b) or (9.c).

with focus or without focus, an adult would rather use a pre-verbal subject, like in (16)<sup>14</sup>.

- (16) *Peso cacche Checco, peso cacche.*  
 [= Francesco ha preso le chiavi] (1;11;26)  
 (has-3S.) taken-M.S. (the-F.P.) keys-F.P. Francesco  
 (has-3S.) taken-M.S. (the-F.P.) keys-F.P.  
 Francesco took the keys, he has took the keys.

The above cannot be a case of the double-object construction, because the past participle is inflected with *-o*, whereas the object is a feminine plural which would have required the main verb to be inflected with *-e*.

But remember that the point of force in the performance limitation argumentation was the presence of the post verbal subject, which suggested the presence of a pronoun. In other words, can we really safely claim that *Fatti la nonna* is a case of a pronominalized object, just because the subject is post-verbal? It could be the case that, as Antinucci & Miller and Borer & Wexler claim, it is actually an occurrence of past participle-lexicalized object agreement, and the child, for mysterious reasons, thinks that post-verbal is beautiful<sup>15</sup>.

Moreover, looking again at the data in [Volterra 1976], the 'slips of the tongue' seem to be too frequent to be considered accidental errors, even if we still have to face the problem of lack of quantification.

On the other hand, maturation offers an attractive answer to the 'richness of the stimulus' problem. Unfortunately, while it is quite easy to postu-

<sup>14</sup>From [Volterra 1976], page 153, F 17-53.

<sup>15</sup>Strangely enough, I noticed that also adults were using post-verbal subject in context in which it seemed unnatural. For example, in the data from [Antinucci and Miller 1976], a mother says to her child:

- (II) *No, non vola la motocicletta.*  
 no not flies the-F.S. motorcycle-F.S.  
 No, the motorcycle doesn't fly.

and a moment later:

- (III) *Cammina la motocicletta.*  
 walks the-F.S. motorcycle-F.S.  
 The motorcycle goes.

Well, I found this strange at the beginning. Then, I realized that I usually hear that kind of construction in what I might call the Italian BTR. Could it be the case that, by post-verbalizing the subject, the child is actually imitating the parents?

late the (cross-linguistic) existence of specific linguistic knowledge in a specific stage of development, it is not as easy to explain its phase out. Moreover, to assume the early existence of principles which later fade without leaving any history is far too easy and far less explanatory.

But, back to *passato prossimo*, if children really represent the past participle as an adjective, why do they always put it in pre-noun position in their productions?

Syntactically, there is nothing wrong with a pre-noun adjective, but Italian adults usually prefer the post-noun position, especially when it is the past participle of a verb that works as an adjective.

Besides, how do maturationalists explain utterances like the following<sup>16</sup>:

(17) *Uè hai messo Lola a catta?* [= Dove ha messo Iole la gatta?] (1;6;6)

where have-2S. put-M.S. Iole the-F.S. cat-F.S.

Where did you, Iole, put the cat?

where a child in the critical age applies the correct non-agreement, inflecting form *-o* instead of the feminine singular *-a*? Is this a slip of the tongue in a *UEAPP* context?

Moreover, there is the problem of the intransitive forms: the presence of intransitive verbs, the ones requiring *avere* as auxiliary, would violate the maturational theories, since the past participle cannot be an adjective, for the simple reason that it has no noun to modify<sup>17</sup>.

On the basis of the tables reported in [Antinucci and Miller 1976], Borer and Wexler claim that all of the verbs in *passato prossimo* are either transitive or verbs which select *essere* as auxiliary.

Actually, looking at the table reproduced at page 173 of [Borer and Wexler 1992], I was able to count at least 16 verbs which require *avere* as auxiliary. They can also appear with *essere*, but the problem here is that Antinucci and Miller do not specify which form of the two was used. They do

<sup>16</sup>From [Volterra 1976], page 155, I 4-106.

<sup>17</sup>Note that, even if the verbs requiring *essere* as auxiliary are all intransitive, nonetheless their presence doesn't compromise the maturationalist hypothesis, because in Italian the verb *essere* transmits predicative power to the constituent following it. In other words, according to the maturationalists, a child in the critical age cannot have instances of *passato prossimo* of intransitive verbs which require *avere* as auxiliary, because this would mean for the child to have *SVV* structures. Instead, the same child at the same age can have instances of *passato prossimo* of (intransitive) verbs which require *essere* as auxiliary because, due to the 'predicative' nature of *essere*, the child look at them as *SVA* structures. Only when over the critical phase, the child will correctly consider both as *SV* structures.

not even specify if the past tense used was indeed *passato prossimo* or some other of the five past tenses which Italian possesses.

In some way conscious of the problem, Borer and Wexler say, on page 176, that they omitted the verbs *mangiare, bere, suonare, scrivere, leggere, graffiare* 'eat, drink, play, write, read, scratch' from their count because they can be used transitively or intransitively. Unfortunately they include verbs like *sporcare, lavare, imparare* 'dirty, wash, learn' which can be used both transitively and intransitively as well.

In any case, the important point is that the data contradict Borer and Wexler's claim<sup>18</sup>, as in (18).

- (18) *Ecco, ho giocato.* (2;0;28)  
 well, have-1S. played-M.S.  
 Well, I played.

Unless we consider those 28 days as a determinant factor which puts this child out of the critical range, we have here a case of intransitive *passato prossimo* with *avere*.

Other examples are:

- (19) [Volterra 1976]  
*Ho dormito insieme co Pippo, ho dormito.* (2;0;22)  
 I slept together with Pippo, I slept.
- (20) [Antinucci and Miller 1976]  
*Ah! Ho capito!* (2;2)  
 Ah! I understood!
- (21) [McKee and Emiliani 1992]  
*Han ballato.* (2;4)  
 They danced.
- (22) [McKee and Emiliani 1992]  
*Ha giocato troppo.* (2;4)  
 He/She/It played too much.
- (23) [Volterra 1976]  
*Ha pianto, allora ha pianto.* (2;4;19)  
 He cried, well he cried.
- (24) [McKee and Emiliani 1992]  
*Ha nuotato troppo.* (2;8)  
 He/She/It swam too much.

<sup>18</sup>From [Volterra 1976], page 156, I 18-3.

For the sake of honesty, it must be said that these children might have already passed the *UEAPP* phase, even if (19) looks rather suspicious in this sense.

However, Borer and Wexler themselves point out that *dormire* and *piangere* are exceptions. Nonetheless, following Antinucci and Miller, they claim that *Ho dormito insieme co Pippo, ho dormito* could be interpreted as 'I was with Pippo', while *piangere* occurs only in a negative context and when the child says 'I didn't cry' he really means 'I wasn't a crybaby'.

First of all, even assuming that the child in (23) is too old and the utterance cannot be used to show that *piangere* can occur in positive contexts as well, negative evidence in spontaneous production is not the best proof for any claim, as already observed.

Second, the two interpretations above for (19) really appear to be forced, notwithstanding whatever unusual context might have accompanied them.

Finally, Borer and Wexler, quoting Antinucci and Miller, say that "during the whole period of participle-object agreement there is not a single instance of pronominalized objects in the speech of the children", and this would seriously compromise the dropped-pronoun theory. But again, the data say something different<sup>19</sup>:

- (25) *Questi l'ho stracciati.* [= *Questi li ho stracciati.*] (1;8;16)  
 these-M.P. them-M.P. have-1S. torn-M.P.  
 These ones, I tore them.
- (26) *Mamma te l'ha data la tua pistola.* (2;0;7)  
 [= *Mamma te l'ha data la tua pistola.*]  
 mummy-F.S. to\_you it-F.S. has-3S. given-F.S.  
 the-F.S. your-F.S.2S. gun-F.S.  
 Mummy has given it to you, your gun.
- (27) *E' nuova. Te l'ha comprata mamma.* (2;1;11)  
 is-3S. new-F.S. to\_you it-F.S. has-3S. bought-F.S. mummy-F.S.  
 It's new. Mummy bought it to you.

Any explanation of the phenomenon has to face these problems. Since there is evidence of dissociation between language and other cognitive faculties, it seems sensible to focus on a purely linguistic hypothesis.

## 7. A Fourth Hypothesis and Conclusions

<sup>19</sup>From [Volterra 1976].

The above discussion showed that the maturationalist hypothesis is weakened by too many problems. Instead, it appears safer to rely on a theory of continuous UG, mapped to a specific language grammar in a way which requires experience and learning as well as en route theory construction.

Keeping this in mind, a fourth explanation for the data could be that indeed there is a widespread application of past participle-object agreement in children under 2;0, but that this is a case of overgeneralization.

Note that Antinucci and Miller rejected the overgeneralization hypothesis because it does not explain why children choose to generalize the agreement rule instead of the non-agreement rule. However, the literature proves that children make many overgeneralizations for which we don't have any reasonable explanation.

Therefore, I consider it possible that, in the case of Italian children, past participle-object agreement might appear in a very early period of the child's language acquisition process, even dominating for a very short time. This period would be followed by a stage of coexistence of the two forms, ungrammatical agreement and correct non agreement. Eventually, past participle-object agreement would leave the field to the adult form.

In fact, look at the following two utterances that a child at the age of (2;0;29) said one a little after the other in the same session [Volterra 1976], utterances F 19-143 and F 19-154 respectively:

(28) *Pesa a pappa del bambino.*

[=? (Il cane ha) presa la pappa del bambino.]

(The-M.S. dog-M.S. has-3s.) taken-F.S. the-F.S. food-F.S.  
of\_the-M.S. baby-M.S.

The dog took the food of the baby.

(29) *Ha peso a pappa.* [= (Il cane) ha preso la pappa.]

(The-M.S. dog-M.S.) has-3s. taken-M.S. the-F.S. food-F.S.

The dog has taken the food.

Mckee and Emiliani would probably claim that in (28) the child meant to say *La ha presa il cane la pappa del bambino* 'The dog has taken it, the food of the baby'.

However, the above could as well be considered evidence for the overgeneralization hypothesis (coexistence stage): the child uses the past participle-object agreement rule in (28), whereas he correctly inflects in *-o* in (29).

Again, more information on the context would be very helpful to decide the interpretation. For example, if (28) had been uttered in response to

a question like "Who has taken the food of the baby?", I would choose the interpretation of Mckee and Emiliani. If instead the utterance was a 'spontaneous' comment of the child, I would agree with the interpretation given in [Volterra 1976].

Referring back to the discussion on *Ho sbagliata strada*, I said that the interpretation given by Mckee and Emiliani, *La ho sbagliata, la strada*, did not seem natural to me. However, assuming again that the child were answering to a question, *La ho sbagliata io, la strada*, with an overt post-verbal subject, would be a perfectly sensible choice.

If the overgeneralization hypothesis were confirmed, it would negate both the maturational hypothesis and the performance limitation hypothesis. However, further data are necessary to decide the issue. An experiment like McKee and Emiliani's conducted on children of younger ages, would be extremely useful for the collection of significant data.

## Appendix

The following tables summarizes source and method of recording for the data discussed.

### Antinucci & Miller and Borer & Wealer

Spontaneous production from:

Number of subjects	Age	Location of recordings	Frequency of recordings	Researcher(s)
6 (from Padova)	1;6-2;5	Nursery school	Once monthly	Tirondola
1 (from Roma)	1;6-2;3	Home	Twice monthly	Antinucci-Tieri-Volterra
1 (from Boston)	1;6-2;2	Home	Twice monthly	Brown

Longitudinal records of the speech of another Italian child (from Roma; researchers: Antinucci-Tieri-Volterra);

Cross-sectional data from 48 Italian children, age 2;0 to 4;4, tested in the Berkeley Cross Cultural Study of Language Acquisition.

### Volterra

Spontaneous production from:

Number of subjects	Age	Location of recordings	Frequency of recordings	Researcher(s)
1 (from Rome?)	1;5-2;4	Home	Twice monthly	Giannelli

*McKee & Emiliani*

Elicited imitation (inspired by the task used by Hamburger and Crain in 1982 for a study on relative clauses) from:

Number of subjects	Age	Researchers
11	2;0 (2;2-2;11)	McKee-Emiliani

### Acknowledgments

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**Subordinate CP and *pro*-drop: evidence for degree-n learnability  
from an experimental study of Spanish and English**  
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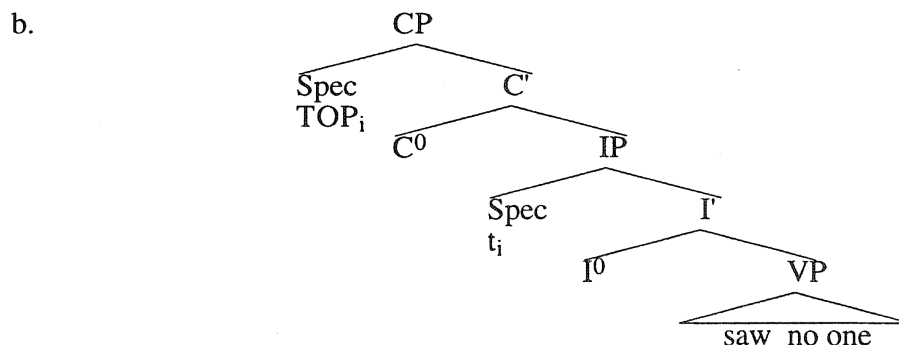
**1. Introduction**

Recent research on the grammar of null subjects has led us to focus on subordinate structures (like 1 and 2) which show a well-known contrast with respect to subject-drop between English and Spanish:

1. a. \*John took off his coat when \_\_\_ walked in
- b. *Juan se quitó el abrigo cuando \_\_\_ entró*
2. a. \*John said that \_\_\_ walked in
- b. *Juan dijo que \_\_\_ entró*

We have chosen to study children's knowledge of the *pro*-drop property of their target language in subordinate domains because, for both the adult and the child, the null subject phenomenon in main clauses recently has been found to be subject to different analyses and, thus, its explanation is confounded. For example, the adult "diary register" (as in 3a) which was described in Haegeman 1990, led her to propose a topic-drop analysis for main clause subject omission, as shown in 3b.

3. a. "A very sensible day yesterday. \_\_\_ saw no one. \_\_\_ took the bus to Southwark bridge... \_\_\_ walked along Thames St."
- (V. Woolf, *Diary*, v.5:203-4; in Haegeman, 1990)



Haegeman argues that, as in V2 languages like German and Dutch, the grammar of the diary register in non *pro*-drop languages allows for a discourse bound null

operator (TOP) (cf. Huang, 1984) in the matrix Spec CP which binds a variable in subject position (its trace in Spec IP)<sup>1</sup>.

More recently, Rizzi (1992) has argued that instances of child language subject-drop, as in 4, are instances of the same phenomenon as null subjects in diary contexts.

4. a. \_\_\_ want more apple (natural speech EricIII (22,0);  
 b. \_\_\_ not making muffins in L.Bloom, 1970)

Rizzi has also assimilated the case of subject drop in colloquial German, as in 5, (which has been standardly analyzed as topic-drop) to subject drop in 'diary registers' and early child speech.

5. \_\_\_ *habe es gestern gekauft*  
 '(I) have it yesterday bought' (colloquial German; in Rizzi, 1992)

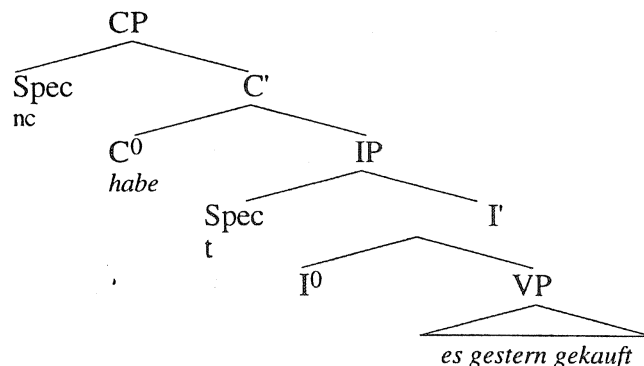
To account for these occurrences of "root" null subjects, Rizzi has proposed an analysis which involves a null constant empty category<sup>2</sup>. 6a interprets the structure proposed for 'root' null subjects in the colloquial speech of V2 languages; 6b interprets his proposal to explain 'root' null subjects in early child speech<sup>3</sup>:

<sup>1</sup> This analysis is not without problems, as Haegeman herself notes. In 'diary registers', only null subjects are found; however, in V2 languages, not only subject topic-drop but also object topic-drop is possible. The apparent constraint against object topic-drop in diary contexts is, therefore, left unexplained.

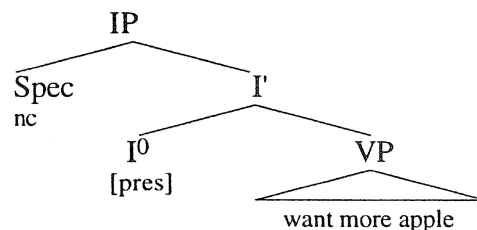
<sup>2</sup> This proposal too is not without problems. In Rizzi's proposal, a null constant empty category can be bound or unbound. It will be bound if the grammar makes available a non-quantificational null operator that will bind its trace (the nc) in Spec IP, from Spec CP. It will be unbound in a structure like that in 6a and 6b, where the nc empty category, in each case, occupies the highest A-position in the structure. The licensing requirement of the ECP does not apply to the unbound nc, if restricted to the case in which a head intervenes between a null element and its identifier (see fn11, Rizzi 1992). The unbound nc is also exempt from the identification requirement of the ECP. With respect to how the unbound nc empty category would, then, be interpreted, "the unbound null constant can survive in the Spec of the root (...)and receive its referential value in discourse". The precise mechanism which would allow this to happen is left without explanation. The status of Spec CP in V2 languages is also debated given that it is also the landing site for *wh*-phrases, for example.

<sup>3</sup> In this paper we will not discuss the suggestion made by Rizzi that early child grammars lack the functional projection CP (or that it is not obligatory but, instead, is only triggered by a fronted element such as a *wh*-phrase; cf. Grimshaw, 1994). However, we believe there is convincing evidence that the CP projection is in fact present in the earliest grammars of children (see Boser et.al., 1991 and Lust, 1994); as our evidence in this paper will also show.

6. a.



b.



These alternative grammatical accounts for null subjects, essentially confound the evidence for a '*pro*-drop' parameter from main clause subjects (particularly utterance initial ones) for both child and adult language. The existence of main clause null subjects in the adult speech of non *pro*-drop languages confounds the empirical facts as well. We, thus, turn to subordinate domains.

The observations from natural speech in 7 suggest that in English, German and French (non-*pro*-drop languages) children, like adults, correctly appear to avoid null subjects in subordinate clauses. In her extensive study of the natural speech of children acquiring English or Italian, Valian (1991) reported that, in English, null subjects very rarely occurred in subordinate clauses or after a fronted *wh*-phrase<sup>4</sup>. Observational data like that in 7 have led Roeper and Weissenborn to speculate that subordinate clauses constitute a "unique triggering domain" (147) for *pro*-drop and have led Rizzi to formulate the hypothesis that children are constrained by "...an early fixation of the Null Subject Parameter"(4).

7. a. \_\_\_ know what I made (Adam 31, in Rizzi, 1992)

b. *lass mal gucken wo das das is*

'let PART see where that that is' (B: 2;8;16, in R&W, 1990)

c. *si on fait pas de lumiere, ben on voit pas bien*

'if one makes not light, PART one sees not well' (P: 2;8;8, in R&W, 1990)

<sup>4</sup> The fact that in at least these two contexts null subjects are not found, suggests that subject omission raises a more general issue, which could be related to a constraint on government of the subject by a 'filled' C<sup>0</sup> head. This, would obviate parameterization and reduce *pro*-drop to UG principles, instead. We leave this speculation for future research.

This initial evidence for the child's early knowledge of *pro*-drop in subordinate domains bears on several current and fundamental debates. (See the introduction to Lust, Hermon and Kornfilt (eds.) for a review of these). First, it calls into question the need for postulating 'markedness' of the *pro*-drop parameter in the Initial State (see Hyams 1986, 1989; Valian, 1990). Second, it bears on widespread speculation in the literature that children's early grammars may be limited to juxtaposed or coordinate structures (see Lebeaux, 1988, Tavakolian, 1977, 1981; cf. Cohen Sherman and Lust, 1993, Lust, 1994). Third, it also bears on widespread speculation that children's early grammars lack functional projections, in particular the CP projection (see Lust, Suñer and Whitman, eds., 1994). Finally, this initial evidence also bears on the postulation that children's language acquisition is constrained by 'degree-zero' data, as proposed by Lightfoot (1991):

8. Degree-zero learnability: "... a restriction that only structurally simple data set parameters, viz. data of degree-0 complexity drawn from unembedded domains." (Lightfoot, 1991)

This proposal in 8 has been debated by Roeper and Weissenborn (1990), as well as others (see Commentary to Lightfoot, 1991). Essentially, a principle of "degree-zero learnability" proposes that children consult only unembedded domains at early periods of language acquisition. If this were true, CP subordination would not be available to the child and thus it could not provide a critical domain for either demonstrating or triggering early *pro*-drop knowledge.

Natural speech data alone (such as in 7) do not provide sufficient evidence regarding the child's knowledge of the grammar of CP subordination. Thus they do not allow firm conclusions on the critical debates. In general, as is well known, young children in their early language appear to be under a length constraint and do not frequently produce complex sentences in their natural speech. In addition, arguments based on 7 rest on the premise that other utterances with null subjects do not exist elsewhere in child speech, which can never be clearly confirmed on the basis of observational data alone<sup>5</sup>. It is important to obtain evidence from more than a few children in order to generalize results and draw conclusions regarding the 'Initial State'. Experimental research is, therefore, required.

## 2. Our Study

In this paper, we present results from a cross-linguistic experimental study of children's knowledge regarding *pro*-drop in subordinate clauses. We test 9:

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<sup>5</sup> In addition, absence of a null subject in a particular utterance may result from a number of reasons particular to that utterance. It need not result from a grammatical constraint.

9. Hypothesis:

If the early child grammar of English differs significantly from the early child grammar of Spanish (reflecting the correct *pro*-drop setting in their adult grammar), then this difference should be reflected in the subordinate domain.

If the hypothesis in 9 were true, then even in the earliest measurable periods of language acquisition we would find knowledge of the constraint against null subjects in subordinate clauses in English (a non *pro*-drop language). This would contrast significantly with production of null subjects in the speech of children acquiring Spanish (a *pro*-drop language).

### 2.1 Design

Our design compared matched samples of children acquiring English to children acquiring Spanish using identical experimental methods, and matched experimental sentences<sup>6</sup>. All children imitated a total of 16 sentences (8 experimental conditions) presented in randomized order (see Table 1).

Testing the hypothesis in 9 requires testing children's knowledge of subordinate structures. Our experimental design, thus, must provide evidence that children are analyzing the subordinate structure. For this reason, we contrasted children's performance (within both Spanish and English) on subordinate structures to closely matched coordinate structures (summarized in Table 1).

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<sup>6</sup> These sentences were controlled for a number of factors, including number of syllables, range of words and same structural format in each language.



that the connectives and and when (y and cuando in Spanish) cannot occupy the same position:

10. a. i. I know that John came in late **and that** he missed the talk  
 ii. \*I know that John came in late **when that** he missed the talk  
 b. i. *Sé que Juan llegó tarde y que se perdió la conferencia*  
 ii. \**Sé que Juan llegó tarde cuando que se perdió la conferencia*

The examples in 11 show that, in both languages, the connective and/y (unlike the complementizer when/cuando) is not within the CP which constitutes the sentential subject:

11. a. i. [That John will be late] is uncertain  
 ii. [When John will arrive] is uncertain  
 iii. \*[And John will arrive] is uncertain  
 b. i. [*Que Juan llegará tarde*] es incierto  
 ii. [*Cuándo Juan llegará*] es incierto  
 iii. \**[Y Juan llegará] es incierto*

This difference between coordination and subordination is linked to the possibility for a null subject, as shown in 12 and 13:

12. a. John is feeling better and \_\_\_ soon will come back to work  
 b. *Juan está sintiéndose mejor y \_\_\_ pronto regresará al trabajo*
13. a. John said [that he was feeling better] and [that \*\_\_ soon would come  
 back to work]  
 b. *Juan dijo [que estaba sintiéndose mejor] y [que \_\_ pronto regresaría al  
 trabajo]*

- 
- ii. Subordination: c. *weil/daß/ob wir den Film nicht gesehen haben*  
 because/that/if we the film not seen have  
 d. \* *weil/daß/ob wir haben den Film nicht gesehen*  
 because/that/if we have the Film not seen

In coordination (a and b), we find the V2 effect (the verb raising to second position). In contrast, in subordinate clauses (c and d), the complementizer prevents verb-raising to C<sup>0</sup> position. Again, the connective cannot be in C<sup>0</sup> for coordination; for subordination, it must be.

In coordinate structures, like 12, null subjects are optionally allowed; in contrast, in subordinate clauses, like 13, only Spanish allows null subjects<sup>8</sup>.

If the hypothesis in 9 is true, we should find a higher production of null subjects in coordination than in subordination in English and a higher production of null subjects in Spanish than in English in subordinate sentences, although not necessarily in coordinate sentences.

As Table 1 shows, we tested two types of subordinate clauses: adjunct clauses (examples 5 through 12) and complement clauses (examples 13 through 16). This allowed us to test children's knowledge of different subordinate  $C^0$  types. It also allowed us to test whether the early child grammar of English allows *that*-complementizer omission (as the adult grammar of English does) and whether this would affect the type of subject used in the subordinate clause.

The adjunct clauses were tested both in postposed and preposed position (as in examples 9 through 12). This was for two reasons: first, if children do correctly analyze subordination in terms of the lexical  $C^0$  head, then even when the subordinate clause is preposed, children should continue to block a null subject in the subordinate clause, while for the Spanish child it could still be an option. Second, when the subordinate clause is preposed, the main clause is no longer initial. Thus although our study was not specifically concerned with main clause subjects, this design allowed us to test the role of the utterance-initial effect on main clause null subjects.

We tested two types of possibilities for subject reduction: either the main clause subject was repeated in the second clause (marked as 'noun-noun' (N-N) sentences) or the stimulus sentence contained a pronoun in the second clause (identified as 'noun-pronoun' (N-p) sentences). For example, in a subordinate clause like 6: "Oscar whistles when Oscar jumps up", a lexical pronoun would be the only possibility for subject reduction in English; while, in Spanish "Oscar silba cuando Oscar salta" would allow further reduction to a null subject. The examples were designed so that a coreferential interpretation of the pronoun would be favored.

The reason for using nominal redundancy was to trigger children's 'reduction' of a noun subject. The child will tend to avoid redundancy by using a pronominal form (lexical or null), in accord with her/his grammar (cf. Chien & Lust, 1985). As in the adult grammar, we assume that the constraint on coreference between two R-expressions in a c-commanding relation (Condition C of the Binding Theory) may be also operative in children's grammars (cf. Lust, Eisele & Mazuka, 1993)<sup>9</sup>. Redundancy will be avoided for pragmatic reasons in any case.

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<sup>8</sup> Notice that it is the subordinate status of the clause and not the fact that it is the second clause that is responsible for the constraint on null subjects in English, when the complementizer is overt.

<sup>9</sup> Lust, Eisele & Mazuka actually provided evidence with respect to the form of Principle C, wherein a pronoun c-commands a noun. They raise an issue regarding the possible non-universality of the form of Principle C involving two nouns.

If hypothesis 9 is true, in subordinate structures, we would expect English and Spanish to differ. In English we would expect to find reduction to a lexical pronoun but not to a null subject in subordinate clauses although this constraint need not apply to coordinate structures. In Spanish, in contrast, we would expect reduction, either to a lexical pronoun or to a null subject in the subordinate domain. In coordinate structures, across the two languages, we would expect possible reduction to a lexical pronoun or to a null subject<sup>10</sup>.

## 2.2. Subjects

As Table 2 shows, we tested 105 subjects, in closely matched developmental samples of Spanish (a paradigm *pro*-drop language) and English (a paradigm non *pro*-drop language) monolingual children. The English children were tested in the US, the Spanish children in Puerto Rico. Their ages ranged from 2,2 to 4,5 (yrs,mos.). Children were tested as early in their process of overt syntactic language development as was possible with our experimental methods.

**Table 2:** Subject Information

Group	Age Range	SPANISH		ENGLISH	
		#Subjects	mean age	# Subjects	mean age
1	2,2-2,11	5	2.8	9	2.7
2	3,0-3,5	17	3.1	8	3.2
3	3,6-3,11	28	3.9	14	3.9
4	4,0-4,5	13	4.2	11	4.3
TOTAL	2,2-4,5	63	3.5	42	3.5

## 2.3. Methodology

To test the hypothesis in 9, we used an elicited imitation task according to standardized experimental methods. It is known from previous research that children analyze and reconstruct the stimulus sentences in their imitation (e.g. Lust, Chien and Flynn, 1986).

## 2.4. Results

In this paper, we present a selection of our results. Tables 3a and 3b show that the Spanish and English groups were closely calibrated in their general performance.

<sup>10</sup> If a principle such as the 'Avoid Pronoun Principle' (see Chomsky, 1986, Montalbetti, 1984) were also operative in children's grammars, then we could find a higher reduction to a null subject whenever either lexical pronoun subjects or null subjects were an option. This would also apply to reduction of redundancy in subordinate structures in Spanish.

**Table 3a:** Overall Calibration of the English and Spanish Groups (% of items)

	No Change	Types of Change		
		2 Clause	1 Clause	Other
ENGLISH	43.60%	34.82%	17.86%	3.27%
SPANISH	38.10%	33.04%	24.50%	3.17%

**Table 3b:** Calibration of the English and Spanish Groups (% of items)

	Amount of Change	
	from Noun-noun	from Noun-pronoun
ENGLISH	64.58%	47.32%
SPANISH	73.61%	50.20%

Table 3a essentially evaluates whether the child did or did not change the stimulus sentences when imitating them. It shows that children made changes to a similar degree in Spanish and English. Table 3b shows that the percent for amount of change was greater for the noun-noun sentences than for the noun-pronoun sentences in both languages. This shows children were responding to the redundancy in the stimulus sentences.

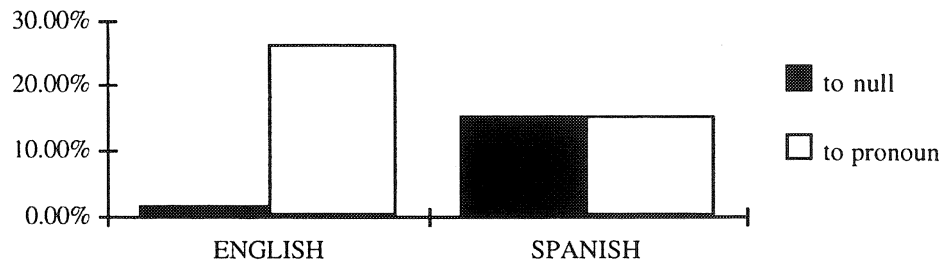
#### 2.4.1. Coordination vs. Subordination

In the coordinate structures, we found that the English and Spanish children produced a null subject to a similar degree: 5.88% reduction to a null subject from a redundant noun in English vs. 9.28% in Spanish; 17.81% reduction to a null subject from a pronoun in English vs. 12.50% in Spanish (% of 2 clause responses).

When we contrasted amount of reduction to a null in Noun-noun and Noun-pronoun sentences in coordination (e.g. 1-4) and in postposed adjunct subordination (e.g. 5-8), we found that children reduced to a null significantly more often in a coordination than in a subordinate clause in English ( $t = 1.983$ ,  $p = .017$  in a two-tailed t-test for unequal n-values) but not in Spanish ( $t = 1.971$ ,  $p = .134$ ).

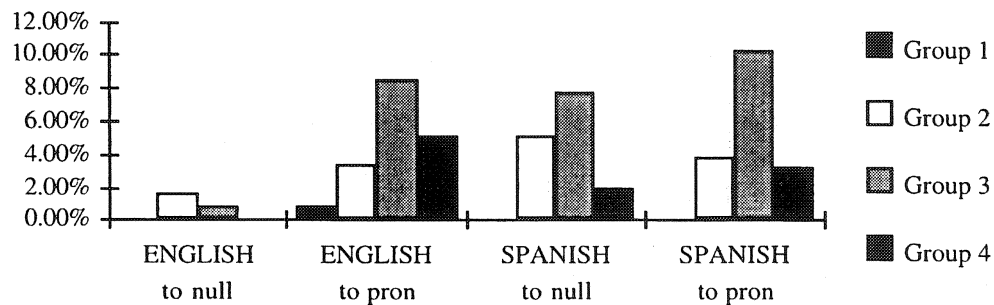
These results contrasted with the subordinate domains. Figure 1a shows the amount of conversion to a null or to a pronoun from noun-noun subordinate sentences; i.e., whether the child generated "Bunny says that he dances" or "Bunny says that ∅ dances" for a sentence like "Bunny says that Bunny dances".

**Figure 1a.** Subordinate Postposed Adjunct (N-N): conversion to null or to pronoun (% of 2 clause responses)



There was a significantly higher amount of null subjects in Spanish than in English subordinate adjunct clauses:  $t = 1.997$  ( $p = .007$ ) in a two-tailed t-test for unequal n-values. In contrast, we found a similar rate of amount reduction to a lexical pronoun across the two languages in these subordinate domains. Figure 1b shows these results broken down into the different age groups:

**Figure 1b.** Subordinate Postposed N-N Sentences (Complement or Adjunct): conversion of the subordinate subject to null or to lexical pronoun per age group (% of 2 clause responses)



#### 2.4.2. Preposed structures: main non-initial subject

The constraint on use of null subjects found in subordinate clauses for the child acquiring English was also found in main non-initial clauses. For a sentence like "When Ernie listens, Ernie sits up", children acquiring English would only reduce redundancy with a lexical pronoun, never with a null in either main clauses or subordinate clauses. In contrast, in Spanish, the child would produce "cuando Mickey entra,  $\emptyset$  silba" or "cuando Mickey entra, él silba" to the stimulus sentence "cuando Mickey entra, Mickey silba".

#### 2.4.3. Structural Conversions

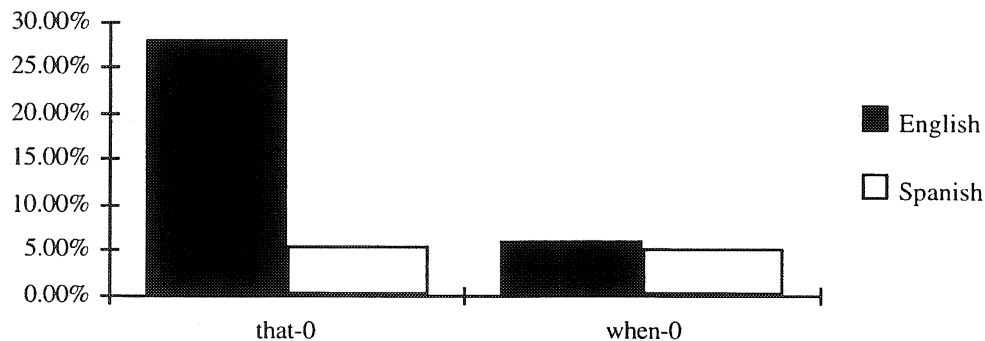
Our results also show that, in both languages, children convert both from subordination to coordination and from coordination to subordination, showing that they are not limited to coordination alone. These conversions appeared to be

structure-dependent in specific ways. For example, children distinguish the different  $C^0$  types. In both languages we found more conversion to coordination from an adjunct clause than from a complement clause, showing a non-random relation between coordination and subordination.

#### 2.4.4. Complementizer Omission

Figure 3 shows that, in English, a child would predominantly generate "BigBird says \_\_\_ BigBird sneezes" for "BigBird says **that** BigBird sneezes". In Spanish, in contrast, children almost never generated complementizer omission: "\*René dice \_\_\_ René corre" for "René dice **que** René corre"; where adult Spanish does not allow this. This result evidences a sensitivity on the part of the child to  $C^0$  itself, in a way which reflects the adult grammar.

**Figure 3:** Complementizer Omission (% of 2 clauses)



#### 2.4.5. One-Clause Data

Figure 4 shows the percentage of single clause responses with null subjects from adjunct, complement and coordinate Noun-pronoun stimulus sentences. Most of these data come from the youngest age group and reflect a 'recency effect' where the child gave the second clause.

**Figure 4:** Null Subjects in One-Clause Data from Adjunct, Complement and second conjunct in Coordination (% of One-Clause Responses)

	ENGLISH	SPANISH
ADJUNCT	0.00%	22.73%
COMPLEMENT	10.53%	25.59%
COORDINATE	25.00%	29.17%

These results indicate that, even in the most primitive responses, children appear to be constrained by the rules of adult grammar showing significant cross-linguistic differences. In English, single clause responses from subordinate stimuli yield very few null subjects. However, in Spanish, as well as in English coordinate sentences,

children respond with a greater percentage of null subjects in their single clause responses. It appears, then, that children process the stimuli as two clause sentences, even distinguishing subordination and coordination when they respond with only single clauses.

#### 2.4.6. Qualitative Data

Table 4 exemplifies spontaneous structural conversions that children gave: from subordination to coordination and from coordination to subordination. These data basically show, in accord with our group statistical data, that English children know about the constraints on subject reduction, since they restrict the occurrence of nulls to the coordination domain, even when spontaneously generated. Children acquiring Spanish, also avoid redundancy but, contrary to what the English child does, they produce both pronouns or null subjects in all domains. This is true even for the youngest ages.

#### 2.5. Discussion of Results

These experimental results provide strong evidence in favor of the hypothesis in 9. In general, they provide evidence in favor of what we have called elsewhere the 'Strong Continuity Hypothesis' of UG (Lust, 1994; Whitman, Lee and Lust, 1991; Boser, Santelmann, Lust & Whitman, 1991). Specifically, these results support very early knowledge of the correct grammar for *pro*-drop, which is reflected in significant differences across our matched Spanish and English samples with regard to this phenomenon. It is reflected in the nearly absolute 'constraint' against allowing *pro*-drop (that is, null subjects) in several forms of subordinate clauses we have tested in the English sample, even though children acquiring English do more freely allow subject reduction in coordinate sentences.

**Table 4: Qualitative Data**

#### A. ENGLISH

##### Conversions to Coordination

<b>Experimenter:</b>	<b>Child: null subject</b>
when Mickey comes in, Mickey whistles	(2,5) Mickey come in and $\emptyset$ whistles
Pluto sneezes when Pluto wakes up	(2,8) Pluto wakes up and $\emptyset$ sneezes
	<b>Child: pronoun</b>
Oscar whistles when Oscar jumps up	(2,8) Oscar sits up and he whistles
When Ernie listens, Ernie sits up	(3,0) Ernie listens and he sits up

### Conversions to Subordination

<b>Experimenter:</b>	<b>Child:</b>	<b>pronoun</b>
Oscar stands up and he dances	(2,10)	Oscar stands up when he dances
Big Bird mumbles and Big Bird sneezes	(3,4)	Big Bird mumbles when he sneezes

### B. SPANISH

#### Conversions to Coordination

<b>Experimenter:</b>	<b>Child:</b>	<b>null subject</b>
<i>René dice que René corre</i>	(3,3)	<i>René salta y <math>\emptyset</math> corre</i>
<i>Pluto dice que él sale</i>	(3,0)	<i>Pluto entra y <math>\emptyset</math> sale</i>

	<b>Child:</b>	<b>pronoun</b>
<i>cuando Ernie juega, Ernie grita</i>	(3,0)	<i>Ernie juega y él grita</i>
<i>Oscar silba cuando Oscar salta</i>	(3,3)	<i>Oscar salta y él silba</i>

#### Conversions to Subordination

<b>Experimenter:</b>	<b>Child:</b>	<b>null subject</b>
<i>Mickey canta y Mickey silba</i>	(3,0)	<i>cuando Mickey canta, <math>\emptyset</math> silba</i>
<i>Oscar canta y él baila</i>	(3,7)	<i>cuando <math>\emptyset</math> canta, Oscar baila</i>

<i>René baila y René salta</i>	(2,6)	<i>cuando él baila, él salta</i>
<i>René corre y René salta</i>	(3,0)	<i>René dice que él salta</i>

The fact that children make this distinction (and several others) between subordinate and coordinate domains provides evidence for early knowledge of subordination where the subordinating connective occupies  $C^0$  position in a CP projection, in distinction from the coordinating connective. Taken together, the results support the hypothesis that the knowledge of cross-linguistic variation in *pro*-drop is more transparently evidenced in subordinate clause domains, thus according with the speculations raised by Roeper & Weissenborn, 1990 and Rizzi, 1992, and with the results of Valian, 1991 concerning Italian-English comparisons.

These results do not accord with a 'degree zero' limitation on child grammars, hypothesized in 8 above. In fact, they (like other evidence, e.g. Lust, 1994) support a subtle sensitivity to the CP subordination domain in child grammars. Since this domain is recursive, we conclude that there is no need to limit child grammars to any 'degree-below-n' in the child, just as there is none in the

adult<sup>11</sup>. It might be counterargued here that simply showing that children control grammatical knowledge in subordinate CP domains does not confirm that this knowledge has not been 'learned' on the basis of the main clause, and generalized to subordinate clauses. As we have shown, however, given the empirical variation and theoretical confounds which characterize the null subject in main clauses, it is not clear how this learning could be achieved; especially not how the 'obligatory' character of the constraint against null subjects in the non *pro*-drop English sample could have been so achieved and so generalized in distinction from the Spanish, and in distinction from coordinate structures<sup>12</sup>.

Finally, it may be counterargued that although these data do not evidence any discontinuity in child grammars down to the youngest ages we tested, i.e., 2yrs, 2months, it is still possible that some grammatical discontinuity does exist at even younger ages. This, of course, remains an *a priori* possibility. Notice, however, that if this is the case, the hypothesis for this restricted discontinuity hypothesis may not be subject to experimental test<sup>13</sup>; thus it may not be testable for disconfirmation. This is particularly serious, given the indeterminacy of interpretation of anecdotal observations of children's natural speech utterances, which we noted above.

Finally, it must be recognized that the data we have reported have included 'one clause' responses from children; presumably reflecting the fact that the youngest children we tested included those at a very primitive level of language, one wherein complex sentence formation (in their production) was still difficult for them. Even these very primitive data reflected cross-linguistic differences, continuous with results from the 2-clause data across Spanish and English samples with regard to *pro* drop<sup>14</sup>.

In the face of these arguments, we must conclude that the null hypothesis is the "strong continuity hypothesis" of UG, and it includes degree-n 'learnability' with regard to first language acquisition.

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<sup>11</sup> We note that the original hypothesis of limiting the child's access to data in terms of degrees (e.g., Wexler and Culicover, 1980) was based on an earlier model of linguistic theory, in which the syntactic 'cycle' could and did insinuate several levels of representation in a derivation between deep and surface structure. Current Minimalist theory (Chomsky, 1992) would obviate this restriction. The original hypothesis was also based on an earlier model of 'error driven' learning in the child. Current learnability theory also obviates this assumption (e.g., Kapur, 1994).

<sup>12</sup> We argue that data from embedded clauses is crucial; we are by no means arguing against degree-0 data as being relevant. It simply isn't a unique triggering domain.

<sup>13</sup> Our sample reaches down as young as possible with experimental methods which can be continuously applied to the child during early stages of overt language acquisition.

<sup>14</sup> The occurrence of null subjects in these data indicated that at least some of these involved children who would be providing occasional natural speech utterances with null subjects, like that reported in the observational literature; thus indicating intersection and continuity between the youngest ages (not testable by experimental method) and slightly older children, beginning at 2,2 in our sample.

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**The acquisition of Spanish null and overt pronouns:  
Pragmatic and syntactic factors**

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## **1. Introduction**

In recent papers, we have argued that there is no developmental stage at which children acquiring either Spanish or English show a syntactic deficit in their knowledge of grammar determining the distribution of null subjects (Austin, Blume, Lust, Núñez del Prado, Parkinson, and Proman 1995a, 1995b). This proposal contrasts with that of others in the field, such as Radford (1990), Rizzi (1994), Hyams (1994), and Hyams & Wexler (1993), who have proposed that various elements of the adult syntax are missing or underspecified in children's early grammars. We have claimed that, with respect to null subjects, children acquiring *pro*-drop and non *pro*-drop languages exhibit early and surprisingly adultlike syntactic knowledge. However, we have claimed that there is development of pragmatic knowledge in the acquisition of both *pro*-drop and non *pro*-drop languages. This pragmatic knowledge affects the distribution of null subjects in both languages.

In this paper, we will present results from our study of Spanish first language acquisition, based on new analyses of young children's natural speech. In our analyses, we further investigate Spanish-speaking children's syntactic competence with regard to null subjects. We compare the distribution of null subjects with the distribution of null auxiliaries in the grammar of Spanish-speaking children, and we argue that these distributions are governed by similar constraints, and show similarities in their development.

## **2. Method**

The children's natural speech samples analyzed for this study were chosen at random from the Cornell Language Acquisition Lab's Natural Speech Corpus. The samples coded and analyzed are summarized in Table 1 in the Appendix. There are a total of 13 samples from 10 subjects, ranging in age from 1 year 2 months to 3 years 4 months, and in MLU in morphemes from 1.29 to 4.77. This MLU range includes children from the very onset of word combination to a point beyond which complex sentence productivity begins.

However, as we will see, Spanish-speaking children appear to be relatively precocious in comparison to English-speaking children of a comparable age, with respect to verbal inflection (see Austin et al. 1995b), as well as clausal complexity.

We first analyzed all of the 2395 utterances in the 13 natural speech samples in order to extract those utterances that we labeled “potential *pro*-drop clauses” (PPDCs), which we defined to include all declarative clauses with explicit verbs. Thus, a complex utterance could have more than one clause in which a *pro* subject would be appropriate. We excluded all imperatives, questions, and sentences with an implicit copula or implicit verb. Examples of each category are given in the Appendix. The resulting number of these for each subject is shown on Table 1.

### 3. Results

#### 3.1. General results

In our Spanish-speaking subjects, we found early competence in a variety of syntactic structures. In Table 1 in the Appendix, we give examples of types of structures on which our subjects demonstrated competence, including use of the subjunctive mood, relative clauses, VP ellipsis, impersonal *se*, and arbitrary plural subjects.

We compared the overall occurrence of null and lexical pronominal subjects in PPDCs, and we found that null subjects appear at the earliest MLU stage, and remain productive throughout development. We found that in Spanish, the lexical pronominal subject appears to be a marked option at all levels of MLU, with only one occurrence of an overt pronominal among the five children at the low end of the MLU range (and this was in a word-for-word repetition of the adult’s utterance), as compared with 17 null pronouns in these subjects. First we looked at Spanish-speaking children’s syntactic knowledge regarding null subjects. Specifically we asked: (i) How do early Spanish-speaking children show knowledge of the licensing requirements of *pro*?; and (ii) Is there a correlation between correct verbal inflection and the presence of null subjects?

Given the claim made by Rizzi (1986), among others, that verbal morphology plays a role in licensing null subjects, we wanted to examine its co-occurrence with null subjects in our samples. Thus we coded all utterances in which null subjects appeared, looking specifically at the verbal morphology. These results, reported in Austin et al. 1995b, showed that Spanish-speaking children master the verbal inflection system of their language early. This finding contrasts with that which we obtained for the English-speaking children in an earlier study (Austin et al. 1995a); these children showed little consistent use of verbal morphology, with the exception of the child with the highest MLU studied (subject AW; MLU 3.68). Examples of the critical cases we measured here, namely, null or overt subjects with or without verbal inflectional tense and agreement (TA) morphology, are shown in (1):

(1) a. **Overt subject +tense/agr morphology:**

*Estoy haciendo yo.* ‘I am doing *e*.’ (AL; MLU 4.61; age 2;06)

**b. Overt subject -tense/agr morphology:**

No examples

**c. Null subject +tense/agr morphology:**

*pro es grande.* 'It is big.' (JP1; MLU 1.73; age 1;08)

**d. Null subject -tense/agr morphology:**

*Ahí... pro volando... toma.* 'Over there, flying...here.'  
(NR; MLU 4.77; age 2;10)

We found no cases in Spanish of a verbal stem with no morphology whatsoever.<sup>1</sup> With regard to the presence or absence of verbal TA morphology with null subjects, the main finding was that every time the TA morphology was missing, the entire auxiliary was also missing, as in (2) below. Examples of this kind account for 10.29% of PPDCs across all subjects (excluding cases of PRO subjects with infinitival verbs).

- (2) a. Adult: *¿Y tu papi dónde está, eh, Freddie?*  
'And where is your daddy, eh, Freddie?'  
Child: *Trabajando.*  
'Working' (FB; MLU 4.26; age 3;04)
- b. Adult: *¿Dónde está el pajarito?*  
'Where is the little bird?'  
Child: *Ahí...volando.*  
'There... flying' (NR; MLU 4.77; age 2;10)

#### 4. Comparison of contexts in which null and lexical pronominals occur

In previous acquisition studies, most researchers have not examined the discourse context in which null subjects occur. However, in *pro*-drop, context plays a crucial role in identifying the referent of the null subject and in determining the acceptability of its occurrence. We separated out the third person subjects from the first and second person ones, since we assumed that first and second person subjects would always have a pragmatic antecedent in the form of the speaker or hearer. Third person (singular or plural) pronominals were selected for context analysis, (excluding expletives and PRO). A *pragmatic antecedent* was defined as any non-

1. We did not expect to find any cases of a bare verbal stem in Spanish without any verbal morphology, since these never occur, but we expected that we might find infinitives in tensed clause contexts.

linguistic entity in the environment; for example the subject, the data collector and any other participants, something in the room, or in a picture book, whether or not referred to by name, as in (2). A *linguistic antecedent* was one which was explicitly identified in the discourse, as in (3a, b).

- (2) Adult: *¿Con qué te las limpias tú?*  
 ‘What do you clean them with?’  
 Child: *Papito, le hizo un hueco.*  
 ‘Daddy, (she) made a hole in it’ (child claims the data collector has made a hole in the doll) (EH; MLU 3.66; age 2;11)
- (3) a. Adult: *¿Un mosquito?*  
 ‘A mosquito?’  
 Child: *¡Ay!, me picó*  
 ‘Ay! (It) bit me’ (NR; MLU 4.77; age 2;10)
- b. Adult: *¿Por qué está llorando tu hermanita, ah?*  
 ‘Why is your little sister crying?’  
 Child: *Po’que se cayó.*  
 ‘Because (she) fell down’ (MA; MLU 3.76; age 2;06)

We found a total of 234 third person null subjects vs. 39 third person overt pronoun subjects.<sup>2</sup> The overt pronoun subjects comprised 12% of the total of third person subjects (including NPs), and the null subjects comprised 72%. We found that virtually all the third person pronoun subjects, both null and overt, had either a pragmatic or a linguistic antecedent. In fact, there was only one clear case where the child was not referring to one of the discourse participants, or to some entity mentioned in the discourse:

- (4) a. Adult: *¿Quieres que vaya contigo?*  
 ‘Do you want me to go with you?’  
 Child: *‘Ta allá.*  
 ‘It is there’ (*Ta = está*) (MA; MLU 3.66; age 2;06)

These results suggest that the Spanish-speaking child knows that both forms of pronominals need identification. This indicates that, from the earliest MLUs tested, children have the general pragmatic competence necessary for identifying

2. The category of overt pronouns included both personal pronouns and demonstratives.

pronominal null or overt subjects, as well as the syntactic competence for licensing null pronominal subjects.

### 5. Development in the interaction between syntax and pragmatics

All this may give the misleading impression that Spanish-speaking children do not show any development in their grammar.<sup>3</sup> Here, we identify two areas where there does appear to be development. These are both areas where the child must integrate knowledge of discourse factors with syntactic knowledge. The first area in which we found development was in auxiliary omission. The examples in (4) show cases in which children use null auxiliaries that are marginally grammatical and subject to dialectal variation (see section 6). While there were examples of a child omitting an auxiliary yet including an overt subject in English, such examples were never found in the Spanish data. However, the Spanish-speaking children sometimes omitted the auxiliary (and lost the verbal morphology) when answering a question in present indicative with the present progressive form, as shown in (4a-e). The problem is that these examples show a total loss of tense and agreement features, and in all but (5f) a mismatch between the aspect marking in the adult's question and the child's response.

- (5) a. Adult: *¿Y qué hacen?*  
           ‘And what do they do?’  
       Child: *??Jugando a cuentos.*  
           ‘Playing (with) stories’ (AL; MLU 4.61; age 2;06)
- b. Adult: *¿Qué hace?*  
           ‘What does it do?’  
       Child: *??Comiendo las hierbas.*  
           ‘Eating grass’ (SC; MLU 3.84; age 2;03)
- c. Adult: *¿Qué hacen ahí?*  
           ‘What do they do there?’  
       Child: *??Comiendo.*  
           ‘Eating’ (SC; MLU 3.84; age 2;03)

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3. In fact, although not directly related to this paper, we noted that Spanish speaking children have difficulty with some syntactic structures such as flip verbs (like *gustar*), tense, aspect, and mood, and our youngest subjects occasionally omitted copula *ser*. Examples are given in Table 2 of the Appendix.

- d. Adult: *¿Y qué haces allí adentro?*  
 ‘What do you do in there?’  
 Child: *??Buscando mis cosas, pero no están.*  
 ‘Looking for my things, but (they) are not (here)’  
 (EH; MLU 3.66; age 2;11)
- e. Adult: *¿Qué hace el gato?*  
 ‘What does the cat do?’  
 Child: *??Comiendo comida.*  
 ‘Eating food’ (MA; MLU 3.76; age 2;06)
- f. Adult: *¿Qué estás haciendo?*  
 ‘What are you doing?’  
 Child: *??Jugar.*  
 ‘To play’ (GR; MLU 2.16; age 2;03)

The present tense is semantically ambiguous in Spanish. It can be interpreted either as having a habitual aspect or a present progressive one. Thus, a question such as (6a) could be answered either with a present progressive, *están durmiendo* — as the child does — or with a present indicative form, *duermen*. The fact that the child answers with a present progressive form suggests that she understands this ambiguity: it could be argued that children use present progressive to answer these questions simply because they don’t know how to use the present indicative, but as shown in (7), children in our study correctly and consistently use present indicative when it is appropriate to the preceding discourse context. The null auxiliary would be correct if s/he were answering a present progressive question, i.e. a question with an overt auxiliary, as shown in the examples in (6 b,c).

- (6) a. Adult: *¿Y qué hacen?*  
 ‘And what do they do?’  
 Child: *Están también durmiendo.*  
 ‘(They) are also sleeping’ (SC; MLU 3.84; age 2;03)
- b. Adult: *Y tu amatxu, ¿dónde está?*  
 ‘And your mommy, where is (she)?’  
 Child: *Tabajando.*  
 ‘Working’ (AL; MLU 4.61; age 2;06)

- c. Adult: *Tú estás leyendo, y él, ¿qué está haciendo?*  
 ‘You are reading, and him, what is he doing’  
 Child: *Pintando.*  
 ‘Painting’ (EH; MLU 3.66; age 2;11)
- (7) Adult: *¿Qué le hace ella?*  
 ‘What does she do to it’  
 Child: *Le hace “wooo”!*  
 ‘(She) does “wooo” to it’ (could also be *le está haciendo*  
 “wooo”! ‘(she) is doing “wooo” to it’)  
 (EH; MLU 3.66; age 2;11)

Thus, the context of the preceding utterance is the crucial factor in licensing a null auxiliary in the response. In answering questions like (5a), Spanish-speaking children need to be aware of three factors: first, that the tense/aspect features of the question and answer must match; second, that the auxiliary can be null or overt; and third, that a null auxiliary requires a linguistic antecedent. Our subjects appeared to know that null subjects had to be licensed and identified either by a pragmatic or linguistic antecedent. However, they seemed to extend the identification requirements for null subjects to null auxiliaries and thus had trouble realizing that every null auxiliary must have a linguistic, rather than a pragmatic antecedent.

This distinction between linguistic and pragmatic antecedents is similar to Hankamer and Sag’s (1976) claim that certain syntactic elements in discourse must have a linguistic antecedent while others merely require a pragmatic antecedent. The alternation between present progressive and habitual aspect in Spanish is independent of the occurrence of null subjects. It is also independent of the child’s syntactic knowledge, since these examples are potentially syntactically well-formed given an appropriate context (for example, if the response in (5c) were given to the question *¿Qué están haciendo?*). If it were the case that examples such as (5a-e) reflected a simple confusion between habitual and progressive aspect, we might expect to find examples in which the child responds to a progressive question with a present indicative form. We never found such examples in the data.

## 6. Dialectal variation

It seems that there is dialectal variation as to the acceptability of responses such as (5). We did a brief preliminary survey of the acceptability of these responses among adult native-speakers of Spanish. These adults were from Spain, Peru and Puerto Rico, and thus were speakers of the same dialects as the children we studied. The acceptability judgments for these question-answer pairs were not consistent, either

between speakers of different dialects or within each dialect. Although this finding is preliminary, the data suggest two possibilities:

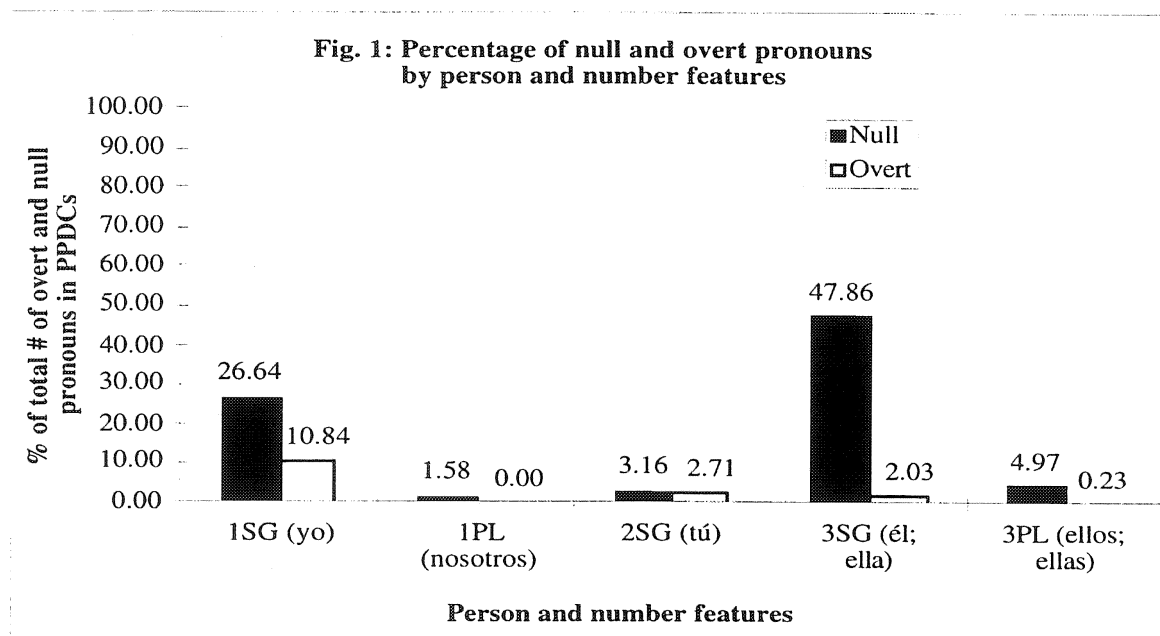
- (8) A. The child use of a null auxiliary response is consistent with that of the adult speakers of his/her dialect, but because there is such variability in the adult use of null vs. lexical responses even within a given dialect, the child does not have a clear model to follow.
- B. The child use of a null auxiliary response is not consistent with that of the adult speakers of his/her dialect. This could be attributed to the following reasons:
- i. The child has a deficit in the knowledge of the pragmatic factors that govern the distribution of the null auxiliary responses.
  - ii. This distribution interacts with other factors, such as constituent length or choice of verb rather than purely syntactic or pragmatic factors. In this case the child is developing his/her knowledge of the idiosyncratic factors beyond the syntax of the utterance that permit the null auxiliary responses.

Notwithstanding, this knowledge is pragmatic as well as syntactic and it is language-specific. It cannot be fully pre-programmed by Universal Grammar and thus must be learned by the child.

### **7. Pronoun overuse**

Another area where we found development was in the use of overt pronoun subjects. As in the case of the distribution of null auxiliaries, the use of overt pronoun subjects involves language specific knowledge which integrates syntax and pragmatics.

In these analyses, we first separated out the null and overt pronouns by person and number features, as given in the bar graph in Figure 1:



Our results show that children produce a greater proportion of the first person singular overt pronoun *yo* than of any other overt pronoun. The finding that 69% of the children's overt pronouns were occurrences of the first person singular *yo* was surprising, since first person singular always has a pragmatic antecedent which should license a null subject pronoun.

It is not clear to us whether this result reflects development in the use of pronouns, or that the excessive use of the first person singular overt pronoun is due to extralinguistic factors, such as the child's egocentric discourse style. Larson and Luján (1992) propose that overt pronouns in adult Spanish are only used for emphasis or contrast; under this analysis, our Spanish-speaking subjects do not seem to have acquired this language specific constraint on the distribution of overt pronouns. This suggests that the use of overt pronouns is an area where development takes place, even though children's knowledge of the licensing and identification of null pronouns is present from early on.

## 8. Conclusion

In conclusion, our previous results (Austin et al. 1995a, 1995b), which showed little evidence for development in the knowledge of the syntax of *pro*-drop, led us to initiate a more refined analysis of the precise environments in which null subjects occur in child Spanish. When we did, we found examples where children have difficulty integrating pragmatic and syntactic factors. This led us to look at the inter-sentential context of utterances, or what Hankamer and Sag (1976) call "the syntax of discourse", rather than examining utterances in isolation.

We have argued that even very young Spanish-speaking children know the syntactic requirements of *pro* subjects. That is, they know that null pronoun subjects require both licensing and identification. Licensing requirements are fulfilled by verbal tense/AGR marking, which Spanish-speaking children master from the beginning of speech production. Here our results provide a remarkable contrast with our earlier findings for English: whereas the English-speaking children quite commonly omit tense and agreement features, the Spanish-speaking children do so only rarely, even at the lowest MLUs. They also recognize the need for an antecedent to identify null and overt pronominal subjects, and they know that a pragmatic antecedent fulfills this requirement as well as a linguistic one.

Our results provide subtle evidence of development in the first language acquisition of Spanish. We localized this development in the integration of syntax and pragmatics. We identified contexts where the children produced null auxiliaries which were not licensed by the discourse because they did not match the features of the verbal antecedent in the previous utterance. Although children at these MLUs demonstrate a good deal of knowledge about aspects of syntactic well-formedness related to *pro*-drop, they still have to acquire the language specific knowledge of how and when to use null subjects and null auxiliaries together in discourse. Children acquiring Spanish seem to require only a pragmatic antecedent to identify a null auxiliary, when in fact what is needed is a linguistic antecedent. Boser (1995) found similar evidence in children acquiring German, who use verb initial utterances with dropped topicalized phrases that have pragmatic antecedents. In adult German, the topicalized phrase can only be omitted when it has a linguistic antecedent and Boser's work shows that this is an area where children have to integrate language specific constraints on the distribution of null elements with knowledge of syntax. We argue that there is a parallel case in the area of *pro*-drop in child Spanish. The Spanish-speaking child shows early knowledge of syntax (i.e., the licensing and identification of null pronouns) in tandem with a longer process of integrating this syntactic knowledge with language specific pragmatics, in order to construct and interpret the larger structures of discourse.

The primary result of the research reported here is a change in focus from the way in which null subjects have been investigated previously. If we had limited ourselves to looking at the purely syntactic aspects of the use of *pro*-drop in our subjects, we would have seen very little development, since their syntactic knowledge is very good from the beginning. Only by looking at the wider discourse context have we found where development is taking place, that is in language specific interactions between syntax and pragmatics which must be learned.

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## Appendix

Examples of PPDC utterances:

### I. Subject types in potential pro-drop clauses:

#### a. Null subject:

Adult: *¿Qué está haciendo el perrito?*

‘What is the doggie doing?’

Child: *pro está en su casa.*

‘(He) is at home.’

(AL; MLU 4.61; age 2;06)

#### b. Pronoun subject:

Adult: *Yo creo que el gatito se escondió.*

‘I think that the kitty hid.’

Child: *¡Párate! Pa’ que tú lo vea.’*

‘Stand up! So that you can see him.’

(MA; MLU 3.76; age 2;06)

#### c. NP subject:

Adult *¿Qué pasa en el patio?*

‘What happens in the patio?’

Child: *Ahí, y eto, me picó un mosquito.*

‘There, and this, a mosquito bit me.’

(NR; MLU 4.77; age 2;10)

### II. Verb types excluded from potential pro-drop clauses:

#### a. Implicit copula:

Adult: *¡Ala! ¡Cuántas cosas!*

‘Wow! So many things.’

Child: *Mira un nene, esto un palo.*

‘Look, a little boy, this a stick.’ (AB; MLU 4.10; age 2;03)

b. **Implicit verb:**

Adult: *Muy bien. Y yo digo: el perro va al parque.*

‘Very good. And I say: the dog goes to the park.’

Child: *Al paque el perro.*

‘To the park the dog.’ (AB; MLU 4.10; age 2;03)

III. **Verb types included in potential pro-drop clauses:**a. **Explicit verb:**

Adult: *¿Es una tarta?*

‘Is it a cake?’

Child: *Mira, y esto es la múkika (música).*

‘Look, and this is the music.’ (AB; MLU 4.10; age 2;03)

b. **Implicit auxiliary:**

Adult: *¿Qué hace?*

‘What is he doing?’

Child: *Comiendo la hierbas.*

‘Eating grass.’ (SC; MLU 3.84; age 2;03)

**Table 1: Some syntactic proficiencies**

Subject	MLU	Age	Construction and Examples
<b>VP Ellipsis:</b>			
EH	3.66	2;11	<i>Puedo tocar pero tú no.</i> ‘(I) can touch but you can’t.’
FB	4.26	3;04	<i>Po’que está que no piende ( prende) y con la fila (pila) tampoco.</i> ‘Because (it) won’t start and not even with the battery.’

<b>Relative Clauses:</b>			
SC	3.84	2;03	<i>Gachito ( gatito) que está bailando con este patito.</i> 'Little cat that is dancing with this little duck.'
NR	4.77	2;10	<i>El que se salió.</i> 'The one that fell out.'
<b>Se Impersonal:</b>			
MA	3.76	2;06	<i>Este no se toca.</i> 'This one can't be touched.'
EH	3.66	2;11	<i>Se maneja.</i> 'It is driven/ one drives it.'
<b>Arbitrary Plural Subject:</b>			
AL	4.61	2;06	<i>Están llamando a la puerta, ¿eh?</i> '(They) are knocking at the door, eh?'
EH	3.66	2;11	<i>Mira, a éste le sacaron los gordos.</i> 'Look, (they) took out the stuffing from it.' (it = a doll)
<b>Subjunctive:</b>			
MA	3.76	2;06	<i>Cuando yo tenga tos año', yo voy pa' l'e'cuela.</i> 'When I am two, I'll go to school.'
EH	3.66	2;11	<i>Papá, yo quiero que me lleves al circo para que vea payasos.</i> 'Dad, I want you to take me to the circus so that I can see clowns.'

Table 2: Some syntactic difficulties

Subject	MLU	Age	Construction and Examples:
<b>Flip verbs:</b>			
AB	4.10	2;03	* <i>Eto te has caído</i> . (There is also a “se” missing) 'This on you (you) have fallen.' ('This has fallen on you')
SC	3.84	2;03	* <i>Me gusta los gatitos</i> . 'To me pleases cats.' ('I like cats')
AL	4.61	2;06	*¿ <i>Te gustas pan?</i> 'To you (you) please bread?' ('Do you like bread?')
<b>Subjunctive:</b>			
AL	4.61	2;06	* <i>Pa' que hace puiii</i> ( last word unclear) 'So that it does puiii'
EH	3.66	2;11	* <i>Para que yo duerme acá</i> 'So that I sleep here'
<b>Infinitives:</b>			
SC	3.84	2;03	* <i>No puedo cogí la luna</i> '(I) can't (I) caught the moon'
MA	3.76	2;06	* <i>A compra chique</i> (chicle) 'To buy (3sg., present) gum'
<b>Wrong person agreement:</b>			
JP3	2.97	2;00	* <i>Se fue a dormir</i> ( should be fueron) '(They) go (3sg, past, plural) to sleep'

<b>Null copula:</b>			
SC	3.84	2;03	* <i>Esto no bueno</i> 'This no good'
AB	4.10	2;03	* <i>Esto un palo</i> 'This a stick'
GR	2.16	2;03	* <i>¿Qué eto?</i> 'What this?'
MA	3.76	2;06	* <i>¿Eso agua?</i> 'That water?'
<b>Null auxiliary:</b>			
AL	4.61	2;06	* <i>¿Qué encontrao?</i> 'What found?'
<b>Null main verb:</b>			
AB	4.10	2;03	Adult: <i>El perro va al parque.</i> 'The dog goes to the park' Child: * <i>Al paque el perro.</i> 'To the park the dog'
<b>Wrong aspect:</b>			
FB	4.26	3;04	Adult: <i>¿No era noche?</i> 'Wasn't (imperfect) (it) night' Child: * <i>De noche fue</i> '(It) was (preterite) night'

**Table 3: Subject information**

Initials	MLU	Age	# of PPDC s	Subject type			Source of data <sup>5</sup>
				Null	Pronoun <sup>4</sup>	NP	
JP2	1.29	1;10	6	6 (100.00%)	0	0	Ithaca: MB
MP1	1.31	1;02	2	2 (100.00%)	0	0	Peru: MB
JP1	1.73	1;08	3	2 (100.00%)	0	0	Ithaca: JA
MP2	2.00	2;10	5	3 (60.00%)	1 (20.00%)	1 (20.00%)	Peru: MB
GR	2.16	2;03	4	4 (100.00%)	0	0	PR: ZNP
JP3	2.97	2;00	28	23 (82.14%)	5 (17.86%)	0	Peru: MB
EH	3.66	2;11	243	187 (76.95%)	40 (16.46%)	16 (6.58%)	Peru: MB
MA	3.76	2;06	103	79 (76.70%)	17 (16.50%)	7 (6.80%)	PR: ZNP
SC	3.84	2;03	99	80 (80.81%)	9 (9.09%)	10 (10.10%)	Spain: JA
AB	4.10	2;03	12	5 (41.67%)	6 (50.00%)	1 (8.33%)	Spain: JA
FB	4.26	3;04	51	38 (74.51%)	9 (17.65%)	4 (7.84%)	Peru: MB
AL	4.61	2;06	52	38 (73.08%)	10 (19.23%)	4 (7.69%)	Spain: JA
NR	4.77	2;10	31	21 (67.74%)	2 (6.45%)	8 (25.81%)	PR: ZNP

4. The category pronoun includes both personal and demonstratives.

5. This column lists the location of the recording of the original data, as well as the initials of the researcher who gathered data. PR is the abbreviation for Puerto Rico; JA is Jennifer Austin, MB is María Blume, and ZNP is Zelmira Núñez del Prado.

# **A New Proposal Explaining the Null Auxiliary in Early Child German (ECG): Interactions between Syntax and Pragmatics**

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## **1. Introduction**

Many have argued that verb final utterances in early German and other early child languages are evidence for a 'stage' in which the child's grammar is fundamentally and qualitatively different from the adult (Clahsen, 1988, 1990, Clahsen et al., 1993/94, Jordens, 1990, Ingram & Thompson, 1996, Platzack, 1992, Deprez & Pierce, 1993, Rohrbacher, & Vainikka, 1995 and Wexler, 1994). If one assumes a 'strong continuity hypothesis', in which the child grammar is not qualitatively different from the adult grammar with respect to UG, then these utterances require an explanation. On the surface, verb final utterances appear to be ungrammatical, since they do not overtly represent either the finiteness features or movement operations which are required in the adult "verb second" language. However, the child data reported here show that these features are represented in the grammar.

If in fact the production of verb final utterances is an indication of a grammatical 'stage', then certain criteria for a stage must first be met. In previous work (Boser et al. 1991, Boser 1992, and Boser 1997) I have argued that there is no evidence for a stage of verb final in early German, either in terms of the strongest form; i.e., no verb second, no finiteness, or weaker forms of this claim; there is no evidence for a qualitative difference with respect to the underlying representation. This was demonstrated specifically in Boser (1997) by a detailed analysis of context and word order in both longitudinal (5 children, ages 24-31 months) and cross-sectional (30 children, ages 21-34 months) natural speech data. The purpose of this brief paper is to provide an explanation for a set of those German child utterances which appear to argue against strong continuity.

## **2. If there is strong continuity, why does the child appear to produce non adult verb final utterances?**

### **2.1. The Null Auxiliary Hypothesis**

Particular attention must be paid to the context and the possible pragmatic interpretation of those child utterances where it *appears* that no movement has taken place, i.e., verb final on the surface. I will assume that those child utterances which have an initial subject have a null auxiliary in the position where an overt auxiliary element is found in the adult grammar. The null representation which I

will assume in (2) has the features of the adult which may not be realized at spell out.

(1) *des mir runtergefallen* (Ellen, 27mos, 5.48mwl<sup>1</sup>)  
that to me downfallen (-f)

(2) [Spec CP des [C<sup>0</sup> ∅ [Spec IP mir [I<sup>0</sup> [VP runtergefallen]]]]]

## 2.2. Evidence for the Null Auxiliary

There are several pieces of evidence which argue that the child has access to the representational structure of INFL and COMP but fails to produce an overt auxiliary when there is language specific morphological, lexical, or pragmatic learning required. In Boser 1997, I systematically go through each of these arguments, using both cross-sectional and longitudinal new data sets. I explore syntactic (word order and finiteness) evidence and support the argument with evidence from 2 constituent utterances, imitation data and complex utterances and I explore the cause of development from the time the German child first produces ostensible verb final utterances to their extinction (Appendix A summarizes the populations studied).

### 2.2.1. Verb position in multiconstituent utterances

First, reviewing the evidence summarized in Appendix B, it is important to observe that the percentage of ostensible verb final utterances which have no finite verb is quite minimal compared to the number of verb second utterances, as demonstrated in the analyses in Boser (1997). Ostensible verb final utterances do not even reach 10% in the youngest sessions of Ellen and Anna and are just barely over 10% in Teresa's youngest session. Only Sebastian and Jule demonstrate more than 10% in their earliest session however only Jule has 23% in her first session, the highest rate of any of the children.

In the cross-sectional data there are on the whole fewer verb final utterances, although overall they still comprise 11% of the data set (See table 6.1.0 in Boser, 1997). Similar to the longitudinal data, there are some children who rarely if ever produce these utterances (5 never produced them). Only the youngest child (Vincent, 21 months) had as much as 25% ostensible verb final, but there were only 9 simple statements with a verb. Having so few overall utterances can seriously undermine an assessment of the child's grammar. If we examine the cross-sectional data verb final and verb third (V3), respectively only comprise about 10% of any one child's data.

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<sup>1</sup>

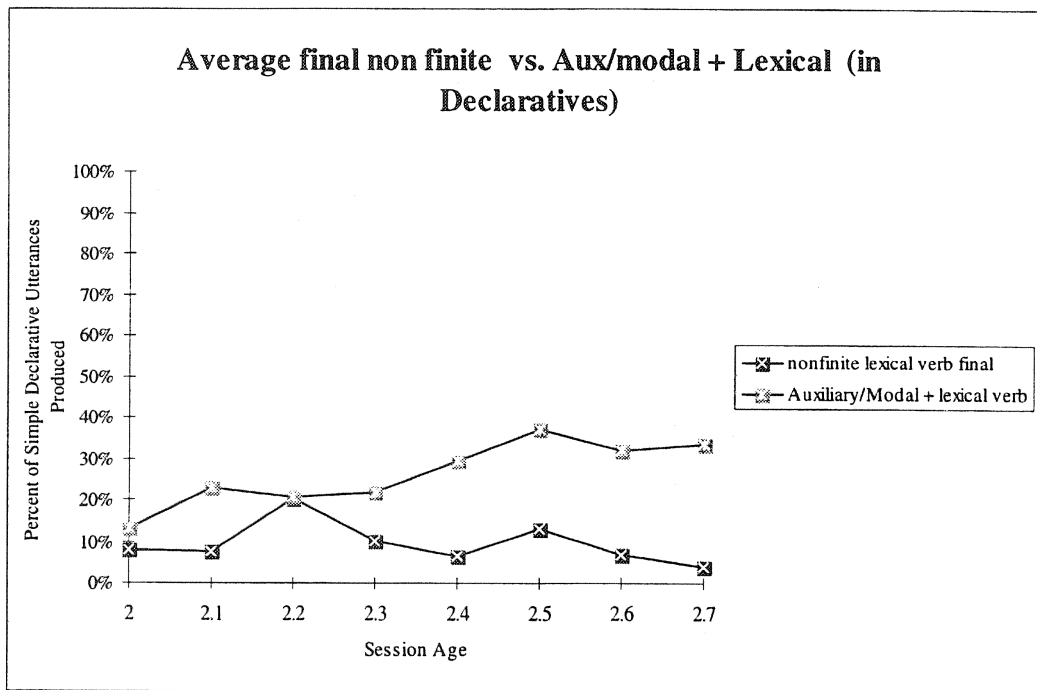
mwl = mean word length See Boser 1997 for explanation.

### 2.2.2. Increase in auxiliary use correlates with decrease in verb final

There is evidence for the overall increase in production of overt auxiliaries relative to structures with one finite lexical verb. However, there is more specific evidence for a connection between nonfinite/finite final utterances and the emergence of overt auxiliaries. As the nonfinite utterances and v3 utterances decrease there is an increase in the use of overt auxiliaries. This can be observed for the longitudinal data in Figure 1 for example. The trend can be seen for both the mean data as well as for individual children.

Importantly, these data do **not** show that at one point the child does not have auxiliaries and then they do. Instead, the increase in auxiliary is gradual and appears to be a slow process, it is not an "all or nothing" process. The decrease in use of verb final is slow and gradual as well, as one can see by the fact that these structures can still be found at later points in development, in those children who produce them to begin with.

**Figure 1: Individual verb final nonfinite vs. auxiliary plus lexical verb:longitudinal**



### 2.2.3. Finiteness correlates with verbal position: A Generalization

A very important finding to support strong continuity in the data is that of a correlation between position and finiteness. This basic knowledge has clearly been demonstrated in ECG. Wherever there is a clearly finite verb it is found in an initial position whereas non-finite verbs are found in final position. Thus, finite

verbs are not found in final position, and non-finite verbs are not found in an initial position (see Boser et al., 1991a,b; Poeppel & Wexler, 1991, 1993 confirm this).

### 2.2.3.1. The Resistant Data

However, there are two utterance types which might provide possible counter-evidence to this generalization: One is the verb third or verb final finite utterance<sup>2</sup>, in

- (3)a. *schreibmaschine mama hat..schreibmaschine*  
 typewriter mama has
- b. *da pizza reinschiebt*  
 there pizza inside-pushes

The other is the existence of some verb nonfinite with dislocated elements:

- (4) *da anmachen des* (Ell, 26m, 4.55mwl)  
 there onmake(-f) that

### 2.2.4. Morphological issues and 'double marking'

Some utterances which appear verb final may be missing the complementizer which marks the complex clause. In fact the following utterance appears to be an early form of a relative clause:

- (5) *da der ma in rathaus arbeitet* (Seb, 27m, 3.18mwl)  
 there man in rathaus works  
 (context: pointing to the man who works in the rathaus)

The child produces utterances with two constituents preceding the verb which are acceptable only with particular lexical elements in the adult.

- a. *auch bastian kommt da* (grammatical with intonation on auch)  
 also bastian comes there (Seb, 27m, 3.18mwl)
- b. *das nochmal deht sich*(ungrammatical with 'nochmal')  
 that again turns itself (Seb, 27m, 3.18mwl)

<sup>2</sup> Elsewhere (Boser 1997), I argue that the existence of verb third in the data can be explained in part by the fact that it is an option in the syntax (CP adjunction) and through the ambiguity which arises when the 'ge' participial prefix is dropped. For example, in the above example there appears to be a morphological error in the 'missing' 'ge' of the participial.

Some of these apparent counterexamples (v3) are explained by the fact that the child demonstrates morphological overgeneralization which can interfere with the adult's interpretation of the child's syntactic structure. There is evidence for double marking of the verb and auxiliary; where both the auxiliary and the final verb are marked for finiteness (8a-d).

Overgeneralization of the participial "t" ending

(6) *ich da bosser seht* (Seb, 27, 3.18mwl)

I there bosser see (amb)

Raising of the particle with the finite verb( a type of overgeneralization)

(7) *das da rumliegt* (Seb, 27m, 3.18mwl)

that there around lies

Double Marking:

(8)a. *da ist er schläft da*(Anita, 26m, 2.63mwl)

there is he sleeps there

b. *da ich hab das läuft* (Ter, 24m, 3.5mwl)

there I have that waked(+f)

c. *der muß klavier spielt* (Julian, 31m, 2.67mwl)

he must piano play(+f)

d. *ein Turm ist umfaellt* (Julia, 31, 5.66mwl)

a tower is falled down (+f)

These double marking contexts are especially important because they argue for the possibility that a certain subset of the verb third (those with final and third verbs) can be explained by a null auxiliary, just as the final non-finite utterances.

### 2.3. Licensing the null auxiliary

In one of our earlier papers (Boser et al. 1991b), we proposed a specific licensing hypothesis to explain utterances containing initial subjects with non-finite verbs in final position:

(9) "In contexts containing a non-finite verb form and no overt tensed auxiliary, C<sup>0</sup> is occupied at S-structure by a phonetically null auxiliary moved from its position in I<sup>0</sup>. This auxiliary contains the phi-features, inserted in I<sup>0</sup>, including tense and agreement features, and is an empty pronominal category. The features of this empty pronominal category are recoverable under the general licensing conditions for null pronominals (pg. 56)"

Here, the null auxiliary was proposed to be licensed under Spec-head agreement with the following conditions:

(10) "the licensing of pronominal empty categories under spec-head relations is symmetric"

(11) licensing under spec-head agreement: (adapted from Rizzi(1986) )

i. where pro is an instance of  $X^0$  or XP pro stands in a spec-head relation with  $X^nY$

ii. let Z be the licenser of an occurrence of the pro then pro has the specifications on the features of X co-indexed with it."

The Spec-head licensing proposed here was motivated because of the correlation found in German child data between finiteness and position of the verb (cf. Boser et al. 1991a, Whitman 1994). Thus, finite verbs were found nearly always in second position and non-finite verbs in final position, as in the adult grammar. This licensing proposal made a specific prediction that one would not find a clearly topicalized element together with a null auxiliary in either declarative topics or overt wh-object questions. This was predicted because the non-overt auxiliary shares phi-features with the subject.

#### 2.4. A new proposal for explaining the null auxiliary

I will concentrate here on child utterances where the verb appears *not* to have moved, i.e., non-finite and apparent finite verb final. This analysis attempts to find an explanation for such utterances where the generalization above is not upheld. I do this especially because earlier papers have already made a strong point for the predominance of finite verbs in second position and the availability of the full adult representation in early child German (Boser et al. 1991, Boser 1997).<sup>3</sup>

In this paper, I will argue that there is evidence for a null auxiliary, but suggest an alternative explanation for its existence. Elsewhere I showed that the specific prediction of the Spec-head licensing explanation for the null auxiliary hypothesis as formulated in 2.3 above is not borne out (Boser 1997). Instead, I propose on the basis of new analyses, that the licensing of this null auxiliary occurs through language particular discourse and pragmatic licensing.

Systematic analyses of the new large data set in Appendix A show that the German child produces non-finite utterances mostly in the same contexts as non-finite clauses in the adult grammar. However they differ from the adult in that the child's null auxiliaries appear to be more frequent and may also occur without an adult context, i.e., spontaneously.

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<sup>3</sup> This generalization first proposed in Boser et al. 1991a, b was independently replicated in a case study by Poeppel and Wexler 1991, 1993.

## 2.5. Null Auxiliary vs. Null Modal

The “null auxiliary hypothesis” has often been misinterpreted as a null modal or modal drop hypothesis and more recently it has been proposed that child infinitives occur solely in modal contexts (Ingram & Thompson, 1996). Our pragmatic analyses are crucial in showing that modal interpretations are not the only environment for the verb final nonfinite. Even though there is a high predominance of modal type contexts, these are also the most frequent contexts for nonfinite utterances in the adult.

## 3. New Evidence on Null Auxiliary

### 3.1. OSV/ASV non subject initial utterances

One category of utterances which occurred had a postverbal subject with a non-finite verb. These comprised 6% of the verb final non-finite and there were 8 total. 4 were anaphoric, 2 expansion and 2 hortative.

(12)a. *Was is jetzt? so umdrehen?*

what is now? so around turn?

*dann Ø das turm umgekippt* (Jule, 26m, 2.42mwl)(anaphoric)

then (is) the tower over-fell

b. *Wer hat es kaputt gemacht?*

who has it broke made?

*dann hoch Ø machen mir* (Jule, 29m, 3.63mwl) (hortative)

then up (do) made we

c. *auch da Ø hingefallt der baer* (Teresa, 24m, 3.5mwl) (spont.)

also there (is) downfallen the bear

d. *A:wo is denn da ein loch?*

where is the hole?

*da ich resa Ø zeigen*(Teresa, 24m, 3.5mwl)

there I, teresa, (want) show(-f)

e. *noch ein Ø warten* (Jule, 26m, 2.42mwl)

another one (must) wait

These utterances with a postverbal subject are those which stand as counter-evidence to the original Spec, head licensing proposal for a null auxiliary as formulated in 2.3 above. As one can see they are only a very small percentage

of the verb final utterances (only 8/133). I have indicated in the examples above where the potential null auxiliary might be in an adult-like utterance. (However, in the adult, these are generally not formed with a post-verbal subject.)

As with verb third utterances, most of the OSV constructions contain adverbs or negation. Lexical items such as "noch", "da" and "nicht" often appear in these types of utterances. Such items require specific language learning regarding their interaction with verb position. The child must learn which require inversion and which do not. The fact that we find null auxiliaries in object initial utterances argues that the structure for a null auxiliary is parallel to that with an overt auxiliary.

### 3.2. Clauses with CPs and overt topics have null auxiliaries

Non-finite verb final utterances are not forms which are limited to children with the lowest MWL. Children with MWLs of 4.0 or higher who produce complex clauses with complementizers, wh-questions and other complex utterances requiring CP also produce non-finite verb final utterances. There are children who produce non-finite clauses in subordinate clauses with an overt complementizer, indicating that the child must have the full adult-like structure.

Simon (age 31 mos, MWL=4.69)

(13)a. *wenn der wind hier dran gemacht dann kann der kapitän*

when the wind here on made, then can the captain

b. *wenn er größer ist, dann sprechen*(Seb, 28m, 3.36mwl)

when he bigger is, then speak(-fin)

(when he's bigger, then he'll speak)

The structures we examined in the sections above showing verb final with object or adverb initial topics (OSV/ASV), also provides evidence that null auxiliaries are produced in the same contexts where a CP structure must be present. Although quite rare, there were also some null auxiliaries in wh-questions:

(14)a. *Warum umdrehen* (Seb, 31m)

Why turnaround(-f)?

b. A: *hab ich das richtig gemacht?*

have I that right done?

E: *Wo dir des doch anzogen?* (Ellen, 29m, 5.48mwl)

where you that still on put(-f)

A: *ja ich hab sie jetzt angezogen*

yes, I have them now on put

I also found null aux in sentences with datives and VP topics as shown below.

- (15)a. *des mir runtergefallen* (Ell, 26m, 4.55mwl)  
 that to me(dat) fell down
- b. *nochmal killian(kitzeln), ich moecht* (Seb, 28m, 3.36mwl)  
 again tickle, I want

#### 4. Context and Verb Final

The context plays a very important role in the use of verb final utterances within the discourse. In acceptable adult discourse, both the subject and auxiliary appear to be missing in a type of ellipsis. The analyses for these is that the null elements are licensed by the antecedents in the previous question.

- (16) KB: *Was willst du?*  
 What do you want?  
 $\phi_i \phi_j$  *nur das Buch mal sehen.* (Killian, 21m, 2.38mwl)  
 $I_i$  want $_j$  only the book once see  
 $\phi_i \phi_j$  *da mal gucken*  
 $I_i$  want $_j$  there once look

There are several child verb final examples with an initial negative which are very similar to adult nonfinite utterances. These are admonitions which the child frequently hears the mother direct at him/her.

- (17) *nicht das angucken*  
 not that at-look

However, these are not grammatical when referring to oneself. They must refer to the second person. The child's attention to specific pragmatic contexts with respect to verb final utterances is evidence for a level of complexity of knowledge available quite early. However, attaining the acceptable form appears to take a long time, well beyond the most complex forms produced. In fact, we do not see fully adult-like use of context through the time studied.

#### 4.1. Non-finite verb final utterances occur infrequently and always together with utterances in which the tense and finiteness features have been overtly realized

In the sequence below, Benjamin (29m, 4.01mwl) demonstrates that he has both null and overt auxiliaries. In addition, not only the auxiliary is omitted, but also subjects and determiners are dropped.

**Ex:** *mäht er den rasen? tut er den rasen mähen?*

mows he the lawn? does he the lawn mow?

**Ben:** *Ø hab ein ra-Ø will a kuche mache mit en--Ø ein rasenmaeher holen*

(I) have a lawn,(I) want a cake make with-(want) lawnmower get

**Ex:** *das ist zu gross*

that is too big

**Ben:** *willst du kleines habe?*

want you (a) small one have?

**Ben:** *da hab Ø in de mama hat de ma--mit de mama gefagt*

there have (I) mama has ma--with mama swept (mispronounced)

**Ex:** *da hast du mama gefragt?*

there have you mama asked?

**Ben:** *Ø Ø mit de mami gefet*

(have) (I) with mami swept

**Ex:** *gefeht, was?*

swept, what?

**Ben:** *Ø gefeht mit der mama, mit der mama gefegt*

(have) swept with mama, with mama swept

**Ex:** *..hmm drausen , genau*

oh outside, right

**Ben:** *Ø muss sauber des soll--des hab i geputzt,*

(I) must clean that should--that have I cleaned

*ich tue au mal fahre mit de mami*

I do also drive with mami

**Ben:** *auf der strasse muss Ø aufpasse*

on the street must (one) watchout

**Ex:** *sonst kommen die autos wenn ma nicht aufpasst*

otherwise come the cars, when one doesn't watch out

**Ben:** *da geht sie noch mit de strassebahn dass ma nicht aufpasst -*

there goes she still with the streetcar that one not watchout

*dass ma nit unfall mach*

that one not accident make

**Ex:** *genau da muss man aufpassen dass kein unfall passiert, gel?*

right, there must one watchout that no accident happens, right?

**Ben:** *mama Ø au kein unfall passiert.*

mama (is) also no accident happens

The child's missing auxiliaries seem to be in some sense 'licensed' by his own dialogue. There are a lot of stops and restarts and Ben begins new topics without having finished old ones. This leads to his leaving out elements which he has used before. The last null auxiliary appears to be an 'addition' to the experimenter's comment which would require only the complementizer 'dass' in order to be well-formed in the adult. The child is capable of producing complementizers since in the previous utterance he has produced two which were not in the adult's dialogue; although it might not always be the correct complementizer (see "*dass man nicht aufpaßt*" should be "*wenn*"). The child selectively leaves out elements. Overt elements always accompany the null ones. Benjamin's data is quite common. Many other children produce null elements along with overt ones. However, there is variation with respect to the frequency with which null elements are produced in any particular child.

Gabriel (28m, 3.18mwl) also has a number of verb final non-finite utterances which co-occur with the overt realization of auxiliaries. In the following sequence Gabriel, as Benjamin did, produces null elements where other elements are stressed in the dialogue and also where there are discourse 'antecedents' to his missing elements:

context: looking at a picture of a rabbit dipping his brush into a palette of colors to paint a picture. Gabriel thinks he is cutting a plate.

(18) Gab: *.Ø Ø Teller g'schnitten*

**(he) (has) plate cut**

ex: *der hat sich geschnitten*

he has himself cut?

Gab: *nein, keller hat Ø nitten* (mispronunciation of *keller*)

no, celler has (he) cut

ex: *im keller*

in the cellar

ex: *nein , de..Ah der Teller Was tut der hase?*

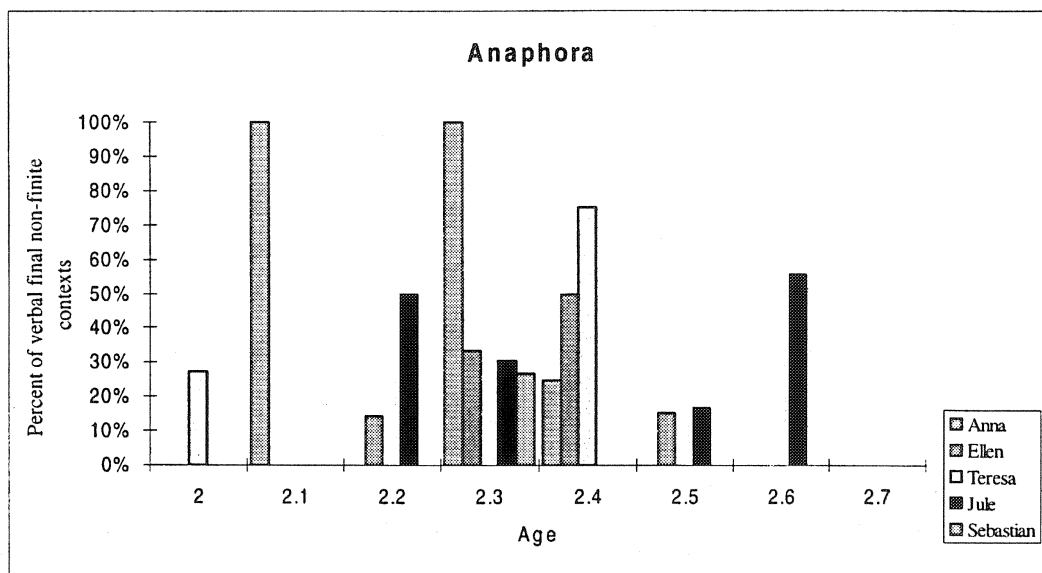
no, oh the plate!, what does the rabbit?

Gab: *der ø teller mahnen* (mispronounced *mahnen*)

he (does) plate draw(-f)

The co-occurrence of both null and overt auxiliaries within the same session with one child is strong evidence that the child's grammar is not necessarily constrained but rather that there is something about the context and the child's knowledge of discourse licensing which appears to be misguided.<sup>4</sup>

**Figure 2: Use of anaphoric null auxiliary in individual children**



In the cross-sectional data, of the verb final (-f) without a subject 62%(58/93) were hortative (19c), 33% (31/93) were anaphoric (19a-b) and 2% were expansion contexts (2/93)(19d) (also self anaphora) and another 2% occurred spontaneously(2/93)(19e).

<sup>4</sup>

Additionally, learning the auxiliary system is quite difficult since they can have so many different forms (Stromswold, 1989). The child must learn the properties of dummy elements, have, be, the modals, and other pseudo-auxiliaries. Each realization of the IP features may have different instantiation which must be learned.

- (19)a. A: *Was macht er?* (anaphoric)  
 What makes he?  
*da draus klettern* (Anna, 25m, 2.87mwl)  
 there outside climb
- b. A: *Tust du dein daumen reinmachen?*  
 Do you your thumb inside make?  
*da daume reinmachen* (Seb 28m, 3.36mwl)(anaphoric)  
 there thumb inside
- c. *da heim meisse* (Ell, 27m, 5.48mwl) (hortative)  
 there inside throw (as Ellen shows experimenter what to do)
- d. *da hut da am bort is des gelegt* (Ter, 24m, 3.5mwl)  
 there hat on shelf is laid  
*da nikolaus ah Inge geschenk gekriegt* (expansion)  
 there nikolaus-oh Inge present given (-f)
- e. *purzelbaum so mache* (Ter, 25m, 3.6mwl) (spontaneous)  
 tumble so make

#### 4.2. A range of IP features instantiated as a null auxiliary

The fact that there may be a range of auxiliaries which can be null is evidenced by the fact that both participial as well as infinitival forms are found in the final position. These forms each select for a different auxiliary. This is demonstrated by contexts for participles which indicate that the past or perfective form is necessary. The imperative or hortative context allows us to 'recover' a modal from the missing position. For example,

- (20)a. *ich was trinke* (Seb, 28m, 3.36mwl)

I something drink

In this example the child was not drinking, but expressing the need to drink, a context which could only select for a modal auxiliary such as *muss* or *moechte*. On the other hand in the following example a 'be' is required.

- b. *mama auch wegegange* (Seb, 28m, 3.36mwl)

mama also away-gone participle

**4.3. Contexts for the null Auxiliary/modal correlate with early production of overt aux/modal**

If we compare contexts with nonfinite verbs to the types of overt auxiliaries produced in the early data, there is an interesting correlation. The first INFL elements the child uses tend to be modals, although the child is not limited to this form (cf. Boser (1997) ). There is also a predominance of hortative contexts for nonfinite utterances, precisely those contexts which support modals. The parallel contexts between these structures argues that they are underlyingly the same.

**Figure 2: Average pragmatic context in Vfinal (-f)**

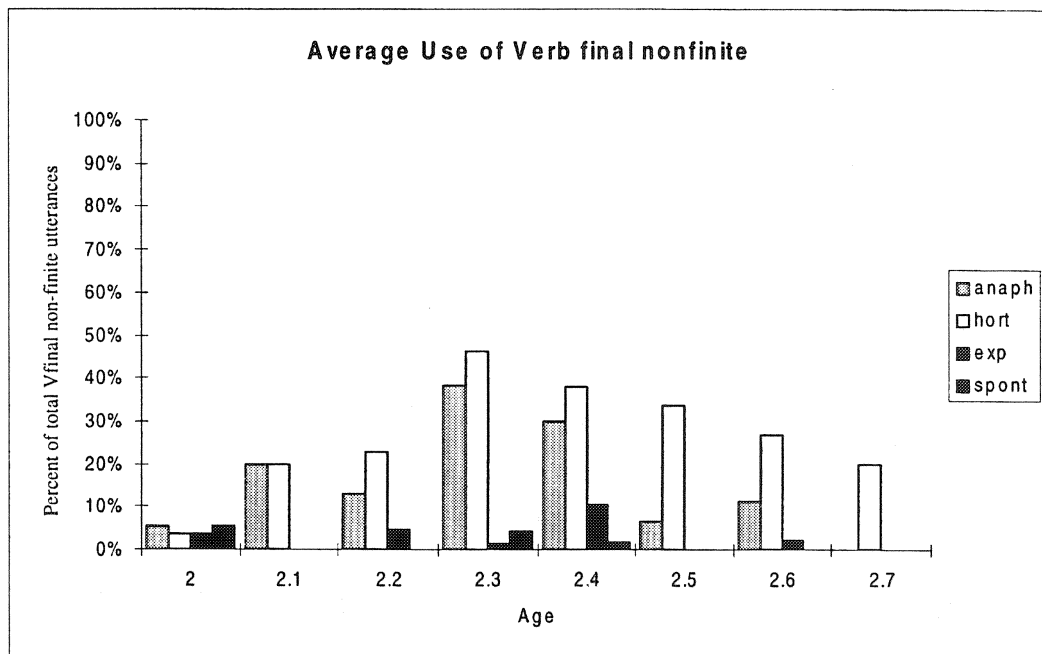
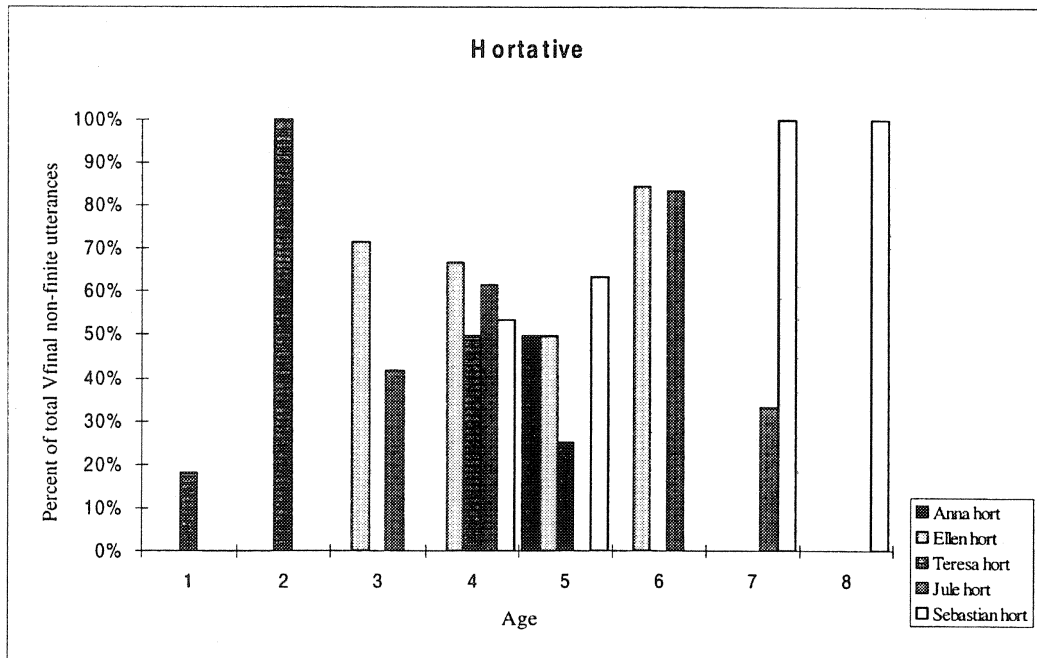


Figure 4: Use of Hortative in individual children



### 5. Summary: Interaction of Syntax & Pragmatics

The null auxiliary structures do not reflect deficit in child grammar. Non-finite final utterances occur mostly without a subject, as in the adult grammar (See Appendix B). In those utterances with a subject, I have suggested the existence of a null auxiliary which is supported by a restricted discourse environment. Verb finite, apparently verb final, utterances on the other hand occur predominantly in syntactic contexts where there is a subject. Null auxiliaries are possible in these contexts as well, since there is evidence for double marking.

I have argued that verb final utterances show a particular pattern with respect to the discourse contexts in which they predominantly occur. Nonfinite verb final utterances occur primarily in hortative but also in anaphoric contexts; rarely are they not so licensed. Verb finite final utterances however, occur only rarely in hortative contexts, and if so, then only when they are missing a subject (which is the major syntactic characteristic of *nonfinite* final) (cf. Boser 1997). Verb finite final utterances often occur spontaneously but also in anaphoric contexts.

Development with respect to use of auxiliaries takes place in language specific areas. The child must integrate its UG-driven knowledge about word order and phrase structure with language specific rules regarding the appropriate discourse/pragmatic contexts for null auxiliary.

Appendix A

Table A1: Cross-sectional Natural Speech Subject Age summary

subject name	age	MWL	total utt	# w/ verb	1 const	% of vb	2 const	% of vb	simple	% of >2	comp	% of >2	> 2 total
Vincent	23	2.14	87	22	3	14%	10	45%	9	41%	0	0%	9
Stephanie	32	2.32	59	18	0	0%	6	33%	12	67%	0	0%	12
JulianB	28	2.37	107	67	2	3%	31	46%	33	49%	1	0%	34
Martin	21	2.38	127	33	3	9%	9	27%	18	55%	3	0%	21
Killian	21	2.41	157	40	3	8%	12	30%	23	58%	2	0%	25
Simon Dr	29	2.44	62	28	1	4%	10	36%	17	61%	0	0%	17
Anita	26	2.63	56	26	1	4%	11	42%	14	54%	0	0%	14
Killian	23	2.65	50	20	3	15%	6	30%	9	45%	2	0%	11
JulianH	31	2.67	206	88	10	11%	18	20%	58	66%	2	0%	60
SvenjaLa	30	2.96	70	37	2	5%	5	14%	29	78%	1	0%	30
10 subjects			981	379	28	7%	118	31%	222	59%	11	0%	233
Shantala	27	3.11	161	83	6	7%	26	31%	47	57%	4	0%	51
Holger	28	3.11	82	29	1	3%	3	10%	24	83%	1	0%	25
Anna	33	3.14	123	71	0	0%	13	18%	57	80%	1	0%	58
Gabriel	28	3.18	173	60	5	8%	20	33%	32	53%	3	0%	35
Michael	33	3.2	49	18	1	6%	3	17%	9	50%	5	0%	14
Patrick	34	3.41	168	107	2	2%	16	15%	82	77%	7	0%	89
Katrin	33	3.51	174	114	2	2%	9	8%	95	83%	8	0%	103
Stefan	33	3.54	96	65	3	5%	4	6%	54	83%	4	0%	58
Leonie	30	3.62	130	85	2	2%	17	20%	59	69%	7	0%	66
LenaS	32	3.73	67	43	0	0%	2	5%	34	79%	7	0%	41
10 subjects			1223	675	22	3%	113	17%	493	73%	47	0%	540
Benjamin	29	4.01	149	110	11	10%	13	12%	77	70%	9	0%	86
Simon Du	32	4.05	98	55	1	2%	8	15%	38	69%	8	0%	50
Lena R	32	4.2	71	43	1	2%	3	7%	33	77%	6	0%	39
Richard	31	4.29	101	72	0	0%	5	7%	41	57%	26	0%	67
Julia Tri	30	4.36	105	82	1	1%	2	2%	63	77%	16	0%	79
Marco	33	4.45	141	109	2	2%	14	13%	77	71%	16	0%	93
Laura	33	4.48	115	91	0	0%	7	8%	75	82%	9	0%	84
Matthias	34	4.56	50	38	1	3%	1	3%	30	79%	6	0%	36
Simon P	31	4.69	88	66	0	0%	6	9%	52	79%	8	0%	60
Julia Tre	31	5.66	149	108	0	0%	3	3%	81	75%	24	0%	105
12 subjects			918	664	17	3%	62	9%	567	85%	128	0%	613
			<b>3271</b>	<b>1718</b>	<b>67</b>	<b>4%</b>	<b>293</b>	<b>17%</b>	<b>1282</b>	<b>75%</b>	<b>186</b>	<b>0%</b>	<b>1472</b>

**Table A2. Longitudinal Data: Subject Age Summary**

Name	Session Date	Age	Utt w/vb	MCL
Ter1	1.20.93	24	183	2.65
Ter2	3.12.93	25	146	2.79
Ter3	5.6.93	27	171	3.33
Ter4	6.24.93	28	343	3.57
Anna1	2.3.93	24	204	2.28
Anna2	3.12.93	25	169	2.46
Anna3	4.23.93	27	234	2.77
Anna4	5.7.93	28	219	2.94
Ell1	11.17.92	26	225	3.59
Ell2	11.25.92	27	360	3.86
Ell3	2.2.93	28	192	3.67
Ell4	2.8.92	29	316	4.4
Jul1	3.3.93	26	140	2.07
Jul2	4.5.93	27	227	2.73
Jul3	5.14.93	29	217	2.94
Jul4	6.18.93	30	267	3.15
Seb1	2.1.93	27	294	2.84
Seb2	2.25.93	28	274	3.08
Seb3	5.30.93	30	75	2.83
Seb4	6.18.93	31	302	3.49
TOTAL			4553	

**Appendix B****An Overview of Verb Final Utterances: Syntax, Verb Position, and Finiteness****1.1. Cross-sectional data**

The tables below provide an overview of utterances which are potentially subject to a null auxiliary hypothesis. Important here is the relationship between finiteness and the existence of an overt subject.

**Table 1: Summary table for verb final (Cross-sectional)**

	<b>Finite (21 total)</b>	<b>Non-Finite (35 total)</b>
w/ subject	<b>90% : subj. init (52%, 11/21)</b> <b>postverb/subj (38%, 8/21)</b>	<b>44% : subj. init (35%, 12/35)</b> <b>postverb/subj (9%, 3/35)</b>
no subj.	<b>10% , 2/21</b>	<b>57% , 20/35</b>

Table 2 shows exclusively the utterances which are coded verb final (because there is a non-finite verb in non-second position) or verb third (where there is a finite verb in non-second position), but where the verb is not the last element, some other element follows it. These codes were used because of the ambiguity of such utterances. Most of these are finite and fit into the verb third category.

- (1) *da noch emal liegt einer loebe* (Julian, 28mos, 2.37mwl)  
 there again lies one, lion  
*hier mann tut bau hier mann* (Killian, 21 mos, 2.41mwl)  
 here man does build here man

There were 3 which had a non-finite verb with some element dislocated to the right:

- (2)a. *auto weg da runter fahr den* (Martin, 21 mos, 2.38mwl)  
 car away there down drive (-f) that(one)  
 b. *d mama raus mache wieder* (Benjamin, 29 mos, 4.0mwl)  
 mama out make(-f) again  
 c. *hase schue anziehen struempfe* (Svenja, 30 mos, 2.96mwl)  
 rabbit shoes onput(-f) socks

**Table 2: Summary table for "other" (non verb final) verb positions (cross-sectional)**

	Finite "other" (32 total)	Non-finite "other" (3 total)
w/subject	94% : <u>subj. init</u> (38%, 12/32) <u>postverb/subj</u> (56%, 18/32)	100% (3/3)
no subject	6% , 2/32	0%

**1.2. Longitudinal data**

The following tables give an overview of the word orders found in those utterances potentially subject to a null auxiliary analysis (verb final). Table 3 shows those utterances where the verb is in final position, either finite and also in the third position or nonfinite. As in the cross-sectional data, utterances with finite final verbs are more likely to have initial subject.

**Table 3: Summary table for verb final (longitudinal)**

	Finite (67 tot)	Non-Finite (133tot)
w/ subject	<b>79% :subj. init</b> (39%,26/67) <u>postverb/subj</u> (27%, 18/67) (66% have an adverbial) <u>Complex Clause</u> (13%, 9/67 )	<b>30% :subj. init</b> (24%, 32/133) <u>postverb/subj</u> (6%, 8/133)
no subj.	<b>21% , 14/67</b>	<b>70% , 93/133</b>

Table 4 provides an overview of verb third and verb nonfinite utterances where the verb is not the final element, either due to right dislocation of an argument or due to lack of inversion. Some examples of finite verb third (the majority of this type) are given in the examples below.

- (3)a. *aber dann wieder kommt zur katharina* (Ellen, 29mos, 6.1mwl)  
 but then again come (+f) to Katharina
- b. *da ritterstraße is bär is ritterstraße bär* (Jule, 29mos, 3.63mwl)  
 there ritterstreet is bear is ritterstreet bear
- c. *da i hab aua* (Ter 24mos, 3.5mwl)  
 there I have hurt(boo-boo)
- d. *des kaputt sind sie* (Seb 28mos, 3.36mwl)  
 that broke is they

Some examples of nonfinite utterances where an element is right dislocated past the verb are given below:

- (4)a. *des nich essen eiern* (Seb, 28ms, 3.36mwl)  
 that not eat(-f) eggs
- b. *mann des nicht fahren, oma ida* (Jule, 26 mos, 2.42mwl)  
 mann that not drive(-f) grandma ida
- c. *da rein gehen ins haus* (Jule, 28 mos, 3.63mwl)  
 there inside go(-f) in house
- d. *wieder anmachen das* (Ellen, 26 mos, 4.55mwl)  
 again on make(-f) that

e. *auch da hingefallt der bär* (Ter, 24 mos, 3.5mwl)

also there downfallen(-f) the bear

**Table 4: Summary table for verb "other" (non verb final) position (longitudinal)**

	Finite "other" order(41tot)	Non-finite "other" order(29tot)
with subject	<b>89%</b> : <u>subj. init</u> (17%, 7/41) <u>postverb/subj</u> (70%, 29/41) <u>VP topic</u> (2%, 1/41)	<b>51%</b> : <u>subj. init</u> (34%, 10/29) <u>postverb/subj</u> (17%, 5/29) <u>VP topic</u> (7%, 2/29)
no subj.	<b>10%</b> , 4/41	<b>41%</b> , 12/29

These tables illustrate both for cross-sectional and longitudinal data that the German child knows that subjects require finite verbs.

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# An Information-theoretic Solution to Parameter Setting

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## 1. Introduction

In grammatical theories based on principles and parameters, such as Government and Binding Theory (Chomsky 1981), the underlying word order variation of natural languages is accounted for by two parameters that determine the complement-head and specifier-head orders in the X-bar structure. Children cannot begin to apply any sophisticated mechanisms and innate knowledge towards acquiring the rest of the syntax of their language if they have not set these word-order parameters to their target values. There is considerable evidence from psycholinguistic studies that children master the word order of their target language very early. By and large, their earliest productions are consistent with the word order of the language to which they are exposed. At the same time, there is considerable confusion in the input the child gets with regard to word order. For example, in some SOV languages such as Dutch and German, the finite verb in root clauses moves from its base position to the second position in the sentence, so that the child gets SVO forms. In fact, there is a preponderance of such forms shown below in (1). In embedded clauses however, the verb remains in the final position and the SOV order is obtained, as shown in (2). These examples as well as the examples that follow are taken from the caretaker speech subcorpora of the CHILDES database (MacWhinney 1991).

(1) (Dut) Ik versta je niet

I understand you not

“I do not understand you”

(2) (Dut) ... dat ik je niet versta

that I you not understand

“... that I do not understand you”

Whereas the verb appears in this second position, not only the subject but also objects can appear in the first position. Furthermore, the resulting OVS order is also possible, as shown in (3). In addition, adverbials and prepositional phrases can also occupy the first position (4).

- (3) (Dut)     Dat    weet                ik    niet  
                   That   know                I     not  
                   “I do not know that”
- (4) (Dut)     Dan    maken                ze    een bootje  
                   Then   make                they a   boat  
                   “Then they make a boat”

This phenomenon is termed verb-second (V2). While linguists are not in complete agreement on the exact description and explanation of this phenomenon (for interesting discussion, see Holmberg and Platzack 1990, Vikner and Schwartz 1996, Travis 1991, and Zwart 1991), it is clear that languages differ in whether or not they show the effects of V2. Gibson and Wexler (1994) capture this variation by means of a V2 parameter and show that the resulting word-order parameter space has *local maxima*, i.e., particular parameter settings different from the target from which the learner will never be able to escape. Given this type of logical problems in the acquisition of word-order (for relevant discussion, see also Frank and Kapur 1996 and Berwick and Niyogi 1996) in addition to the apparent confusion in the input data, it is all the more surprising that children appear to set the word-order parameters to their target value early. In this paper, we point out a way using which children could obtain the target values of the word order parameters for their language. The main new idea is an entropy-based statistical analysis of the input stream that children receive.

## 2. The Learning Algorithm

In this section, we describe a method which is able to reliably determine the proper setting of the V2 parameter. The parameter is shown to be set by using information-theoretic measures on small (3,000 utterance) corpora of unannotated text from a variety of different languages. No structural analysis needs to be carried out on the texts. The only knowledge assumed prior to learning is a small set of words (5 in number), known to be verbs. The first step in learning involves carrying out a straightforward distributional analysis to automatically learn a larger set of verbs. The V2 parameter is then set based

upon a comparison of the distributional behavior of words in the neighborhood of the verbs in the input, where the input stream is viewed as a linear sequence of words.

### 2.1. Entropy

Entropy is an information-theoretic measure of randomness. In particular, the entropy of a random variable  $X$ , measured in bits, is  $\sum_{x \in X} p(x) \log p(x)$  where  $p$  is the probability distribution of this random variable and  $\log$  is the standard logarithmic function. To give a concrete example, the outcome of a fair coin has an entropy of  $-(.5 * \log(.5) + .5 * \log(.5)) = 1$  bit. If the coin is not fair and there is a 0.9 chance of heads and a 0.1 chance of tails, then the entropy is only 0.5 bits. There is less uncertainty with the unfair coin—it is most likely going to turn up heads. Entropy can also be considered to be the number of bits on average required to describe a random variable.

Conditional entropy is the entropy of a random variable given the value of another random variable. It is a measure of how much better the first variable can be predicted when the value of the second variable is known. Obviously, the conditional entropy of a random variable can be no more than its unconditional entropy. For example, consider the random variable  $X$  which equals 1 if it rains on a particular day and is 0 otherwise. Consider another random variable  $Y$  which equals 1 if it is cloudy on a particular day and is 0 otherwise. The random variable  $X$  can be predicted better provided the value of the random variable  $Y$  is known. Suppose a random variable  $Z$  is the outcome of a lottery. In this case, the entropy of  $X$  conditional on  $Z$  is the same as the unconditional entropy of  $X$ .

### 2.2. Learning Verbs

For our V2 parameter-setting algorithm to work, a few verbs must first be learned. In our experiments, we required around 20 verbs to be learned. However, to assume that the child has properly classified 20 words as verbs prior to setting the V2 parameter is both unreasonable and unnecessary. Rather, we can begin with a much smaller list of known verbs and use a learning algorithm to try to find a number of additional verbs. The learning algorithm we use is based upon the work of Zellig Harris (1951). He proposed these sorts of algorithmic methods for field linguists to determine word classes and class membership in unfamiliar languages.

First, a “distributional fingerprint” is built for each of the five representative verbs that are assumed to be known beforehand. The distributional fingerprint is a probability vector  $P(W)$ , where  $W$  is a random variable over words, indicating the probability of word  $w \in W$  occurring before (after)

Language	Size of the corpus (in thousand words)	Number correct / 20
Dutch	41	19 (95%)
English	314	20 (100%)
French	46	16 (80%)
German	14	17 (85%)
Italian	24	18 (90%)

Table 1: Precision of the Verb-learning Algorithm

any of the five verbs. Probabilities are estimated using a corpus of sample utterances. The distributional behavior of any word can then be compared to the approximated verb distributional behavior by comparing the distributional fingerprint of that word to that of the set of sample verbs. A number of similarity measures could be used for this comparison. In this work, we used *relative entropy*.

Relative entropy is an information-theoretic measure indicating the amount of additional information (measured in bits) needed to describe the random variable  $X$  given the random variable  $Y$ . Of course, if  $X = Y$ , then  $relative-entropy(X, Y) = 0$ . For a number of frequently occurring words in a sample corpus, we measured the relative entropy of their distributional fingerprint and the five-verb fingerprint. When the words were sorted in an increasing order on this measure, the words on the top of the list, i.e., words with the smallest relative entropy, tended to be verbs. (See Brill and Marcus 1992b for a more complete description of distributional fingerprints and their use in computational linguistics.) Table 1 shows the accuracy of this method when the first 20 words are picked from the sorted list. It is not essential for the success of the V2 parameter learner that all the words judged to be verbs are actually verbs, just that a significant fraction are.

### 2.3. Conditional Entropy in the Neighborhood of Verbs

Once the set of verbs has been learned, the next step is to analyze the distributional behavior of the words in the neighborhood of these verbs. For each of the 20 verbs, we measure the entropy of the probability distribution of words occurring precisely one position before (after) the verb in the corpus. We also measure the entropy of words at positions 2 and 3 prior (subsequent) to the verb, obtaining a table of  $entropy(VERB, POSITION)$ , where  $VERB =$  learned verbs and  $POSITION = [3L, 2L, 1L, 1R, 2R, 3R]$  relative to the verb. The position 1L is the one closest to the verb on the left and 1R is the closest on the right. Of course, the verb itself is occupying the one position between 1L and 1R. Note that the category of the words in these positions is

not involved in the computation. Then, we average the entropy at each of the positions over all the verbs so that we obtain  $\text{entropy}(\text{POSITION})$ , the average entropy of the word distributions at different positions in the neighborhoods of any of the 20 verbs.

This completes the process by which, provided with a small corpus of utterances from any language, along with a very small list of words known to be verbs, the average positional entropy of the distribution of words at various distances from this set of words can be calculated. We next show how this result can be used in parameter setting.

### 3. The Main Results

Up to this point, we have shown how we obtain the entropy values for each of the three positions to the left and to the right of each of the verbs. At least for the languages we have considered so far, it is reasonable to assume that the third position to the right of the verb is not influenced by the verb to any measurable degree. In other words, with high probability, the conditional entropy of this position approaches the unconditional entropy because the verb very weakly ‘selects’ this position. With respect to this level of entropy (which we call the *base level*), we expect the entropy to dip as the verb is approached from the right and then, at or around the third position to the left of the verb, the entropy should return to the base level. Our expectation is borne out as shown in Figure 1 for Polish and English where the entropy at each of the six positions averaged over the 20 verbs is plotted. Note that *scaled entropy*, i.e., entropy relative to the base level, rather than raw entropy is plotted. This is to ensure that plots for different languages can be readily compared. Recall that the positions marked 3L, 2L, and 1L are the three positions to the left of the verb, 1L being the closest, while the positions marked 1R, 2R, and 3R are to the right of the verb.

Certain aspects of word order of Polish and English seem to stand out in the plot. For example, Polish has a flatter graph than English, possibly a reflection of the relatively free word order in the former. We also investigated the change of entropy values between adjacent positions for each of the nine languages. The languages behave similarly between every pair of adjacent positions except between position 1L and position 1R. For Danish, Dutch and German, the entropy at position 1L is considerably higher than that at position 1R (Figure 2). For all other languages, the reverse holds (Figure 1 and Figure 3). For a compact representation of our main result, see Table 2 in which all the scaled entropy values are reported for positions 1L and 1R. Results of a 1-tailed paired t-test are also reported. Notice that except for English (possibly due to remnant V2 effects), all other results pass the significance test (marginally so for Danish). We believe that the observed pattern

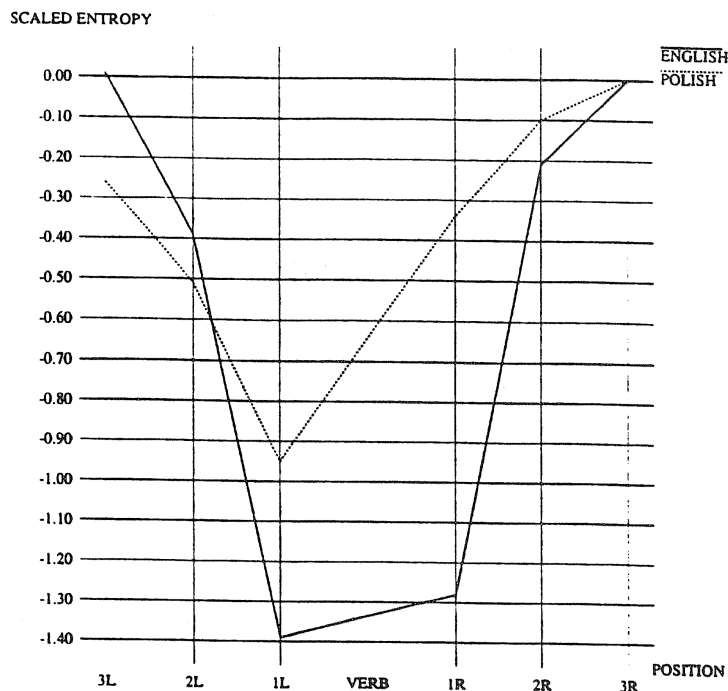


Figure 1: Entropy Conditioned on Position

in the patterns is precisely due to the V2 phenomenon.<sup>1</sup>

Next we considered if something even more conclusive could be said about the similarity between the graphs of the various languages we had obtained. To obtain the next result, we used a simple measure of the distance between graphs, the *mean square distance*. Given any two languages  $L_1$  and  $L_2$ , we defined

$\text{Similarity}(L_1, L_2) = \text{square root of sum of square of difference in entropy}(\text{POSITION})$ .

We then computed possible partitions of the nine languages into two sets such that the sum of the average similarity between all the languages in each of the groups is maximized. The optimal partitioning out of the 246 possible ones turns out to be the one in which the V2 languages Danish, Dutch

<sup>1</sup>It has been suggested to us that in a VS languages such as Irish and Welsh we would also observe that the entropy of position 1L is much higher than that of position 1R. We have been limited by the lack of the corpora we need to test this prediction.

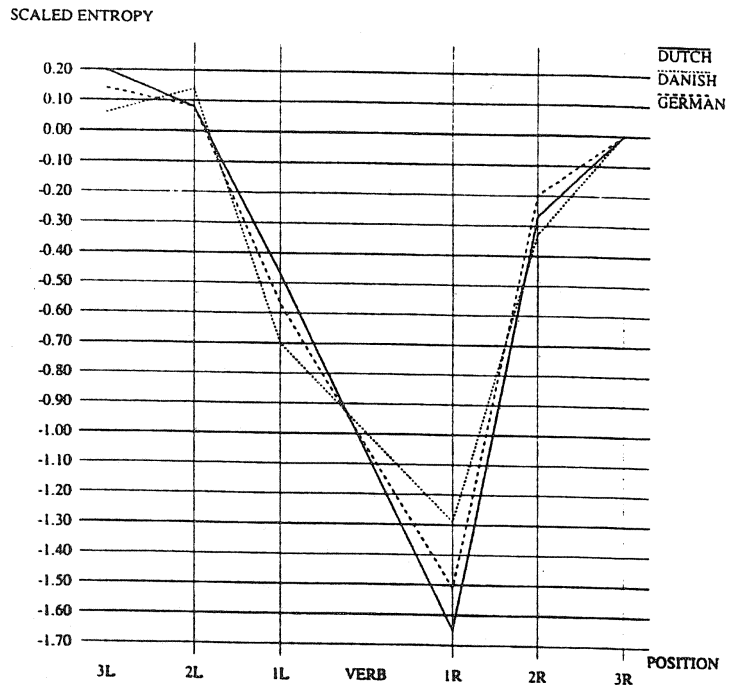


Figure 2: Entropy Conditioned on Position

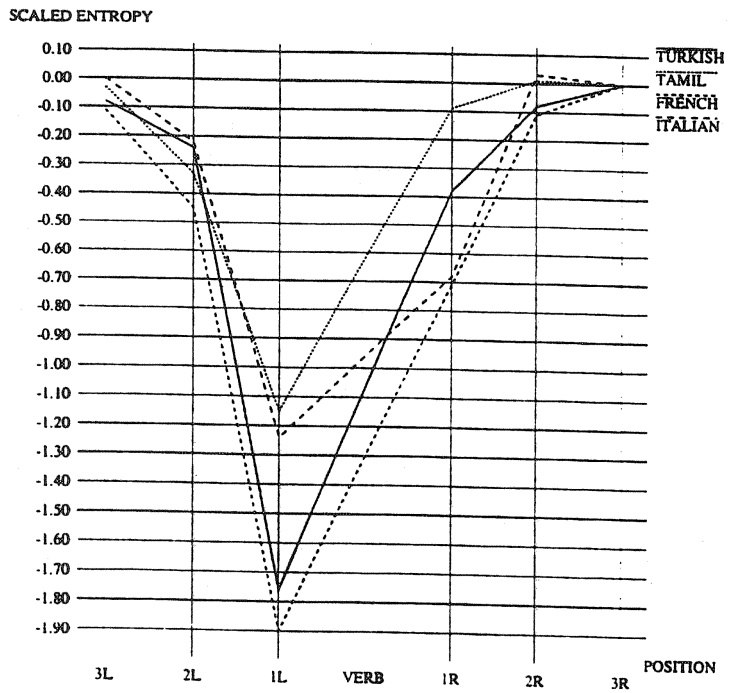


Figure 3: Entropy Conditioned on Position

Language	Scaled Entropy at 1L	Scaled Entropy at 1R	Significance %
Danish	-0.70	-1.29	94.23
Dutch	-0.47	-1.65	99.99
German	-0.57	-1.51	99.84
English	-1.39	-1.28	66.75
French	-1.90	-0.71	99.98
Italian	-1.24	-0.68	98.77
Polish	-0.95	-0.34	98.02
Tamil	-1.15	-0.09	99.98
Turkish	-1.76	-0.38	99.92

Table 2: Entropy reveals V2/non-V2 Distinction

and German together make up a partition. This is clear evidence that the graphs capture some essential linguistic characteristic that all the languages in the same group share. It is important to note that the shared characteristic cannot be the base word order; Danish is SVO while Dutch and German are SOV.

Recall that due to the V2 effect, the verb moves to the second position and then the first position may be occupied by any of a number of possible syntactic categories, i.e., noun phrases (both as subjects and objects), adverbials, and prepositional phrases. Whenever the subject is not in the first position, it is most likely in the first position to the right of the verb (as in (3) and (4)). Thus, whether the basic word order of the language is SOV or SVO, the position to the left of the verb is likely to be much more random exactly in case the language shows V2 effects. In our opinion, this effect is precisely captured in the graphs.

We believe that our method can be used by children to determine whether or not their language has V2. Once the value of the V2 parameter is settled, the input is far more revealing with regard to other word-order parameters. The child can then set the remaining word-order parameters using a number of alternative ways, some of which may also involve other information-theoretic criteria. Simple variations of the trigger-based strategy of the kind Gibson and Wexler (1994) discuss might also suffice since once the value of the V2 parameter is settled, the remaining word-order parameter space is devoid of any local maxima. Since we have been constrained by the number of language corpora we have been able to access, we are not in a position to make a definitive statement in this regard.

#### 4. Additional Observations and Results

In a number of short sections that follow, we bring out some other interesting aspects of our approach and investigate some variations as well. One purpose of these investigations is to show that the proposed algorithm is fairly robust. It is argued that it is quite plausible that the child uses such an algorithm to set parameters. Some concerns that arise naturally in view of the novelty of our approach are addressed.

##### 4.1. Noise in the Input

The learning algorithm we have proposed is remarkably robust. We did not clean the input, so that there are many instances of incomplete words as well as sentence fragments (e.g., "And that is a"). We, of course, removed any annotations of the documenter and selected only those utterances whose length was at least two. We ignored the sentence boundaries so that none of the punctuation marks are considered to be part of the input. Even though it is plausible that children at that early stage can introduce sentence boundaries and/or punctuation marks from speech systematically, we do not need to assume that they can reliably do so. This is in keeping with our aim to establish upper bounds on both how much children need to know and what they need to do in order to learn. To make the noise problem harder, we even introduced random noise so that about one third of the utterances had some words altered randomly to noise. Remarkably, the results were unaffected.

##### 4.2. Closed Class Words

The presence of articles could be making a difference to the entropy of certain positions in a non-uniform fashion. We considered whether removing some fraction of them from the input will allow us to obtain similar (or better) results. Since closed class words are sometimes unstressed in caretaker speech and are often absent from the first productions of children, there is a rich ongoing debate in language acquisition about whether or not functional categories are available to the child from the outset. We plotted new entropy graphs in the situation where certain words were assumed to be absent from the input. In order to simulate a way in which the child could skip over the closed class words (without having to know them beforehand), we considered the possibility that the child ignores a certain number of words from amongst the most frequent ones. We have observed that most of the frequent word tokens in any language corpora tend to be closed class words. In English, for example, the six most frequent words—"you", "the", "a", "it", "to", and "what"—were ignored. In French, the words ignored were "tu" (you), "pas" (not), "c'est" (it is), "a" (that), "le" (the (masc)) and "que" (that (compl.)). Our results shown in Figures 4-6 continue to show the predicted pattern. Furthermore, we

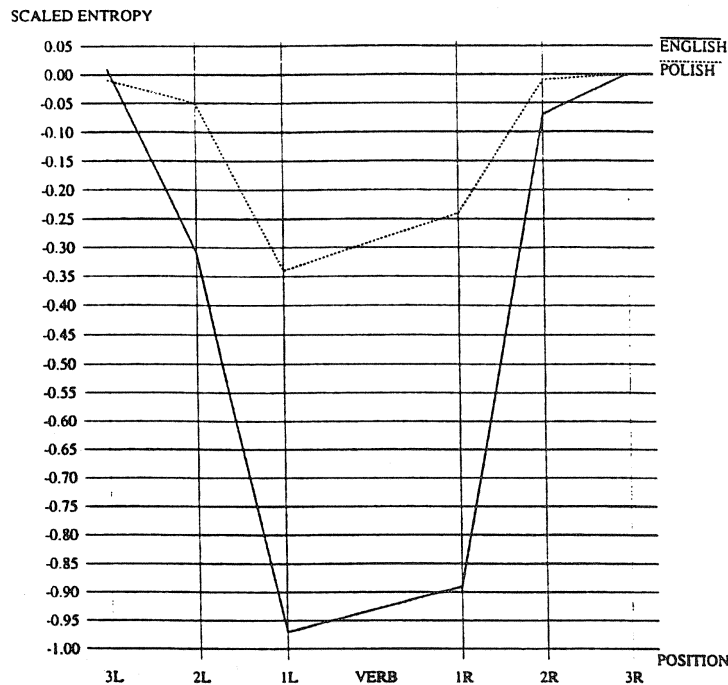


Figure 4: Entropy Conditioned on Position

observed strong similarity between the graphs for certain pairs of languages—Dutch and German, Italian and French, and Tamil and Turkish. It is well known that the languages in each of these pairs are similar in a variety of respects, including in their word orders. Dutch and German are SOV with V2; French and Italian are SVO without V2 and Tamil and Turkish are SOV, also without V2.

#### 4.3. Simplifying the Entropy Calculation

One objection to our approach that can be raised is that the computational complexity of calculating entropy of positions might be too severe on the child. Since entropy involves the transcendental function  $\log$ , in general, the child could at best be computing an approximation to it. We considered this possibility by substituting a two-term Taylor approximation to the  $\log$  function for the  $\log$  function and obtained an approximate value for entropy in this way. Remarkably, the results were unaffected. Note that the resulting computation only involves the four basic arithmetic operations. We also performed the same simplification in the process of learning the verbs by similarity and obtained good results. There are, of course, other ways of addressing the computability concern. It is well known that there are measures comparable to entropy which

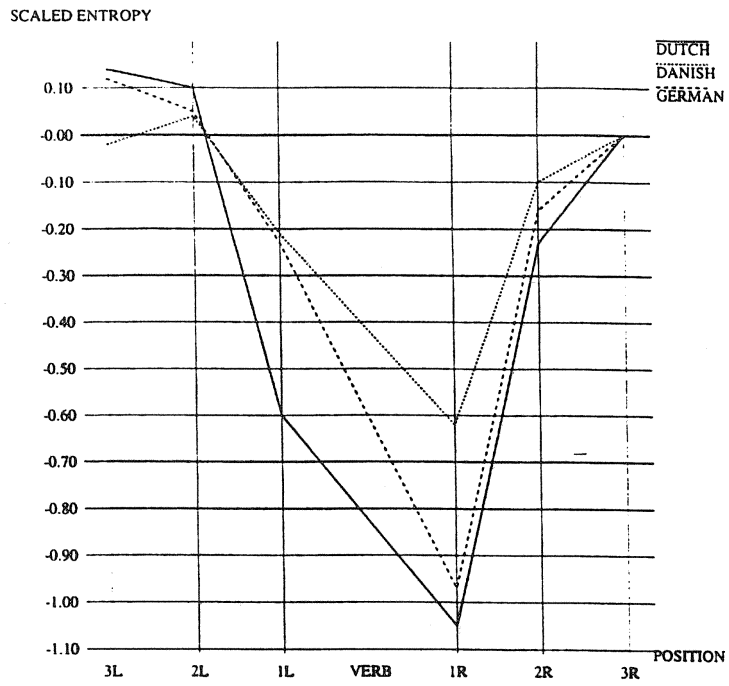


Figure 5: Entropy Conditioned on Position

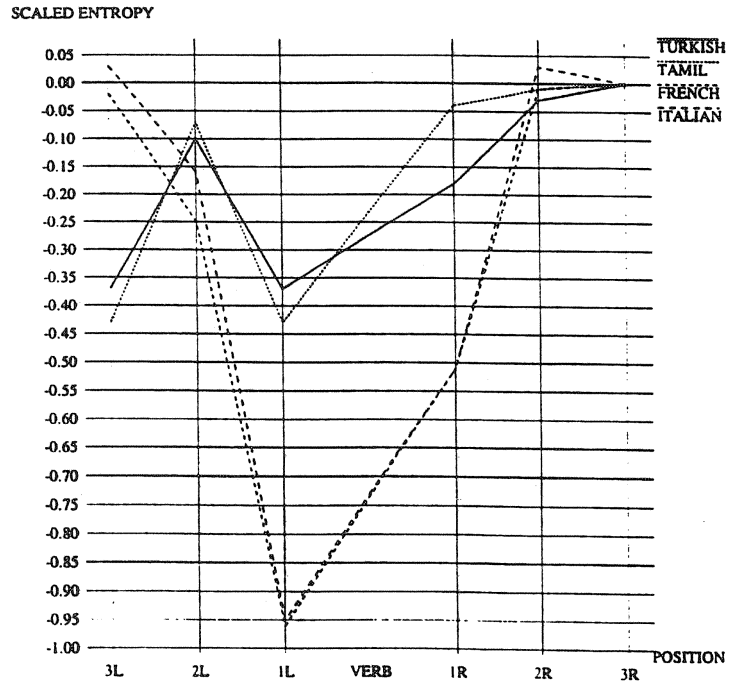


Figure 6: Entropy Conditioned on Position

involve only basic arithmetic operations. We conjecture that the results will hold regardless of which of them is used.

#### 4.4. Storage Requirements

Another objection to our approach, similar to the one in Section 4.3., can be that the use of statistical methods over a corpus of utterances might require use of an unreasonable amount of memory. First, it should be noted that the child need not store all heard utterances in their entirety. Only word-pair co-occurrence statistics need be stored. In the worst case, our method could require on the order of  $n^2$  additional storage, where  $n$  is the size of the vocabulary, beyond that already employed to store the vocabulary. This is the storage required for keeping statistics on all possible word-pair co-occurrences. However, due to Zipf's law (Zipf 1949), the actual storage requirements will be much less. Experiments reported in Brill (1993b) show an empirical upper bound for the storage requirements at about  $3 \times n$ , and since the word-pairs considered are only those where one of the words is one of the 20 verbs, this number is bound to be very reasonable.

#### 4.5. Any Words rather than Verbs

We have been forced to assume that children are able to distinguish some word types that are all common verbs before they have acquired word order. As expected, we noticed that no systematic results were obtained if instead of 20 words most of which were verbs we considered any random 20 words. It is well accepted that verbs select their arguments. Therefore, it is not at all surprising that the child needs to focus on verbs in order to obtain revealing information about word order in general and, in particular, about the verb-complement order.

#### 4.6. Corpus Size

We have shown results involving corpora containing 3000 utterances each. This number is not arbitrary but in fact it is the lower limit of the range up to which we have been able to obtain the results we have reported (both with regard to verb extraction and the entropy of the positions around the verb). At 1500 utterances, the results are no longer systematic so that on different random corpora of that size for the same language, we obtain graphs that look quite different from each other. In contrast, on random corpora of size 3000 or larger for any of the languages, we always obtain similar graphs. Depending on how we conceive children to be learning, we could interpret these results in different ways. If children need not commit themselves to the value of the V2 parameter at any particular point, they could very well start off with a small corpus and at various stages continue to determine the value of the V2

parameter to the best of their ability. From the point they have come across around 3000 utterances, we believe children will stabilize on the correct value of the V2 parameter. But of course they may never (nor need to) know whether or not they have stabilized on the correct value.

Remarkably, our learning strategy is also consistent with a learning criterion in which at some point the child must make a definite decision about the value of a particular parameter and never have to revoke this. Children could first figure out at which point the graph appears to stabilize, for example, by comparing the values on two or more fixed size corpora. They could then decide the value of the parameter based on a corpora of that size. Notice that there is another kind of stability the child could possibly seek. This would require that the graph on different corpora of some fixed size be almost identical. Clearly, the first kind of stability is guaranteed by this second kind of stability. We conjecture that the second kind of stability may not be achievable given the constraints under which the child has to work. Furthermore, our results show that it is not necessary for the child to seek this second kind of stability in order to be successful at learning. Notice also that it is not at all necessary that stability be achieved at the same point for different languages. It could well be the case that the graph stabilizes for Turkish at 750 utterances, while for English it does so only at 3000 utterances.

## 5. Other Properties of this Solution

One outstanding feature of our solution is that it is fully verifiable. The results for all the nine languages we have considered so far are fully replicable. Furthermore, whatever claims we have made about the information-theoretic properties of the input can be refuted or confirmed for other languages as soon as corpora of around 3000 utterances of caretaker speech are available for them.

Our proposal is also in line with some ideas based upon formal learning theory incorporated in recent work (Kapur 1993, Kapur 1994). The following description provides a brief overview of this general model of parameter setting: Parameters are subdivided into groups and the groups are ordered by their relative frequency of expression. The parameters which are expressed more frequently are assumed to be set first. Learning is categorically not error-driven so that the motivation for the child to set parameters derives from efficiency considerations, i.e., the need to extract the correct 'meaning' from the input increasingly rapidly. Parser failure is not regarded to be of any importance in this process. Initially, all the parameters are unset and the parser is organized to obey only all the universal principles. At this stage, utterances from any possible natural language will be accommodated with equal ease, but no sophisticated structure can be built out of them. Input will be used to weigh support for each of the alternative settings of the parameters

in the first group. Clearly, this evidence must be of a primitive nature, for the parser is incapable of anything but a rudimentary analysis. The word-order parameters of the kind discussed in this paper are very basic and expressed frequently so that they are likely to belong to this first group. It must be possible to set them, based on a very superficial analysis of the input.

Consistent with this general parameter-setting proposal, we have demonstrated in this paper that in fact the word-order parameters can be set, based on rather simple analysis of unstructured, unannotated input. The method is tolerant of considerable noise in the input. Minimal processing requirements are assumed of the child; child need to semi-reliably find word boundaries in their input speech stream but need not even find sentence boundaries, nor make use of any syntactic information. The few common verbs required initially only need to be acquired in the sense that their verbal category is known but there is no need to have any knowledge of their subcategorization frames or their semantic categories. They are viewed as nonsense tokens but with some salience; all other words are viewed as plain nonsense tokens. Furthermore, the amount of input required—3000 utterances—is very reasonable. It is conceivable children use prosodic information from the speech stream in order to acquire syntactic aspects of their language. Our work does not contradict this. It only shows that there is no logical necessity for the child to use prosodic information, at least for determining the word-order parameters.

Finally, it ought to be noted that our information-theoretic solution to parameter-setting is not tied closely to any particular linguistic conception of parameters. Just as any linguistic theory has to account for variation, any theory of language acquisition has to explain how variety is mastered. Our work is an important step towards providing a general-purpose solution to the problem of language acquisition.

## 6. Future Work and Conclusions

There are a number of directions in which this work can be extended. For one, as soon as we can get access to corpora from other languages, we would like to verify that the relationships observed are maintained. For another, we still have to show how the child can determine the word-order parameters for other lexical and functional categories besides the verbal ones. We are quite optimistic that we will be able to obtain results along the lines developed in this paper. Kapur and Clark (1997) have reported some success at using similar techniques for solving hard problems in the mastery of the French pronoun system.

We plan to extend our work to handle rest of the commonly accepted parameters. It is not unlikely that for other parameters we will need more sophisticated primitives and not just word tokens and their linear positions relative to words. For example, once the X-bar structure of the utterance

can be built subsequent to the setting of word-order parameters, structural notions such as c-command will become available if needed. Just as the V2 parameter seems to reveal itself in a straightforward entropy characteristic, it is not unlikely that other parameters' values also have consequences which are far more surface apparent than the phenomena themselves.

As far as we know, this work is the first effort to establish an interesting link between the traditionally theoretical, generative notion of language that involves principles and parameters, and techniques that are similar to those used by the structuralists of the 1950s and 60s. (For other work in a similar spirit, see Brill 1991, Brill and Marcus 1992a, Brill 1993a, and Brill 1993b.) If progress continues to be made along the direction we have embarked upon, there will be major ramifications for linguistics and the theory of language acquisition. It will be conclusively demonstrated that the whole issue of the absence of negative evidence in the input has been overblown. Based on formal learning theory, we have shown elsewhere that stochastic nature of the input can be used to adequately compensate for the absence of negative evidence (Kapur 1993 and 1994, Kapur and Bilardi 1992 and 1996). The issue of overgeneralization and its purported solution, the Subset Principle (Berwick 1985, Manzini and Wexler 1987), are meaningless since the extensional relationship between various languages plays no part in our learning proposal. For example, two languages could well be subsets of each other, but there is adequate evidence to move from any one language to the other, if necessary. Assuming stochastic input, this evidence may require observation of non-occurrence in order to generate a canonical form of indirect negative evidence. In this paper, it more directly took the form of the entropy characteristic in the neighborhood of common verbs.

Our work has also established that the trigger-based approach to learning (Gibson and Wexler 1994) is overly simplistic. A trigger need no longer be considered to simply be a single utterance or even a small set of them. Rather, it is the statistical properties of large portions of the corpus that trigger parameter values. Such a move is necessary if tolerance to noisy and confusing input is to be satisfactorily established.

## 7. Acknowledgements

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**Wh-Less Questions in Early Swedish:  
An Argument for Continuity in Language Development**

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**1. Introduction**

The acquisition of questions has long been of interest because in many languages, because it is an area of child language where development can be seen. This paper examines the acquisition of wh-questions in child Swedish, focusing on wh-questions where children omit the question word, which I shall call *wh-less questions*, as seen in (1).

- |     |                                     |                        |
|-----|-------------------------------------|------------------------|
| (1) | <u>Child Swedish</u>                | <u>Adult Swedish</u>   |
|     | a. __ är det? (Tor 19, 2;8)         | c. Vad är det?         |
|     | __ is that (missing vad, what)      | what is that           |
|     | what is that                        |                        |
|     | b. __ gör apa då? (Tor 15, 2;6)     | d. Hur gör apen då?    |
|     | __ does ape then (missing hur, how) | how makes the ape then |
|     | 'how does the ape go then?'         |                        |

The child Swedish questions in (1) clearly violate the well-formedness conditions for the adult language, which require an overt question phrase in all wh-questions, and there is considerable debate about what causes children to make such errors.

Errors in question formation in child English have sometimes been hypothesized to reflect a lack of the structure in child grammar (e.g., Radford (1994) Vainikka (1992)). A similar proposal has been made to explain wh-less questions in the V2 languages. For example, Penner (1994) argues that non-adultlike questions in child German provide evidence that the structure necessary for question formation is not available to the child in the early stages of language acquisition. Penner argues that German children produce a range of non-adult type questions, including wh-less questions, such as those in (1) and other types of errors, because they do not have

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the full functional structure, including the category CP, and thus cannot produce adult like questions.

However, the view that children produce non-adult questions because they lack the necessary functional structure has been challenged, e.g., Valian, Lasser & Mandelbaum (1992), and Stromswold (1994). These authors have shown that English-learning children have some aspects of question formation at a very early age. They argue that the child can have the functional structure necessary for well-formed questions while still producing non-adult questions for other reasons. These positions are consistent with a continuity view of child language acquisition (e.g., Whitman, Lust and Lee (1990), Demuth (1992, 1994), where child grammar is argued to have the full functional structure and principles provided by UG.

## 2. Hypotheses

In this paper, I examine the acquisition of wh-less questions in light of these two opposing views of the structure for questions in child grammar. If wh-less questions truly represent a lack of CP in the child's grammar, then the acquisition of adultlike questions should correlate with the acquisition of other structures that require CP, such as declarative topicalization and subordinate clauses with overt complementizers. In particular, this hypothesis about the status of CP in child language makes the following predictions for questions in child Swedish:

- (2) a. All early questions should be non-adult like, since the child will not have the syntactic structure necessary for question formation.
- b. Wh-less questions should not occur alongside non-subject topicalization, since these require a full CP.
- c. Wh-less questions should not occur alongside complex clauses with overt complementizers, since these also require a full CP.
- d. The disappearance of wh-less questions in child speech should correlate with the acquisition of non-subject topicalization and complex clauses with overt complementizers.

If on the other hand, the child has the access to the full functional structure and principles necessary for question formation, as predicted by the Continuity Hypothesis, then there should not be any significant correlation between the presence or absence of wh-less questions and the acquisition of other structures that require CP. This hypothesis makes the following predictions about questions in child Swedish:

- (3)
- a. Some early questions will be well formed, since the child can have access to CP.
  - b. Wh-less questions should be able to occur alongside overt topics, since the child will have the full CP projection.
  - c. Wh-less questions should occur alongside complex clauses with overt complementizers, again because the child will be able to use the CP projection.
  - d. The disappearance of wh-less questions will not correlate with the acquisition of functional structure.

If the predictions made by the maturation approach in (2) hold, then this would be evidence that early grammars lack the full functional projection and/or the ability to move into this projection. This would also support the position that functional categories mature in the child's grammar (e.g., Radford (1990)). If on the other hand, the predictions made by the continuity approach in (3) hold, then this would be evidence that non-adult like questions can appear even if the child has the functional structure for question formation. This would support the position that functional categories do not mature, but are present in the earliest periods of language acquisition, and would indicate that another explanation for non-adultlike questions must be found.

In the next section, I will present an introduction to CP in Swedish grammar. I will present the data on wh-less questions in child Swedish, and then examine the relationship between wh-less questions, and other structures that require a CP structure. I will demonstrate that wh-less questions cannot be due to a lack of CP in the child's grammar, because they occur alongside a number of other structures that require the full CP structure. In the final sections, I will then explore other reasons for the presence of wh-less questions in child Swedish. I will argue that these questions possess an abstract or unspecified wh-operator and suggest that Swedish children are using null and underspecified wh-operators as they learn to integrate the language specific lexical and prosodic information about realizing operators, syntactic information about licensing null operators, and pragmatic/contextual information about identifying null operators.

### **3. CP and the Structure of Questions in Swedish**

Swedish is an SVO language with V2 word order. This means that only a single constituent can precede the verb in main clause declaratives and wh-questions, as seen in (4a) and (4b) below. If more than one constituent precedes the verb, then the sentence is ungrammatical, as seen in (4c) and (4d).

(4) V2 second clauses

- |    |  |    |   |
|----|--|----|---|
| a. | <i>Vad läser barnet?</i><br>what reads the child                     | c. | <i>*Vad barnet läser?</i><br>what the child reads                     |
| b. | <i>Den boken läser barnet inte.</i><br>that book reads the child not | d. | <i>*Den boken barnet läser inte.</i><br>that book the child reads not |

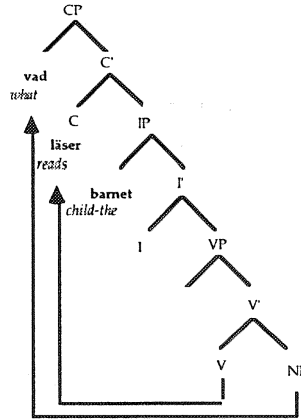
Verb Second in Swedish is a main clause phenomenon. Following Pollock (1989) it is assumed that negation and other sentential adverbs are located between the functional categories and VP in Swedish, and thus mark the edge of the VP. In main clauses such as (5a), the finite verb *får* 'may', moves past negation *inte* 'not' and into the second position. In subordinate clauses, such as (5c), the verb does not move, but follows negation. Because negation is assumed to mark the left edge of VP it is standardly assumed that the verb remains inside the VP in subordinate clauses.

(5) Verb movement in Swedish Main and Subordinate Clauses

- |    |   |    |   |
|----|---|----|---|
| a. | <i>Morfar <u>får inte</u> köra bil.</i><br>grandpa may not drive car  | b. | <i>*Morfar <u>inte får</u> köra bil.</i><br>grandpa not may drive car |
| c. | <i>Det är mammans bil som morfar <u>inte får</u> köra / *...som morfar <u>får inte</u><br/>köra</i><br>it is mamma's car that grandpa not may drive /..*that grandpa may not<br>drive |    |   |

This complementary distribution with main clauses showing verb movement and subordinate clauses lacking verb movement suggests that the verb in main clauses occupies the position filled by the overt complementizer in subordinate clauses. Thus, following den Besten (1983), Platzack (1986) and others, Verb Second in main clauses is analyzed as follows: the finite verb moves through  $I^0$  to  $C^0$ , the position of complementizers in subordinate clauses. Then a phrasal element, either the subject or other phrase, moves to the Specifier of CP, as in (6).

- (6) *Vad läser barnet?*  
 what reads the child



The complementary distribution between main clauses with overt verb movement and subordinate clauses with no verb movement, cf. (5c) also demonstrates that the verb does not move at all, unless it moves to C in Swedish. Platzack (1986), Holmberg & Platzack (1996) argue that this indicates that Swedish does not have verb movement to the IP projection for inflectional reasons.<sup>2</sup> If there is no movement to C, then there is no verb movement at all. In other words, finiteness marking occurs inside the VP and any verb movement that occurs is motivated only by whatever motivates the V2 constraint. Thus, whenever verb movement occurs in Swedish, it is always movement to C<sup>0</sup>.

Because verb movement in Swedish only takes place to the CP projection, and is not motivated for inflectional reasons, evidence for verb movement in Swedish can be used as evidence for CP. Verb movement can be seen in two constructions: verb movement past negation, as in (5a) above, and verb movement past the subject, as in (4a) and (4b) above. In this paper, I will focus on evidence provided by verb movement past the subject.

#### 4. Wh-less Questions in Child Swedish

##### 4.1 Subject Information

The data from this study are based on natural speech data from two sources.<sup>3</sup> The first source of data is cross-sectional natural speech data from 30 Swedish children ages 1;11 to 4;5 collected in Lund, Sweden by the author, (Santelmann, 1995). This

<sup>2</sup> This contrasts with German, which shows overt subject-verb agreement and thus always has movement to the IP projection for inflection in all clauses (e.g., Schwartz & Vikner (1990)).

<sup>3</sup> All ages will be given in the format year;month.

data consists of 30-60 minute recordings of each child with the author at their day care center. In this study I will present data from five of these children. I have selected data from the three youngest children who use more than one word utterances and whose data has been transcribed and checked, and two older children who just under three and whose data has also been transcribed and checked.

The second source of data comes from longitudinal data from 3 children: Ask, Tor, Embla, from the Project Child Language Syntax (Söderbergh (1975), Lange & Larsson (1977)). The longitudinal data was collected in the children's homes on a biweekly basis, from the time the children were 20-22 months of age until 40 months of age. I made intensive hand searches of these transcripts, and excerpted all multi-constituent questions with a verb, along with the context they occurred in. For all children I examined the transcripts from the time when their MLU was over 1.50 as calculated by Lange & Larsson (1973) until they consistently used overt complementizers. A summary of the subject information and questions found is given in the table in (7). From both the cross-linguistic and longitudinal data, I collected all *wh*-questions and analyzed those that were larger than one constituent. I excluded incomplete or unclear utterances.

### (7) Subject Summary Information

a. Santelmann (1995)

Subject	Age	MLU	# Utts	Total Wh Qs	Wh Qs w/ verb	Wh Qs w/o verb
Åke	1;11	2.78	111	2	2	0
Frank	2;0	1.48	211	22	16	6
Kenneth	2;2	2.14	429	42	18	24
Daniel	2;10	2.33	339	2	1	1
Lars	2;11	4.67	243	27	20	7
Totals:	1;11- 2;11	1.48-4.67	1,333	95	57	38

## b. Söderbergh Corpus (Söderbergh (1975), Lange &amp; Larsson (1977))

Subject	Age Range	MLU Range	# of Utts	Total #	Wh Qs	Wh Qs
				Wh Qs	w/ verb	w/o verb
Ask	1;11-2;9	1.91-4.61	4,103	216	214	2
Embla	1;8-2;8	1.32-4.03	4,288	158	154	4
Tor	2;1-3;0	1.34-4.76	3,756	306	247	59
Totals:	1;8-3;0	1.32-4.76	12,147	680	615	65

I have included in this analysis question such as *vad är det?* 'what is that?' or *var är XP* 'where is XP?'. I have done so for several reasons. First, there is evidence that even these "routine" questions are not treated as an unanalyzed phrase. Rather, even for the children with the lowest MLUs (at or below MLU 1.50), there is some evidence that they are analyzing and operating on each constituent of the question separately. First, there is some variety in the subjects used, as seen in the examples below. This indicates that these questions are not just a set phrase, but are applied to different subjects.

- (8) a. *\_\_ är det?* (Frank 2;0, MLU 1.48)  
 \_\_ is that  
 'what is that?'  
 b. *va är denna?* (Frank 2;0, MLU 1.48 )  
*what is this*  
 c. *a e bilen?* (Tor 10 2;2, MLU 1.50)  
 where is the car  
 d. *a e pappa?* (Tor 10 2;2, MLU 1.50)  
 where is pappa

In addition, there is evidence that the verb and the question word are also analyzed individually. In some of the questions, the wh-word is omitted, as in (9), but in others, the verb is omitted, as in (10).

(9) Omitted wh-words

- a.     \_\_\_ *är det?*           (Frank 2;0, MLU 1.48)  
        \_\_\_ is that  
        'what is that?'
- b.     \_\_\_ *gör det?*           (Frank 2;0, MLU 1.48)  
        \_\_\_ does that  
        'what does that?'
- c.     \_\_\_ *e pennan?*       (Tor 10, 2;2, MLU 1.53)  
        \_\_\_ is pen-the  
        where is the pen?

(10) Omitted verbs

- a.     *vad det?* (Frank 2;0, MLU 1.48)   b. *va pappa?* (Tor 2;2, MLU 1.50)  
        what that                                 where pappa

If the verb and the question word were an unanalyzed phrase, we would expect them to be omitted together, rather than separately.

Finally, there is some evidence for movement in these very early questions. For example, Frank (age 2;0 MLU 1.48) uses two different verbs in his questions, the main verb *gör* 'does' (in 1 question) and the copular *är* 'is' (see (9) above). Furthermore, there is evidence that this verb is moved. While the verb appears before the subject in the majority of questions, Frank does have one instance of a non-moved verb, as in the following example.

- (11) Question without moved verb     Question with moved verb  
        a. *vad det är?*           (Frank 2;0 1.48)   b. *va är denna?*       (Frank 2;0 1.48)  
        what that is                                 what is this

This non-moved verb indicates that the verbs that appear in pre-subject position underwent movement and are not simply part of an 'idiomatic' expression.

This data indicates that children who are still in the two word stage are treating each part of the question: the question word, the verb and the subject, as distinct parts of the structure. Because of this, I have included *vad är det?* 'what is that?' and *var är XP?* 'where is XP?' as wh-questions in my analysis.

#### 4.2 Distribution of *wh*-less questions

Questions where children omit the *wh*-word are common in the data analyzed, as shown in the tables in (12).

##### (12) Overview of *wh*-less questions in child Swedish

###### a. Santelmann (1995)

Subject	Total # of Wh Qs w/ verb	# Wh Qs w/o Ques word	% <i>wh</i> -less questions
Åke	2	1	50.00%
Frank	16	13	81.25%
Kenneth	18	1	5.56%
Daniel	1	0	0.00%
Lars	20	2	10.00%
Totals	58	16	29.31%

###### b. Söderbergh (1975), Lange & Larsson (1977)

Subject	# of Wh Qs w/ verb	# Wh Qs w/o Q word	Range of <i>wh</i> -less in each session	% <i>wh</i> -less over all sessions
Ask	214	23	0-100%	10.75%
Embla	154	26	0-75%	16.88%
Tor	247	58	0-100%	23.48%
Totals	615	107		

There are a number of indicators that these are true *wh*-questions, and not yes/no questions or sentence fragments.<sup>4</sup> First, these questions have a clear *wh*-

<sup>4</sup> This type of *wh*-question has long been acknowledged in the literature on the acquisition of V2 languages. Work on Swedish (Lange and Larsson (1973)) and German (Felix (1980), Penner (1994), Tracy (1994)) all classify this type of utterance as a type of *wh*-question, distinct from yes/no questions and sentence fragments.

question intonation, distinct from yes/no question intonation and declarative intonation. Second, these wh-questions have a gap in the initial position and missing argument that corresponds to the intended question phrase. In the few cases where there is no missing argument but a missing adjunct, as in (14d) below, the judgment as to whether the question was a wh-question or a yes/no question was made on the basis of intonation and context. If there was any doubt about an utterance being a wh-question, it was not included as a wh-less question. Finally, these wh-less questions are clearly intended as wh-questions; it is clear from both the context and the response of the adults and the children that these structures are questions. The extra-linguistic context often includes the child pointing to something or looking for something. In addition, either the adult or the child almost always answers the question. Some sample contexts where null wh-words occur are given in (13).

(13) Sample contexts where null wh are used

a. Adult/child context (Frank 2;0 MLU 1.48)

Frank: *e trilla-la* (looking at a picture of a pig falling off a bridge)

mm fall -prt

Frank:     *är det?* (pointing to a new picture)

    is that

(what) is that?

Adult: *ja vad är det?*

yes, what is that

b. Child self-context (Tor 21 2;9, MLU 3.71)

Tor:     *är de andra bilen?*

    is the other car

(where) is the other car?

Tor: *där var den.*

there was it.

There is a wide range of *wh*-words that are omitted in these questions, as seen in the examples in (14), including *hur* 'how', *varför* 'why', *vart* 'where-to', *vad* 'what', and *var* 'where'.<sup>5</sup> The context demonstrates that the dialogue often gives many clues as to what the missing *wh*-word is. The context is sometimes given by the adult and sometimes by the child him/herself.

<sup>5</sup> This is very similar to data reported in Felix (1980) for German, where children were reported to drop *was* 'what', *wo* 'where', which *wohin* 'where to', *wer* 'who', and *wann* 'when'.

(14) a. Missing vad 'what'

Tor: \_\_ *är det?* (Tor 21, 2;9, MLU 3.74)

\_\_ is that

'what is that'

Adult: *Ja, vad tror du det är?*

yes, what think you it is

'yes, what do you think it is'

Tor: \_\_ *säger han?* (Tor 19, 2;7, MLU 3.76)

\_\_ says he

'what does he say'

Ad: *Ja "Du kan inte ta mig" säger han till flickan.*

yes, 'you can't take me' says he to girl-the

b. Missing var 'where' (Tor 22, 2;9, MLU 4.33)

Tor: \_\_ *är honoms mössa?*

\_\_ is his hat

'where is his hat'

\_\_ *är ho/hennes mössa?*

\_\_ is his/ her hat

'where is her hat'

Ad: *Ja. Var är hennes mössa?*

yes. where is her hat

c. Missing vart 'where-to' (Ask 18 2;8, MLU 4.25)

Adult: *Vart tror du R. åkte med båt då?*

where think you R. went by boat then

'where-to do you think that R. went by boat then?'

Ask (to R.): \_\_ *åkte du med båten?* (intonation as if the sentence

\_\_ **went you with boat-the** were introduced by *vart*)

'where-to did you go with the boat?'

d. Missing *hur* 'how' (Tor 15, 2;5 MLU 2.67)

Tor:     *gör apa då?*  
    **makes monkey then**  
**'how does the ape (go) then?'**  
*Hur gör apa då?*  
 how makes monkey then  
 'how does the ape (go) then?'  
    *gör apa då?*  
    **makes monkey then**  
**'how does the ape (go) then?'**

e. Missing *varför* 'why' (Tor 25 2;11, MLU 4.76)

Tor: *Varför kan inte komma in?*  
 why can not come in  
 'why can't it come in'  
 Varför kan --  
 why can--  
    *kan den inte komma in?*  
    **can it not come in**  
**'why can it not come in?'**

This range of missing wh-words shows that wh-less questions are not limited to a certain question type; they occur with both argument and adjunct questions, and over a wide range of different question words.

In addition to having a range of missing wh-words, wh-less questions occur with a variety of verbs, including modals and main verbs, in both present and past tense, as in (15).

(15) Main verbs

a.     *gör den?* (Kenneth 2;2, MLU 2.14)  
    **does it**  
**'what is that doing?'**

- b. \_\_\_ *är där?* (Frank 2;0 MLU 1.48)  
 \_\_\_ is there  
 'what is there'
- c. \_\_\_ *äter den?* (Embla 09 2;1, MLU 2.05)  
 \_\_\_ eats it  
 'what does it eat?'
- d. \_\_\_ *gjorde du nu?* (Ask 01, 1;11 MLU 3.06)  
 \_\_\_ did you now  
 'what did you do now?'
- e. \_\_\_ *sa du?* (Embla 14, 2;3 MLU 2.35)  
 \_\_\_ said you  
 'what did you say?'

#### Modals and auxiliaries

- f. \_\_\_ *ska man göra med den da?* (Ask 14 2;6, MLU 3.44)  
 \_\_\_ shall one do with it then  
 'what should one do with this then?'
- g. \_\_\_ *har hänt?* (Ask 08, 2;3, MLU 2.80)  
 \_\_\_ has happened  
 'what has happened?'

The data above show that wh-less questions are not limited to a single verb type, and that wh-less questions occur with a range of verbs, both thematic and non-thematic. The range of verbs and the range of missing wh-words suggest that wh-less questions are a productive alternative for question formation in early child Swedish.

### **5. Wh-less Questions and Evidence for CP in Early Child Swedish**

These wh-less questions clearly violate the well-formedness conditions for the adult language (e.g., Rizzi (1991)), which require both an overt question word in the specifier of CP and a verb in the head of C. In the next sections, I will examine other structures that require CP and show that there is nonetheless evidence for the principles of question formation and for CP in the children who produce wh-less questions.

### 5.1 Well-formed Wh-Questions

The first piece of evidence that these wh-less questions are not due to lack of structure or lack of question formation principles comes from well-formed wh-questions. Every child who used wh-less questions also used well-formed wh-questions at the same time, except for the first recording of Ask (age 1;11). While Ask had no well-formed questions in his first recording, he did use well-formed non-subject topics in that recording, as discussed in the next session. Some examples of well-formed questions alongside wh-less questions are given in (16).

- (16)    wh-less                      with wh word
- a.        \_\_\_ *gör det?*                      *vad är denna?*      (Frank 2;0 MLU 1.48)  
           \_\_\_ makes that                      what is this  
           'what makes that?'
- b.        \_\_\_ *gör den?*                      *vad gör denna?*      (Kenneth 2;2, MLU 2.14)  
           \_\_\_ makes that                      what makes this
- c.        \_\_\_ *öppnar man?*                      *hur ska det va?*      (Lars 2;11 MLU 4.67)  
           \_\_\_ opens one                      how should it be  
           'how do you open (this)?'
- d.        \_\_\_ *är det för något?*                      *vad är det för något?*      (Tor 2;6, MLU 2.12)  
           \_\_\_ is that for thing                      what is that for thing  
           'what is that?'                      'what is that?'
- e.        \_\_\_ *försöker hon göra?*                      *vad tänker bäbisen ta?*      (Ask 2;7 MLU 4.01)  
           \_\_\_ tries    she do                      what thinks the baby take  
           'what is she trying to do?'

The presence of these well-formed questions in every child's speech sample indicates that the wh-less questions cannot be due to inability to form questions, since the children clearly can produce well-formed questions. The well-formed questions contain both a verb and the question word in pre-subject, or CP position. Furthermore, every child showed evidence for both verb movement and question phrase movement. Even the youngest children show some variety in the verbs and question words used, as can be seen in the examples in (17).

- (17) a.        *vad är denna?*    (Frank 2;0 MLU 1.48)  
           what is this

- b. *em e den?* (Frank 2;0, MLU 1.48)  
who is that
- c. *var är min nalle?* (Kenneth 2;2, MLU 2.14)  
where is my teddy-bear
- d. *vad gör dom?* (Kenneth 2;2 MLU 2.14)  
what do they
- e. *vad säger kalven?* (Embla 12, 2;2, MLU 3.17)  
what says the calf
- f. *hur gör man?* (Embla 12, 2;2 MLU 3.17)  
how does one
- g. *vems är det?* (Ask 09, 2;4 MLU 3.21)  
whose is that

These questions show overwhelming evidence for syntactic movement of the wh-word. The wh-word is always placed at the beginning of the utterance.<sup>6</sup> All children showed at least two different types of question words. In addition, in the speech samples examined, only 5 questions out of a total 670 questions with a verb lack verb movement. These examples are given in (18).

(18) Questions with non-moved verbs (all examples found)

- a. *Var han bor?* (Embla 11, 2;1, MLU 2.51)  
where he lives
- b. *Vad det är?* (Frank 2;0 MLU 1.48)  
what that is
- c. *Vad det är? (2 times)* (Tor 15, 2;5 MLU 2.67)  
what that is
- d. *Vad för grejer du har med dig?* (Lars 2;11 MLU 4.67)  
what for things you have with you  
'what kind of things (will) you have with you?'

<sup>6</sup> In the data I have examined, I have found no examples of in situ wh-words. I have heard occasional anecdotal evidence for their existence in child Swedish. This is similar to the data for in situ wh-words in child English. While in situ questions may exist, they are very rare indeed.

These questions represent less than one percent of the total number of questions. All children who produce non-moved verbs also produced questions with verb movement in the same session, and every child had more moved verb questions than non-moved verb questions.<sup>7</sup>

## 5.2 Non-subject Topicalization

Further evidence against an analysis of wh-less questions as having a lack of structure comes from the fact that wh-less questions continue alongside non-subject topics, such as adverbs and objects. Examples of wh-less questions and overt topics in the same speech sample are given in (19).

- | <u>null wh</u>                             | <u>overt topic</u>                               |
|--|--|
| a.    ___ <i>är det</i> ?                  | b. <i>nu ska jag gå.</i> (Åke 1;11 MLU 2.78)     |
| ___ is that                                | now shall I go.                                  |
| 'what is that?'                            |  |
| c.    ___ <i>gör den</i> ?                 | d. <i>nu vaknar dom.</i> (Ken 2;2, MLU 2.14)     |
| ___ does that                              | now wake they                                    |
| 'what does/makes that'                     |  |
| e.    ___ <i>är det</i> ?                  | f. <i>det hade jag.</i> (Tor 16, 2;6, MLU 2.50)  |
| ___ is that                                | that had I                                       |
| 'what is that?'                            |  |
| g.    ___ <i>ska vi göra nu tycker du?</i> | h. <i>en parkering ska jag göra av det hära.</i> |
| ___ shall we do now think you?             | a parking shall I make with this here            |
| 'What should we do now,                    | 'I'll make a parking lot with this' (Ask 19)     |
| do you think?'                             |  |

In these non-subject topics, both the phrasal topic and the verb are in pre-subject position, indicating that they have moved past the subject and into the CP projection.

This topicalization is also productive at this point in time. These early topics show productive verb movement and productive phrasal movement. Only 1 child,

<sup>7</sup> Felix (1980), Tracy (1994), and Penner (1994) report data from German children who make extensive use of verb-final structures such as those in (18). I have no data from Swedish children who make extensive use of questions of this type. However, a missing functional category cannot explain these questions in German, because the child reported by Tracy (1994) uses structures that require CP, i.e. topicalization and subordination, at the same time he uses V-final wh-questions.

Frank, showed no evidence for declarative topicalization, and he asked a number of questions, with several different question words and verbs. These topics occur with a variety of verbs, including main verbs, auxiliary verbs, transitives, intransitives, as well as the copula *be*, as seen in the examples in (20) and (21) below. These topics also show a variety of topicalized phrases, including locative adverbs and time adverbs, as seen in (20), as well as object pronouns and object NPs as seen in (21).

- (20) a. *nu ska jag gå.* (Åke 1;11)  
now shall I go
- b. *så gör du.* (Ask 1;11)  
so make you
- c. *nu är det tomt.* (Tor 12 2;3)  
now is it empty
- (21) a. *det gör jag.* (Åke 1;11)  
that do I
- b. *skärp har hon* (Embla 10 2;1)  
belt has she
- c. *nä dockan ska jag ha* (Tor 11, 2;3)  
no the doll shall I have

Together with the question data, these well formed topics, with a range of topicalized phrases and a range of moved verbs, indicates that the CP projection is available to the child even while they are producing wh-less questions. In addition, the presence of both productive topicalization and productive question formation even among the youngest children suggests that the child's grammar has the full CP projection and ability to move into this projection.

### 5.3 Complex Clauses

The final piece of evidence that demonstrates that children can have the full functional structure required for questions and still produce wh-less questions comes from utterances with overt complementizers. Wh-less questions are present for some time after overt complementizers and subordinate clauses appear. Subordinate clauses with overt complementizers are generally taken to be the surest evidence that the CP is present in the child's language. Some examples of both wh-less questions and overt complementizers are given in (22).

(22) Null WhOvert complementizers

Lars 2;11 MLU 4.67

- a. \_\_\_ *öppnar man?*  
 \_\_\_ opens one?

- b. *samma grejer som du hade idag?*  
 same things **that** you had today?

- c. *det är roligt när det hissar ner.*  
 it is fun **when** it hoists(runs) down

Embla 15 2;4 MLU 2.66

- d. \_\_\_ *heter han?*  
 \_\_\_ is-called he?

- e. *för att hon kan det.*  
**because** she can [do] it

- f. *tittar om man är fin.*  
 see **if** one is pretty

Ask 17 2;8 MLU 4.19

- g. \_\_\_ *händer då?*  
 \_\_\_ happens then

- h. *det är det här huset som heter kringa.*  
 it is that there house **that** is-called kringa.

Tor 21 2;9 MLU 3.71

- i. \_\_\_ *är det?*  
 \_\_\_ is that

- j. *är det inte du som bor där i huset?*  
 is it not you **that** lives there in the house

If children are able to use complex clauses with overt complementizers and yet still produce wh-less questions, it is clear that the wh-less questions cannot be due to lack of functional structure in the child's grammar.

**5.4 Wh-less Questions as CP**

In addition to the evidence that CP is present in the child grammars while wh-less questions are being produced, there is some evidence to suggest that these wh-less questions themselves are compatible with a CP analysis. First, these wh-less questions show subject-verb inversion, which, in Swedish results from verb movement to C<sup>o</sup>, past the subject in the Spec of IP, as outlined in (23).

(23) [CP (vad) [C<sup>o</sup> heter<sub>v</sub>] [IP den [I<sub>o</sub> t<sub>v</sub> [VP t<sub>v</sub> ]]]

*what is-called that?*

Evidence that these verbs are truly moved into C comes from the fact that subjects in all structures are consistently placed in Spec,IP to the left of negation at the edge of the VP.

(24) Subjects outside negation

- a. *den kan inte öppna motorn.* (Ask 01 1;11)  
that can not open the motor
- b. *bilarna inte köra.* (Ask 01 1;11)  
the cars not drive
- c. *älger säger inte - inte mu.* (Embla 07 1;11)  
moose say not - not moo
- d. *är den inte farlig?* (Tor 14 2;5)  
is that not dangerous
- e. *Tor inte om pipa.* (Tor 14 2;5)  
Tor not prt pipe

'Tor doesn't like pipes' The presence of the majority of subjects preceding negation indicates that the subject has moved out of the VP and into Spec,IP. So when the verb appears preceding the subject, it must have moved over the Spec of IP and into C.

While questions with negation are not terribly frequent, there are also questions with negation and the subject outside negation indicating that the subject has moved to Spec of IP and the verb to C. It should be noted that questions with negation, while rare, do occur during the same sessions with wh-less questions, providing further evidence that wh-less questions cannot be due to a lack of structure or lack of movement of phrasal elements. Examples of questions with negation are given in (25) below.

(25) Questions with negation

- a. *kan man inte göra nånting - här?* (Ask 14 2;6)  
can one not do anything - here?
- b. *finns det inte ratt där?* (Tor 15 2;5)  
is-found it not wheel there  
'isn't there a [steering]wheel there?'
- c. *varför kan den inte komma in?* (Tor 25 2;11)  
why can that not come in
- d. *Pappa, varför körde jag inte?* (Embla 20 2;7)  
Daddy, why drove I not

### 5.5 Development in wh-less questions

Finally, developmental evidence also indicates that these wh-less questions are not linked to the emergence of other structures that require CP. While wh-less tend to be used proportionately more often in the younger speech samples, the use of these structures in child Swedish is highly individual. Some children frequently omit the wh-phrase, while others rarely do. Some children maintain these questions over a long period of time, while others do not. I have even found isolated examples of this type of question in adult speech. In the cross-sectional data, for example, Frank (2;1 MLU 1.48), drops the wh-word in 13 of 17 questions (76%), while Kenneth (2;2 MLU 2.14) drops the wh-word in only 1 of 18 questions (5%), as can be seen from the table in (12) above.

Similar variation is seen in the longitudinal data. Embla uses this construction only once after age 2;4, and not at all after age 2;5, while Ask and Tor on the other hand continue to use the wh-less constructions for a much longer period. Thus, the loss of these wh-less structures does not correlate with age or MLU as seen in (26).

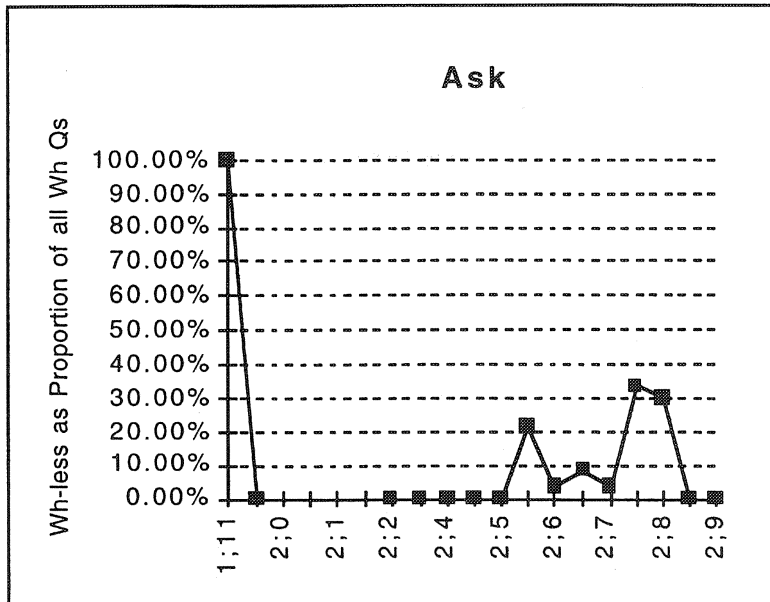
#### (26) Null wh structures used over time

Subject	Age at last null wh	MLU at last null wh
Embla	2;5	2.89
Tor	2;11	4.76
Ask	2;9	4.22

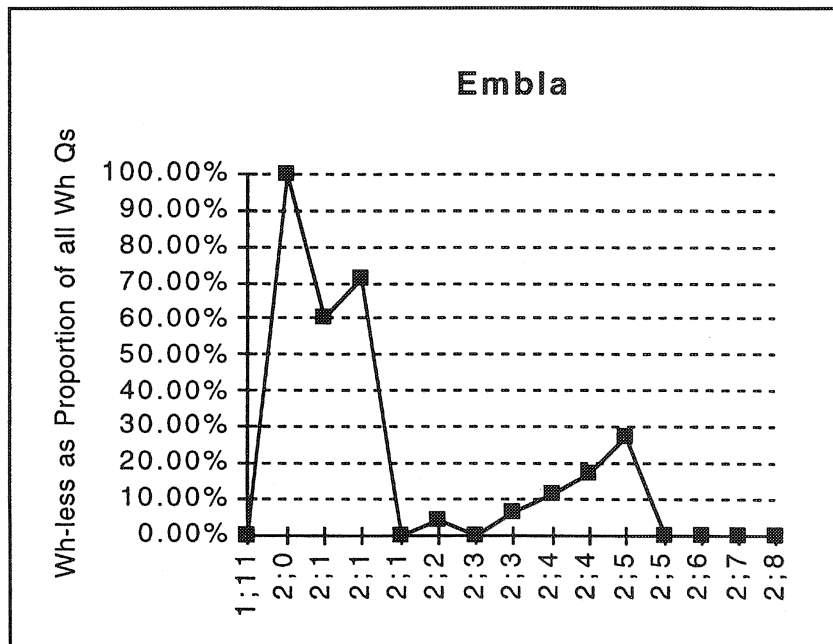
The longitudinal data also shows that the development that does occur is gradual. The number of wh-less questions remains fairly constant throughout the sessions. What increases is the number of well-formed questions in relation to the wh-less questions. This can be seen by the graphs (27) on the next pages.

(27) Distribution of Wh-less Question Over Time

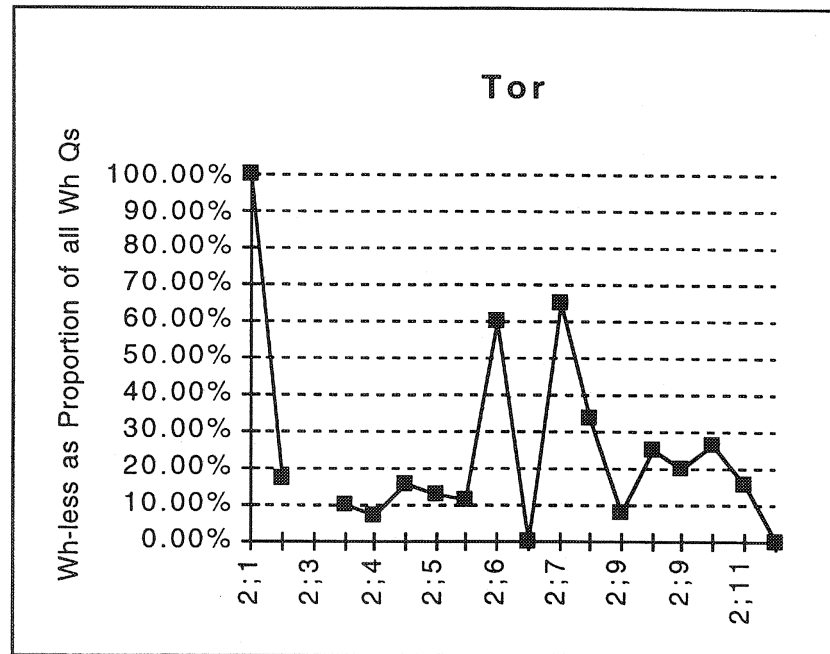
a. Ask Wh and Wh-less Questions over Time



b. Embla Wh and Wh-less Questions over Time



## c. Tor Distribution of Wh and Wh-less Questions over Time



First note that wh-less questions rarely constitute a majority of questions. Even when there are more wh-less questions than wh-questions, the children show evidence for other structures that require CP at the very same time. For example, Ask 01 has only wh-less questions, but he does have several non-subject topics, with inversion, during this session.

- (28) a. *så gör du.* (Ask 01, MLU 3.09)  
so make you
- b. *där finns den.* (Ask 01, MLU 3.09)  
there is-found it.

Embla 08 has more wh-less than wh-questions, but she also shows non-subject topics in this session. Embla 10, which also has more wh-less than wh-questions also shows non-subject topics as well as overt complementizers.

- (29) a. *åka bil säger barnet.* (Embla 08 2;0 MLU 2.19)  
drive car says the child  
'car-driving' says the child'
- b. *så där gjorde den.* (Embla 10 2;1 MLU 2.54)  
so there did it  
'like that it went'

- c. *nallebjörn som rider på lejon.* (Embla 10 2;1 MLU 2.54)  
teddy bear that rides on lion  
'a teddy bear that rides on the lion'

The same pattern holds true for Tor. Tor 17 and Tor 19, both of which show more wh-less than wh-questions, both clearly show non-subject topics and he has begun to use overt complementizers as early as Tor 14.

- (30) a. *Precis som Tor snurrar runt.* (Tor 14 2;5 MLU 2.32)  
just as Tor whirls around  
'just like Tor whirls around'
- b. *den får jag leka med.* (Tor 17 2;6 MLU 2.12)  
that may I play with  
'that [one] I get to play with'
- c. *att bilen ska åka.* (Tor 18 2;7, MLU 3.04)  
that the car will drive  
'that the car shall drive'

Note also that there is no dramatic decrease in proportion of wh-less questions for any child. Instead, the later samples show several wh-less questions and an increasing number of wh-questions. As noted above, the age at which these wh-less questions disappear is highly variable, and is not linked to the appearance of non-subject topics or overt complementizers, but rather to increasing language ability in general. Thus, this developmental evidence confirms the data presented in the earlier sections, demonstrating that the presence of wh-less questions is not tied to other structures that require CP or to a stage in development.

In sum, the data from wh-question formation, non-subject topics and complex clauses show that CP is present in the child's grammar at the same time the child is producing wh-less questions. In addition, the developmental data indicate that wh-less questions are not a stage, but a phenomenon that gradually disappears as the child's language ability increases. These results disconfirm the predictions made in (2) by the maturation account and they confirm the predictions made by the Continuity hypothesis in (3). Thus, I conclude that whatever leads to these questions, it cannot be a lack of structure or principles for question formation. The explanation we find for these questions must be able to account both for the variability in use among children and the gradual disappearance of this structure in the child's speech.

## 6. Discussion: Integrating Aspects of Question Formation

In order to account for the presence of *wh*-less questions while CP is clearly available in the child's grammar, I propose that the "missing" *wh*-word is not simply a lack of structure or a gap in the structure, but is a null or abstract *wh*-operator. I suggest that this null *wh*-operator is a type of "proto" *wh*-word. In other words, this null *wh*-operator has the abstract features of a *wh*-word, but is phonologically unspecified. This operator is not limited to a specific interpretation, rather the interpretation ranges over the type of *wh*-words found in the adult language, as seen from the variety of missing *wh*-words in (14) above.<sup>8</sup> This null *wh*-operator in Swedish child language is consistent with recent proposals for other null operators (e.g., Watanabe (1992), Aoun & Li (1993)), and with the idea that null question operators, both Y/N and *wh*, are part of UG.

I suggest that *wh*-less questions result from the children's need to learn how their language realizes question formation within UG constraints. Syntactic surface realizations of question formation across languages varies greatly, and children must identify how their language forms questions before they can properly ask questions. This is more than simply setting a single parameter (e.g., syntactic vs. LF movement). Rather it requires integrating UG with language specifics in a number of different areas of language and grammar. Swedish children do show early mastery of some aspects of question formation, such as movement.<sup>9</sup>

I suggest that when problems in question formation in child Swedish arise, the difficulties reflect the integration of different aspects of question formation. In order to produce well-formed questions, Swedish children must integrate a number of factors, e.g., knowledge about which null operators are allowed in their language, which features of map onto question words, and how the phonology of question formation interacts with the lexicon and syntax. These are all language specific factors that must be acquired.

### 6.1 The Null *wh*-operator

The syntax and semantics of *wh*-less questions both suggest that there is an abstract *wh*-word present. These structures are intended and interpreted as *wh*-questions by the child. In order to be interpreted as questions, there must be a question word or operator at some level of representation. In addition, there is a gap in the topic (i.e. preverbal) position and a corresponding missing argument, suggesting a null element occupying the initial position or Specifier of CP. As I mentioned earlier, there is considerable work (e.g., Landau and Gleitman (1985), Naigles (1990), Naigles, Gleitman and Gleitman (1993), Gleitman and Gleitman (1993), Fisher, Hall, Rakowitz and Gleitman (1994)) demonstrating that children are sensitive to

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<sup>8</sup> An abstract *wh*-element has also been suggested for German by Weissenborn, Roeper & de Villiers (1991), and by Penner (1994).

<sup>9</sup> See Santelmann (1995) for more detailed evidence on *wh*-questions in child Swedish.

argument structure at a very young age. This research shows that children can identify transitive and intransitive verbs based on the number of arguments at ages as young as 18 months, even for novel verbs. Thus, it is reasonable to assume that Swedish children who use wh-less questions are representing the missing argument with a null wh-word.

The word order also indicates that there is a null question word present. Wh-less questions consistently use subject-verb inversion. Parallel to these wh-less questions, questions with overt wh-words also consistently show subject-verb inversion plus the question word in the initial position. The presence of consistent subject-verb inversion in wh-less questions suggests that there is a non-overt element in the initial position that is triggering this inversion. If the missing element were not a question operator, then there would be no reason for there to be consistent subject-verb inversion with a gap in the initial position.

So for example, non-wh (or non-operator) objects and locatives occur both in situ following the verb and in topic position with subject-verb inversion, as seen in the examples in (31). For example, in (31c), Ask topicalizes the object *gunghäst* 'rocking horse', where it triggers subject-verb inversion, while in (31d), he leaves it in situ, so there is no inversion.

(31) Overt Objects and Locatives in Topic Position and in situ

- |    |                             |    |  |
|----|-----------------------------|----|--|
| a. | <i>namn har den.</i>        | b. | <i>missar har tofflor</i> (Embla 10 2;1) |
|    | name has it                 |    | cats have slippers                       |
|    | 'a name, it has'            |    | 'cats have slippers'                     |
| c. | <i>gunghäst ser dom.</i>    | d. | <i>dom ser gunghästen.</i> (Ask 10 2;4)  |
|    | rocking-horse see they      |    | they see the rocking-horse               |
|    | 'a rocking horse, they see' |    | 'they see the rocking horse'             |

Overt wh-words in contrast are *always* preposed. I have no examples of in situ wh-words in my data. If the missing element in wh-less questions were simply a null object or other non-operator, then we would expect that the gap corresponding to the missing argument could occur equally well after the verb or in the initial position. Thus, the fact that the wh-less questions systematically use subject-verb inversion, indicates that the gap is in the initial position. This strongly indicates that missing element corresponds to a wh-operator, and that like overt-wh operators, the null wh-operator is obligatorily preposed.

In addition to the evidence from the word order, further evidence for a null wh-word comes from parallels to another structure in Swedish, namely null topics. Adult Swedish, like adult German, has discourse oriented topics, (e.g., Huang (1984), Cardinaletti (1990)), as seen in the examples below.

(32) Null Topic Context

- A: *vi ska gå på Schindlers List? vill du också gå på den?*  
 we shall go to Schindler's List? want you also to see it?  
 'we're going to see Schindler's List tonight. Do you also want to see it?'
- B: OK *\_\_ har jag redan sett.*      B: \**jag har redan sett \_\_.*  
 \_\_ have I already seen      I have already seen \_\_  
 'it have I already seen.'      'I've already seen it'

In Swedish, topics that have been already established in the discourse, can be omitted in conversational speech. However, they can only be omitted from the initial "topic" position shown in B, and not from the post-verbal object position, as in B'. Thus, Swedish licenses these null topics in the initial position, and identifies topics via the context of the discourse. I suggest that Swedish children are using the structure and the licensing mechanisms that the adult grammar uses for null topics to license the null wh-operator as well. Indeed, the in example in (33) shows an instance where the child seems to be using the preceding context by the adult to license a null wh-word.

(33) Null Wh-Context

- Adult: *Vart tror du R. åkte med båt då?*  
 where think you R. went by boat then  
 'where-to do you think that R. went by boat then?'
- Ask (to R.) *\_\_ åkte du med båten?* (intonation as if the sentence were  
 \_\_ went you with boat-the      introduced by *vart*, 'where-to')  
 'where-to did you go with the boat?'

**6.2 Factors Conditioning the Use of the Null-Wh****6.2.1 Null Operators in Adult and Child Swedish**

While UG can provide null operators and mechanisms for licensing them, it does not tell the child how to integrate these into its own grammar. I propose that the first factor that leads to the use of the null wh-operator in child Swedish is the need for the child to integrate the language specifics of question formation with language specific licensing of null operators. Swedish has a number of null operators, including relative operators, Y/N question operators, and null topic operators such as those discussed in the previous section. Two factors may be leading Swedish

children to overgeneralize the contexts in which null operators occur and thus use null wh-operators. First, UG allows for wh- and Y/N operators to be null (e.g., Watanabe (1992), Aoun & Li (1993), Chomsky (1977)). Swedish children may be using a null wh-operator partly because they need to learn the phi-features of wh-operators in their language. Second, Swedish allows for arguments to be null in null topic constructions. Swedish children may be using null wh-operators partly because they are overextending the contexts in which null arguments are allowed. What Swedish children need to learn is that while adult Swedish licenses null question operators in Y/N questions without any context, and null argument operators in null topics with discourse context, it does not possess null wh-operators in either context. They must learn that the features of the wh-questions require them to be overt in all contexts.

Evidence that children are learning where discourse licensing is allowed comes from the fact that children seem to "overuse" null topic operators which require discourse identification (e.g., Håkansson (1991), Håkansson & Nettlebladt (1993), Boser (1995)). Swedish is a verb-*second* language, meaning that the verb is the second constituent of main clauses. Null topics are allowed, but in discourse-linked contexts. Swedish child language exhibits null-topics in more contexts than in the adult language. Examples where there is no clear discourse missing argument, can be seen in the series of sentences from Ask in (34).

(34) Null topics in Child Swedish

Adult: *Jaa. Vad gör KLOTTE då da?*

Yes. What did Klotte then ?

Ask: *tar jag AV - AV dom här.* (Ask 13, MLU 2.51)

took I off off these here.

*tog jag AV dom här.*

took I off these here.

*tog jag AV dom.*

took I off them.

*kör jag -ner, handlar /je/ lite mat TILL i bilen.*

drive I down, shop I little food for in the car.

Adult: Mm.

This sort of narrative null topic is used only in clear story-telling contexts in adult Swedish, e.g., Dalbäck and Vamling (1989) and Platzack (1987). The overuse of null topics, both wh and non-wh in child Swedish, suggests that children are using null operators until they learn to restrict the use of null operators to the specific lexical items and contexts that are allowed by the adult language.

### 6.2.2 Lexical and Syntactic Factors

The second factor that contributes to the use of a null *wh*-word in child Swedish is the need for the child to learn to integrate the features of a *wh*-element with the lexicon. In some ways, this lexical learning is connected with the syntactic learning discussed above, since it requires learning which features of the language must be overt, and which features can be covert. However it is more than this, since the child needs to be able to acquire the individual lexical *wh*-words in addition to the strong/weak features. There is considerable evidence that Swedish children are learning these *wh*-items as part of gradual process, as one would expect with lexical learning. This evidence comes from the fact that in addition to the null or unspecified *wh*-elements, Swedish children use *underspecified wh*-words as seen in the examples in (35).

#### (35) Underspecified *wh*-words in Child Swedish

- a. *ha båten?* (adult *var*) (Ask 07, 2;2)  
 'ha' the boat  
 where [is] the boat?
- b. *o är det?* (adult *vad*) (Kenneth 2;2)  
 'o' is that  
 what is that?
- c. *e heter den?* (adult *vad*) (Embla 10 2;1)  
 'e' is-called it  
 what is it called?
- d. *en får den?* (adult *vem*) (Embla 15, 2;4)  
 'en' gets it  
 who gets it?
- e. *a åker dom på?* (adult *vad*) (Tor 22 2;9)  
 'a' ride they on  
 what do they ride on?

Here the children reduce the vowels and omit or reduce the consonants found in the adult question word. In other words, the children fill the syntactic position, but do not give it the full lexical form that is found in the adult language. These questions have a question operator without the full morphological or phonological form of the adult operators.

This use of underspecified wh-operators is also consistent with UG. There is support for the notion of an underspecified wh-word from a dialect of adult Norwegian.<sup>10</sup> According to Lie (1982), Oslo Norwegian sometimes uses an unspecified wh-element *å*, along side of the standard full forms, *hva* 'what', *hvem* 'who', *hvor* 'where', *når* 'when', *hvilken* 'which' or *hvorfor* 'why'. Some examples of this reduced question word are given in (36).

(36) Norwegian Reduced Questions      Norwegian Standard Question

- |    |   |    |  |
|----|---|----|--|
| a. | <i>å er dette for noe?</i><br>å is that for something<br>'what is that?'              | b. | <i>Hvad er dette (for noe)?</i><br>what is that (for something)? |
| c. | <i>å var du hen i går?</i><br>å were you prt yesterday<br>'where were you yesterday?' | d. | <i>Hvor var du hen i går?</i><br>where were you prt yesterday?   |
| e. | <i>å dag var det?</i><br>å day was it<br>'which day was it?'                          | f. | <i>Hvilken dag var det?</i><br>which day was it?                 |
- (from Lie 1982: 198-199)

These questions with a reduced question word generally require some sort of identifier PP or adverb in the sentence, e.g., *for noe* 'for something' in the (a) example and the locative particle *hen* 'there/thither' in the (b) example. However, given the proper context, the featureless wh-word is possible in a variety of contexts in Oslo Norwegian, even without an identifying phrase, as in (36e). Thus, in adult Oslo Norwegian, an underspecified lexical wh-element can be licensed either by an identifying phrase or by context.

While they are still acquiring the features and lexical form of wh-words in Swedish, Swedish children may be using a featureless wh-operator similar to that found in adult Oslo Norwegian. Swedish children must learn that neither sentence internal identifiers nor discourse context in Swedish are sufficient to license the features of the wh-words, and that these features must be overtly realized and individually specified.

### 6.2.3 Prosodic and Phonological Factors

In addition to the syntactic and lexical factors discussed in the previous sections, there are also prosodic factors which condition the presence of the null wh-word in child Swedish. The stress patterns of these questions may favor dropping of the wh-item. Recent work on prosody in English speaking children (e.g., Gerken (1994))

<sup>10</sup> I thank Kersti Koch Christensen for bringing these facts to my attention.

has argued that English children prefer trochaic, Strong-Weak stress patterns and they are "less likely to preserve weak syllables at the beginning of an utterance rather than in utterance-internal or utterance-final positions." (Gerken, 1994). Gerken links this pattern with the fact that the majority of words in English begin with strong syllables. English speaking children are more likely to preserve this predominant pattern in their early speech. For example, they are more likely to preserve (37a) than they are to preserve (37b).

- (37) a. MON-key           (stress indicated by caps)  
       b. gi RAFFE           (Gerken 1994)

These preferences can carry over into phrasal stress patterns as well.

Swedish, like English, has strong stress on the initial syllable in the majority of words, as seen some examples in (38).

(38) Common Stress Patterns in Swedish Words (stress indicated by caps)

- |    |                |    |               |    |               |
|----|----------------|----|---------------|----|---------------|
| a. | <i>FLIC-ka</i> | b. | <i>POJ-ke</i> | c. | <i>NAL-le</i> |
|    | girl           |    | boy           |    | teddy         |

Because the majority of Swedish words have the strong-weak stress pattern, we would expect to find that like their American counterparts, Swedish speaking children would be more likely to preserve the strong-weak stress pattern and less likely to preserve weak syllables at the beginning of utterances. I suggest that Swedish wh-questions follow this predicted pattern in child Swedish. Unlike the majority of Swedish words, Swedish wh-questions often have weak syllables at the beginning of the utterance, as shown in the example below.

- (39) Adult Swedish Question  
       *vad GÖR du?* (stress indicated by caps)  
       what do you

Thus, it is not surprising that Swedish children have a tendency to omit the weak syllable (i.e. the question word) at the beginning of the utterance, as seen in (40).

- (40) Child Swedish Omission of the Weak Syllable  
       *GÖR du?*                           (stress indicated by caps)  
       do you  
       'what are you doing?'

Thus, this preferred stress pattern in Swedish contributes to the omission of the wh-word. Because the main stress falls on the verb, the wh-word has weak stress, and thus it is likely to be omitted. Note, however, that prosody cannot explain

all examples of omitted wh-words, because sometimes the multi-syllable question word *varför* ('why') is occasionally omitted, as seen in the example in (41).

(41) Child Swedish Missing *varför* 'why'

\_\_ *kan den inte komma in?* (Tor 25 2;11, MLU 4.76)

\_\_ can it not come in

'why can it not come in?'

In addition, these null wh's sometimes occur in subordinate contexts, where the prosody does not necessarily favor omission.

(42) Missing wh in subordinate contexts

(from Lundin (1988:56)

*titta \_\_ en katt gjorde där.* (Freja 2;8)

look (what) a cat did there

In addition to needing to integrate prosody with the phrase structure, Swedish children must also acquire the phonological specification of individual wh-words. For example, Swedish children must learn to distinguish *vad* 'what' from *var* 'where', which are phonologically very close. This need to acquire phonological features contributes to both the use of unspecified wh-items and underspecified wh-elements discussed in the previous section.

### 6.3 Underspecification of Wh-Operators

In sum, there are many language specific factors in question formation that the child needs to integrate in order to ask well-formed questions. These language specific factors are not acquired in isolation, but are all interconnected. For example, there must be syntactic acquisition in determining the linguistic contexts in which null operators are allowed. However, even if children know the syntactic contexts where null operators are allowed or disallowed, they still need to map these contexts onto the lexicon and the phonology. Lexical learning involves not only acquiring the individual words, but also integrating lexicon and syntax, since children need to acquire knowledge about which features are strong and need to be overtly realized. These lexical and syntactic factors must also be integrated with the phonological and prosodic specifications of the language.

Thus, the child may continue to use under- and unspecified wh-words until these language specifics are mastered. Sometimes children may be using a null operator simply because the prosody is difficult, sometimes it may be that they are working out which lexical features may be overt, and sometimes they may be working out how and where certain operators, both null and overt, are licensed in their language. These language specific factors can account for the presence of null wh-operators even if the child has the full functional structure.

#### 6.4 Development and Cross-Linguistic Patterns

The analysis proposed here linking null wh-operators to the language specific acquisition of null topics and other factors, makes several predictions for development. First, it predicts that wh-less questions should always be able to occur along side other structures that require CP, since they are not due to missing functional structure. These predictions were borne out, as shown in Section 4 above. This account also predicts that wh-less questions should be most frequent among children who are the least adept at integrating syntactic lexical, discourse, pragmatic and prosodic factors into their speech. This is also borne out. Wh-less questions do tend to occur proportionately more often among the youngest children. Even so, the behavior of these constructions across time supports the idea that it is language specific learning rather than maturation of functional categories which is at work in the language of these children. If CP became suddenly available by ‘maturing’ in the children’s grammars, then we would expect a big drop wh-less questions when this category became available. Instead, we find a gradual decrease in this construction, with a great range of individual variation. This is predicted under the current account, because as the children grow older, they will acquire a more accurate phonology, a more refined lexicon and more knowledge of the linguistic and discourse contexts in which elements can be left null.

In addition to the developmental predictions, this account makes several predictions for the cross-linguistic acquisition of wh-questions. If it is true that null wh-words are due to the need to integrate trochaic stress patterns, lexicon and language specific knowledge about when elements must be *overtly* expressed, then this predicts that null-wh words will be found in child languages that share these features with Swedish. All children, regardless of their target language, need to acquire the lexicon of question formation in their language, and to integrate this lexicon with language specific syntax and prosody. However, in the languages that allow the same types of null topics as in Swedish and have predominately trochaic stress patterns as in Swedish, children are predicted to show wh-less questions. This prediction is certainly borne out for the other Germanic languages that allow discourse null topics and that have similar stress patterns, namely German and Dutch. Null wh-questions have often been reported in German, e.g., Felix (1980), Weissenborn, Roeper & de Villiers (1991), Penner (1994), Tracy (1994) and others, and Isabella Barbier (p.c.) has also informed me that such structures are also found in child Dutch.

In languages that do not have similar null topic constructions and stress patterns as Swedish, wh-less questions are predicted to be rare or non-existent. This prediction is certainly borne out for child English, which does not have null wh-operators in main clause questions.<sup>11</sup> It remains for further research to determine

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<sup>11</sup> I am not ruling out the possibility that null wh-questions might occur in English. They may occur, but they are predicted to be far fewer in frequency than they are for the full V2 languages, which all share the features that lead to null wh-questions in Swedish.

whether these predictions can be generalized to other languages, and to what extent each of these factors, syntax, lexicon and prosody, contributes to the presence of wh-less questions in child Swedish.

## 7. Conclusion

In this paper, I have shown that wh-less questions in child Swedish cannot be explained by a lack of functional structure or lack of ability to form questions, since they occur alongside well-formed questions and other structures that require the full CP structure, e.g., non-subject topicalization and complex clauses with overt complementizers. Instead, I have argued that wh-less questions are best analyzed by the presence of a null wh-operator in child Swedish. I have argued further that these wh-questions reflect the child's need to integrate language specific syntactic, lexical and prosodic factors into the syntax of questions.

The null wh-operator proposed here is consistent with a growing number of null elements proposed for child language. This range of null elements in child language suggests that children omit elements in part because they are acquiring and integrating language specific factors with Universal Grammar. (e.g., Boser, Santelmann, Lust and Barbier (1994), Lust (to appear)). A great number of things, e.g., tense marking, wh-operators, copular verbs, are phonetically null across languages. Universal Grammar provides information about what *may* be null, but it does not give information about what *must* be overt. This is knowledge that must be acquired.

Finally, this proposal is consistent with the Continuity Hypothesis, which attributes to the child the full range of structure and licensing principles provided by Universal Grammar, (e.g., Demuth (1992, 1994), Whitman, Lust & Lee (1990), Boser, Lust, Santelmann and Whitman (1992), Lust (1994), Lust (to appear)). Under this analysis of non-adult like structures, child grammar can have the full range of structure and principles found in adult grammars, without the child having acquired all of the language specifics. This suggests that one of the major tasks in learning language is to restrict the possibilities allowed by Universal Grammar and to integrate the knowledge provided by Universal Grammar with knowledge acquired about language specifics.

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# Cognate Effects in English-Spanish Bilingual Lexical Access

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## 1. Introduction

Psycholinguists use two interpretative models to show how the words of two languages are stored in the bilingual mind: the independence model (two separate lexicons) and the interdependence model (a shared lexicon). Previous researchers have shown that the model depends on the type of psycholinguistic task employed. For example, they have concluded that the results of "data-driven" tasks yield the independence model. Yet, a paradox in the field remains unresolved: these studies have not controlled for other researchers' finding that bilinguals respond more quickly to cognates than to noncognates in lexical decision tasks. This experiment factored in these results, asking if a specific "data-driven" task accesses the morpho-phonological features shared by cognates. English-Spanish bilingual subjects completed a word fragment completion task on both cognates and noncognates. The results consistently yielded the interdependence model of bilingual lexical representation. The results also showed that the word storage model does not depend on the task type used, refuting task-dependent interpretations.

### 1.1. Background

Cognitive scientists research the mental representation of language knowledge, striving to discover what factors play a role in the arrangement of words in the mind. Formally modeling such a word storage system would have many practical applications. Language teachers, for example, would be able to figure the most efficient way to teach second language learners. Knowledge of the system's intricacies would also enable neurologists to develop a "systematic approach to rehabilitation" in aphasics. (Aitchison, 1994)

Theoretical linguists speak of two models of bilingual lexical representation: an independence model (separate lexicons, or storage places in the mind, for the words of two languages) and an interdependence model (a shared lexicon for the words of two languages). Experimentalists have made task-dependent interpretations of the system. Durgunoglu and Roediger (1987) conducted two task types on English-Spanish bilingual subjects. They concluded that the language-specific results of a "data-driven" task (word fragment completion) reflected the independence model, and that the language-independent results of a "conceptually-driven" task (free recall) reflected the interdependence model. Heredia and McLaughlin (1992) conducted a related experiment that yielded similar conclusions. Yet, both research groups also concluded that a "data-driven" task seems to access "perceptual features" of words. (Heredia and McLaughlin, 1992)

Though these interpretations seem plausible, "a psychologist may not always be aware of all of the variables which exist, and so may unwittingly have falsified the experiment." (Aitchison, 1994) I detected this situation in those experimental designs that have led to task-dependent interpretations. In fact, these designs lacked control for the following variable: cognate translations share such morpho-phonological features as root and sound (i.e., English: computer vs. Spanish: computadora), while noncognate translations do not share these features (i.e., English: pumpkin vs. Spanish: calabaza).

The results of priming task studies confirm that this variable must be controlled for in word storage experimentation. Cristoffanini, Kirsner, and Milech (1986) found that in English-Spanish bilinguals "repetition priming between cognates increases as a function of increasing similarity between the words in each pair." (Kirsner, 1992) Likewise, DeGroot and Nas (1991) conducted a lexical decision task on Dutch-English bilinguals, which showed that cognates produce a significantly greater priming effect than do noncognates.

Hence, the two outlined bodies of research have created a paradox: task-dependent interpretations of word storage have been made, even though the tasks probably have different retrieval requirements. A "data-driven" task probably accesses the morpho-phonological features shared by cognates. Therefore, the model might depend more on the type of stimuli tested than on the task type used. This experiment employed a word fragment completion task on both cognates and noncognates in an attempt to resolve this paradox.

## **2. Method**

### **2.1. Subjects**

Forty-eight subjects, including twenty-four English-dominant bilinguals and twenty-four Spanish-dominant bilinguals, participated in the study. All participants met the following criteria: (a) they were native speakers of either English or Spanish, (b) they were proficient speakers of the alternate language and (c) they were at least eighteen years of age. Language dominance was determined by subjects' self-ratings of their oral, written and reading skills in the English and Spanish languages, respectively.

### **2.2. Materials**

This experiment employed 12 word sets, each of which contained 24 words: 8 within-language repetitions and translation equivalents and 8 filler words. To calibrate with previous research, the repetitions were taken directly from Durgunoglu's and Roediger's (1987) appendix. Each word set contained equal numbers of cognate and noncognate translations, of noncognate English and Spanish repetitions and of high and low frequency words. (Francis and Kucera, 1982) Use of Microsoft Excel 4.0 allowed for the construction of 24 differently ordered lists per word set. Combinations of four different lags separated the stimuli in each list.

The experiment also employed 12 English word fragment sets, each of which corresponded to one of the 12 word sets. Each set contained 8 fragments of words contained in its corresponding word set, 8 additional fragments of contrived words and equal numbers of fragments of high and low frequency words. A strict set of principles was used to construct the word fragments. Each word fragment set contained a uniquely ordered combination of the different types of word fragments.

All lists, including both the word set lists and the word fragment set lists, were displayed vertically-down standard-sized white pages.

### **2.3. Design**

Subject testing involved three phases: a practice phase, six study phases and six corresponding test phases. During each study phase, each subject viewed a word set list. And during the corresponding test phase, each subject viewed an English word fragment list.

Excluding the practice phase, each subject viewed a total of 144 words (6 sets, each containing 24 words) and a total of 96 word fragments (6 sets, each containing 16 fragments). Each subject viewed the 6 sets in different orders and differently ordered lists within each set.

This experiment was designed to obtain results that could be analyzed for the presence or absence of a bilingual equivalence effect (BEE) amongst the cognates, noncognates and repetitions contained in each set. The BEE holds that between-language repetitions increase word fragment identification by the same amount as do within-language repetitions, reflecting the interdependence model of word storage in the bilingual mind. (Heredia and McLaughlin, 1992)

### **2.4. Procedure**

Subject testing took place throughout the fall 1995 term. The experimenter first explained to subjects how to complete a word fragment completion task. Subjects would be presented with a vertical list of English and Spanish words. A board containing a window would be placed above the first word for them. At the sound of the whistle (every 6 seconds), they should move the board downwards to view and try to remember each word. At the end of the list, this sheet would be immediately replaced with a corresponding English word fragment list. At the sound of the whistle (every 22 seconds), they should move the board downwards to view and try to fill in the missing letters of each word fragment.

Subjects were allowed a five-minute break after completing three study and test phases. At the end of the testing session, subjects completed either an English or Spanish version of a questionnaire. The experimenter paid each subject five dollars and explained the purpose of the experiment.

### 3. Results

Table 1 summarizes the basic results of this experiment. Comparing the mean proportions of correctly filled word fragments corresponding to high and low frequency words, respectively, several observations can be made.

The high frequency word data shows that subjects correctly filled significantly more fragments of studied cognates than those of both studied English repetitions ( $p=0.00$ ) and studied noncognate translations ( $p=0.0001$ ). This data also shows no difference in word fragment completion of studied noncognate translations and studied English repetitions ( $p=0.10$ ). The low frequency word data shows that subjects correctly filled significantly more fragments of studied English repetitions than those of both studied cognates ( $p=0.004$ ) and studied noncognates ( $p=0.002$ ). (Note: the proportions of correctly filled English word fragments corresponding to Spanish repetitions are not discussed here because subjects undoubtedly used "conceptually-driven" processes to translate these Spanish words to English when completing the task) (Heredia and McLaughlin, 1992)

Another analysis of the high frequency word data displayed in Table 1 shows that subjects correctly filled significantly more fragments of noncognate than cognate translations in the nonstudied condition ( $p=0.005$ ), while they correctly filled significantly more fragments of cognate than noncognate translations in the studied condition ( $p=0.0001$ ).

Overall differences across lag were not significant ( $p=0.61$ ).

**Table 1: Mean Proportions of Correctly Filled Word Fragments**

HIGH FREQUENCY		LOW FREQUENCY	
study condition	proportion	study condition	proportion
E-E (N)	0.63	E-E (N)	0.89
S-S (N)	0.73	S-S (N)	0.50
E-S (C)	0.83	S-E (C)	0.80
E-S (N)	0.69	S-E (N)	0.79
nonstudied (C)	0.38	nonstudied (C)	0.24
nonstudied (N)	0.47	nonstudied (N)	0.33

(Key: E = English; S = Spanish; C = cognate; N = noncognate) The mean for high frequency cognates is significantly greater than that for high frequency English repetitions ( $p=0.0000$ ). The means for high frequency noncognate translations and repetitions are not different ( $p=0.0990$ ).

### 4. Discussion

The high frequency word results of this experiment are in accord with the interdependence model of bilingual lexical representation. Analysis of the results shows: (a) a traditional BEE amongst noncognate translations and English repetitions and (b) a "surpassed" BEE amongst cognate translations and English repetitions. A "surpassed"

BEE reflects that word fragment completion of cognates significantly surpasses, rather than merely approaches, that of within-language repetitions.

Because subjects performed the task significantly better on high frequency cognate translations than on any other high frequency word type, the results also show that the nature of the intersection between the two lexicons must include the morpho-phonological features shared by cognates. (see Figure 1) These features aid bilinguals in accessing certain lexical items from storage.

Although extensive controls were employed in designing and conducting this study, certain aspects of the method must be questioned. Most importantly, how did the timing of the study and test phases affect subjects' lexical access from storage? Perhaps the timing was short enough for the task to be a completely "data-driven" one. Then again, it is possible that the time duration allowed subjects to also use "conceptually-driven" processes to complete the task. Since I used similar timings as Durgunoglu and Roediger (1987) used in their task, however, I need not discuss here which processes subjects used to complete either task. My intentions were mainly to refute the previous researchers' task-dependent models. Since the results of my "data-driven" task (like those of "conceptually-driven" tasks) have yielded the interdependence model of bilingual lexical representation, previous researchers' task-dependent interpretations have been refuted. The model does not necessarily depend on the psycholinguistic task type used.



L1=English Lexicon; L2=Spanish Lexicon

Figure 1: Interdependence Model of Word Storage in the Bilingual Mind

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# Spanish Accusative Clitics as Strong Determiners\*

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## 1. Introduction

In this paper, I will present a proposal for the underlying representation for accusative (ACC) clitic constructions in Spanish that was triggered by the need to explain an overmarking clitic-doubling phenomenon that I had observed in child data (a fuller representation of the acquisition data as well as of the theoretical proposal advanced in this paper can be found in Núñez del Prado, in prep.).

### 1.1 Acquisition data on ACC clitics

Acquisition data collected in Puerto Rico (PR) in 1993 from children ages 3 to 5 years with an elicited imitation task showed children changed transitive subordinate clauses with a postverbal object and no accusative clitic, as in (ia), to clitic-doubling constructions, as in (ib), by adding *lo*:

- (ia) *Mickey dice que quiere ayudar al pato*  
'Mickey says that (he) wants to help the duck'

to (ib) *Mickey dice que lo quiere ayudar al pato*

It was also found that transitive subordinate clauses with an accusative clitic and no overt postverbal object, as in (iia), were changed to (iib) or (iic), by making the object in the subordinate clause overt<sup>1</sup>, again generating clitic-doubling:

- (iia) *Pluto le dice al ratón que lo busca*  
Pluto 'le' [IO] says 'a' the mouse that (he) 'lo' [DO] looks for  
(him)  
'Pluto tells the mouse that (he) looks for (him)'

to (iib) *Pluto dice que lo busca al ratón*  
Pluto says that (he) 'lo' looks for 'a' the mouse

or to (iic) *Pluto dice que al ratón lo busca*  
Pluto says that (he) 'a' the mouse 'lo' looks for

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\* This paper (without the introductory section on acquisition data) was presented at the LSA Conference held in Chicago on January, 1997.

<sup>1</sup> The structure in (iia) provided a syntactic antecedent for the covert postverbal object.

Independent of the problem of how children restructured (iia) to produce (iib) or (iic) (apparently maintaining coreference between the IO in the main clause and the DO in the subordinate clause), the responses show clitic-doubling. This is particularly interesting given the fact that in adult PR Spanish clitic-doubling is only found with pronouns and not with full NPs (B. Avila, pc)<sup>2</sup>. The complete set of acquisition data (only partially represented above) suggests preference for the structure ‘clitic + object’ vs. ‘only object’ or ‘only clitic’, as well as preference for preverbal clitic vs. postverbal clitic, and even for preverbal object vs. postverbal object (in those cases in which the IO from the main clause is made overt as the DO in the subordinate clause generating ‘clitic-doubling’). This acquisition data was the trigger to look into the syntactic representation underlying accusative clitic constructions.

### 1.2. Theory on ACC clitics: no consensus on their syntactic representation

Currently, there is no consensus on what is the precise syntactic representation for object clitics as in 1.

1. *Lo vimos*  
(we) ACC-CL(3p.sg.) saw(1p.pl.)  
‘we saw him’

Points of debate range from what is the syntactic status of object clitics (whether pronominal or AGR elements, head or phrasal, syntactic words or morphemic) to what accounts for their position at spell-out: movement (Kayne 1975, 1989, 1990, Sportiche 1989, 1990, Cardinaletti & Starke 1994, Uriagereka 1995) or base-generation (Strozer 1976, Jaeggli 1982, Borer 1983, 1986, Suñer 1986, Sportiche 1992). Proponents of the base-generation hypothesis argue for a structure as in 2a for 1; proponents of the movement hypothesis argue for 2b (2c is a variant of 2b in Uriagereka 1995 where only the clitic-head moves; a specifier and complement are generated and remain in postverbal position).

2. a.  $Lo^f$  vimos  $pro^f$
- b.  $Lo_i$  vimos  $t_i$
- c.  $Lo^f_i$  vimos [<sub>DP</sub>  $pro^f$  [ $t_i^f$ ]  $pro$ ] Uriagereka 1995

Though the main concern has been to account for the position of clitics and their syntactic properties, still a semantic property has been associated with accusative clitics: that of ‘specificity’. However, there has been much terminological confusion with respect to it. ‘Specificity’ has been understood in its literal meaning as ‘unique’ and ‘well-defined’ and also as a Discourse-related property (“old

<sup>2</sup> Hurtado (1986) also reported clitic-doubling with full-NPs in the natural speech of older children in Mexico. In Mexico, this is also perceived by adult speakers as overmarking.

information” in Enç 1991, “familiarity”, “point of view” in Uriagereka 1995, “anaphoric to prominent antecedent in discourse” in Cardinaletti & Starke 1994). Accounts for specificity range from claiming clitics are lexically marked as +specific (Suñer 1988, Enç 1991) to having ‘specificity’ derive from independent syntactic mechanisms, different ones in each proposal<sup>3</sup>.

### 1.3. Proposal in this Paper

In this paper, I want to propose that we are missing something fundamental when trying to identify the syntactic representation of object clitics and that is what is the MOTIVATION for clitic constructions. This paper proposes that it is semantic and has to do with how we understand the ‘specificity’ property.

In this paper, we argue that (i) accusative clitics are neither pure pronominals nor pure agreement markers but ‘strong’ determiners (Milsark 1977, Diesing 1992) at the level of the verb, and that (ii) accusative clitics act as scopal markers for the *in situ* object (overt or *pro*) so that it can take a ‘presuppositional’ interpretation. With respect to (i), we will establish a semantic and syntactic parallelism between accusative clitics at the level of the verb and definite articles at the level of the noun that will allow us to identify the syntactic representation for accusative clitics. (A consequence of our analysis will be to present a unified account of extraction phenomena at the levels of noun and verb extraction out of NP with a definite article and extraction out of VP with clitic-doubling). With respect to (ii), we propose clitic constructions represent the covert counterpart to object raising constructions in Scandinavian and Germanic, where the object is also interpreted as ‘presuppositional’ as a consequence of it taking scope over the VP (see Diesing 1992, 1994).

This paper is organized as follows: sections 2 and 3 present data on determiner/clitic-doubling and extraction that suggest accusative clitics and definite articles are syntactically and semantically related; section 4 compares object shift and object scrambling data from Scandinavian and Germanic with accusative clitic constructions in Romance that suggest accusative clitics act as scopal markers to allow a ‘presuppositional’ reading for the *in situ* object; finally, section 5 presents our proposal for the underlying structure of accusative clitic constructions, as well as an account of the extraction patterns at the levels of verb and noun, on the basis of the structure we propose. Section 6 is for conclusions, and here we briefly return to the acquisition data.

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<sup>3</sup> In Sportiche 1992, clitics license specificity in ‘doubled’ expressions in a functional projection below TP; in Cardinaletti & Starke 1994, clitics lack a range restriction and are, therefore, referentially deficient; in Uriagereka 1995, specific expressions involve a predicate of existence ‘pro’, the ACC clitic licenses *pro* from a functional projection above TP.



article) accounts for the ungrammaticality of 5c. 5 also suggests that the relevant relation is that between the  $D^0$  head and the complement to the head noun which provides the ‘specification’ for  $D^0$ .

6 and 7, with clitic constructions at the level of the verb, show a similar pattern to 4 and 5.

6. a. *Examinamos a este caballo*  
(we) examined “a” this horse
- b. *Examinamos a mi caballo*  
(we) examined “a” my horse
- c. *Examinamos a algún caballo*  
(we) examined “a” some horse
7. a. *Lo examinamos a éste*  
(we) ACC-CL examined “a” this (one)
- b. *Lo examinamos al mío*  
(we) examined “a” the mine
- c. \**Lo examinamos a alguno* specificity  
(we) examined “a” some-one
- $D^0$  V N-specified**

7 shows ‘clitic-doubling’. A demonstrative and a possessive can ‘double’ the accusative clitic, but not an indefinite. With respect to 7c, it has been claimed that ‘specificity’ of the clitic accounts for the ungrammaticality of 7c. It is also clear from 7 (even more so than from 5) that a crucial dependency holds between the accusative clitic as a preverbal head and the complement to the verb, where the complement provides an overt specification for the accusative clitic.

Similar extraction patterns can also be found at the levels of the noun and verb, as shown in 8 and 9. 8 has been referred to as a definiteness effect; 9 has been related to specificity of the accusative clitic.

8. out of NP: a. \**De quién viste las fotos t ?*  
‘who did you see the pictures of?’
- b. *De quién viste unas fotos t ?*  
‘who did you see some pictures of?’
- c. *De quién viste  $\emptyset$  fotos t ?*  
‘who did you see pictures of?’

9. out of VP: a. \**A quiénes los viste t hoy?*  
 ‘who did you ‘them’-see today?’  
 b. *A quiénes  $\emptyset$  viste t hoy?*  
 ‘who did you see today?’

8 shows extraction out of NP. This has been discussed by many (Chomsky, 1973, 1977, Fiengo & Higginbotham 1981, Bowers 1988, Sportiche 1989, Giorgi and Longobardi 1991, Valois 1991, Diesing 1992), but still it remains a problem. 9 shows similar facts from extraction out of VP (Jaeggli 1982, 1986, Aoun 1981, Borer 1984, Suñer 1986, 1992).

In section 4, we will see how by identifying the functional projection DP at the level of the verb (assuming identical functional projections at both noun and verb levels, with Cardinaletti and Starke 1994), and by identifying the relation between  $D^0$  and its specification or referential complement (structural complement of the predicate head N or V), we will be able to account for the extraction facts.

### 3. Definite articles and ACC clitics: presuppositionality/familiarity

Another semantic property associated to definite articles is that of ‘presuppositionality’. Milsark (1974, 1977) proposed a classification of determiners as strong vs. weak on the basis of whether they can or cannot occur in existential contexts such as *there*-constructions.

10. a. strong \**Hay el caballo en el potrero*  
 ‘There is the horse in the paddock’  
 b. weak *Hay un caballo en el potrero*  
 ‘There is a horse in the paddock’
11. a. strong \**Hay cada/ todo/ todos los/ la mayoría de los caballo(s) ...*  
 ‘There is/are each/every/all/most horse(s) ...’  
 b. weak *Hay algún/ varios/ pocos/ muchos caballo(s) ...*  
 ‘There is/are some/several/few/many horse(s) ...’

10 shows that definite articles, unlike indefinite articles, cannot occur in the context of *hay/there-be* constructions. 11a shows those determiner-quantifiers that behave like definite articles and are strong; 11b shows those that pattern with indefinites being weak. Milsark accounts for these data by proposing that strong determiners (universal quantifiers and definite determiners) presuppose existence and are, therefore, incompatible with existential contexts.

Musan (1996) and others have shown that there is more to the strong vs. weak distinction. Partitivity comes into play and allows otherwise weak determiners

to behave like strong determiners so that they are less acceptable in existential contexts than weak determiners alone. This is shown with overt partitives in 12.

12. a. \**Había la mayoría de los estudiantes en la fiesta*  
 ‘There were most of the students at the party’  
 b. ?*Había algunos de los estudiantes en la fiesta*  
 ‘There were some of the students at the party’  
 c. *Había algunos estudiantes en la fiesta*  
 ‘There were some students at the party’

12a shows a strong determiner that is overtly partitive - it yields ungrammaticality when inserted in *hay*-constructions; 12b shows a weak determiner that is overtly partitive - the sentence is considerably worse than 12c where the weak determiner is not overtly partitive (therefore allowing the non-partitive interpretation). The generalization here is that strong and weak partitive NPs yield ungrammaticality (of different degrees) in existential constructions.

We also find a parallel with respect to this 3-way contrast between strong, weak partitive and weak (non-partitive) in clitic-doubling constructions<sup>4</sup>.

13. a. strong     *Lo vi a él*  
                   ‘I saw him’  
 b. weak        \**Lo vi a alguien*  
                   ‘I saw someone’  
 14. a. strong     *Lo vi al mecánico*  
                   ‘I saw the mechanic’  
 b. weak        \**Lo vi a un/algún mecánico*  
                   ‘I saw a/some mechanic’  
 15. a. weak ?*Lo vi a uno de los mecánicos que arregla mi carro*  
       partitive    ‘I saw one of the mechanics that works on my car’

<sup>4</sup> It is important to note that variation is found across dialects of Spanish and across colloquial and formal registers for a single dialect regarding the acceptability of clitic doubling with NP objects. The data discussed in this paper allows clitic-doubling with full NPs (as in the Porteño and Peruvian dialects); in other dialects of Spanish such as the PR dialect discussed in the introductory section with regard to the acquisition data (where NP clitic-doubling in children’s responses is perceived as overmarking by adult PR Spanish-speakers), only pronominal clitic-doubling is allowed.

b. weak            *?\*Lo vi a un mecánico que vende partes de Volkswagen*

'I saw a mechanic that sold parts for Volkswagen'

13 and 14 show a contrast between definite and indefinite objects, where only definite objects are grammatical as the 'specification' or referential complement to the accusative clitic (structural complement to the predicate verb in accusative clitic constructions). 15 shows indefinite objects greatly improve in this context if they are made partitive, as in 15a. 15b shows, by contrast with 15a, that 'specificity' cannot be taken in its literal meaning since providing a definite description as specification does not yield grammaticality as partitivity does, in accusative clitic constructions. The generalization here is that definite and partitive indefinite objects yield grammaticality (of different degrees) in accusative clitic constructions.

Bringing together the data presented so far in this section on those NPs that can or cannot occur in existential constructions and accusative clitic constructions, we arrive at the following generalization: (strong and weak-partitive NPs<sup>5</sup>) are the only ones that can occur as the 'double' object in accusative clitic constructions. And this leads us to claim that accusative clitic constructions are presuppositional.

With respect to 'presuppositionality', it should be noted that it has been understood in different ways by different researchers: in Milsark 1977 and Diesing 1992 presuppositionality refers to 'presupposition of existence'; in Barwise and Cooper 1981 it takes a 'set-interpretation', and in Heim 1982 presuppositionality refers to 'shared knowledge between speaker and hearer' or 'familiarity'.

Not only do we find the 3-way distinction between definite, partitive indefinite and indefinite objects in accusative clitic constructions, but there also is evidence for the semantic property of 'presuppositionality' in these constructions, if interpreted as 'familiarity'. Refer to 16.

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<sup>5</sup> Where the set includes not only +/-definite determiners but also quantifiers.

16. a. *Lo vimos a Juan* familiar, definite  
 b. *Vimos a Juan* novel<sup>6</sup>, definite  
 c. *Lo vimos* familiar, definite (understood)

In 16a, we find an overt object in situ (“a Juan”) in a clitic construction. The object is interpreted as definite and familiar (‘we share some knowledge about Juan; we saw him’). 16b also shows an overt in situ object (“a Juan”) but no clitic construction. Here the object is interpreted as definite but novel (new information), i.e. in saying we saw Juan, we are introducing Juan into the conversation; also, we assume no previous shared knowledge about Juan. Also, we obtain a contrastive interpretation in 16b, where it is implied that Juan is who we saw as opposed to, say, Pedro. 16c, a clitic construction with an understood object is interpreted like 16a, as definite (the object being understood) and familiar.

17 shows the two independent semantic properties identified so far for accusative clitic constructions: that of ‘presuppositionality’, understood as ‘familiarity’ (Heim 1982) and ‘specificity’, understood as definite / partitive.

17. *Lo vimos al jockey*

we both share some knowledge about x;      x is a jockey; we saw x

**presuppositionality**

**specificity**

The first property (presuppositionality) is related to presence of the accusative clitic; the second (specificity) is a constraint on the syntactic representation of the ‘double’ object imposed by the accusative clitic so that clitic and NP-object ‘agree’ in specificity when in a specifier-head configuration. Specificity, rather than a semantic property, is a syntactic constraint on the object imposed by the syntax for presuppositionality/ familiarity. The object NP identifies ‘who’ we both share some knowledge about, this (the fact that we share some knowledge about x) requires that it take a definite/partitive-indefinite form).

<sup>6</sup> For speakers who accept clitic-NP-doubling only marginally, the contrast in interpretation between 16b (without the clitic) and 16a (with the clitic) can be shown by inserting a definite description in apposition to the NP-object:

16a'. *??Lo vimos a Juan, el chico que trabaja en Wendy's*  
 him-saw 'a' Juan, the guy that works in Wendy's  
 'we saw John, the guy who works at Wendy's'

16b'. *Vimos a Juan, el chico que trabaja en Wendy's*  
 saw 'a' Juan, the guy that works in Wendy's  
 'we saw John, the guy who works at Wendy's'

16a' becomes considerably worse than 16b'. 16a' could only be fixed by giving the definite description a particularly marked intonation in order to ratify that the speaker knows ‘who we are talking about’ (i.e. so that 16a' could be interpreted as ‘we saw John (strong pause) of course, you know who we are talking about: the guy who ...’). Instead, 16b' is fine with a regular intonation to the apposition.

#### 4. Crosslinguistic data: familiarity interpretation for definite/specific objects

In this section, we present cross-linguistic data that supports our claim that the motivation for accusative clitics is to act as scopal markers for ‘presuppositionality’/‘familiarity’.

In Scandinavian and Germanic constructions with object shift or scrambling we find similar syntactico-semantic constraints on the object NP (‘specificity’) and the presuppositional/familiar interpretation of the object that we have identified for accusative clitic constructions in Spanish.

18 and 19 show data from Icelandic (taken from Diesing 1992, 1994).

18. a. *Jón keypti bókina ekki* ok  
 John bought book-the not  
 ‘John didn’t buy the book’
- b. *Jón keypti ekki bókina* marked
19. a. *Hann las þaer ekki*  
 he read them not  
 ‘he didn’t read them’
- b. \**Hann las ekki þaer*

18a shows the NP *bókina* (‘the book’) shifted with respect to the negative marker “*ekki*”. This renders a fully grammatical sentence, while 18b with *bókina* unshifted (i.e., below negation, in its base-generated position) renders a marked sentence. The pattern is even clearer when data from indefinite NPs is brought in since shifted indefinites render the sentence ungrammatical (the equivalent of 18a with *bok* instead of *bókina* is ungrammatical); only unshifted indefinites are grammatical. In Icelandic, shifted full NPs must be definite or specific/generic. 19 shows that pronouns must raise.

20 and 21 show data from German (also from Diesing 1992, 1994).

20. a. *...weil ich die Katze selten streichle* ok  
 since I the cat seldom pet  
 ‘since I seldom pet the cat’
- b. *...weil ich selten die Katze streichle* contrastive
21. a. *...weil ich sie selten streichle*  
 since I her seldom pet  
 ‘since I seldom pet her’

- b. \*... *weil ich selten sie streichle*

20a shows that the NP *die Katze* ('the cat') has raised from the VP-internal position where it is base-generated to a VP-external position; the 'scrambled' position is clear from its ordering with respect to the adverb *selten* ('seldom'): the object appears above the adverb and the sentence is fully grammatical. 20b, instead, shows the unscrambled object (below the adverb); here, the object can only take a contrastive interpretation (Büring, 1993) (interpretation: I seldom pet the cat, as opposed to my often petting the dog). With respect to indefinites, the same pattern is found as in Icelandic - the equivalent of 20a with a scrambled indefinite NP is ungrammatical; 20b with an unscrambled indefinite is grammatical. 21 shows that, in German, as in Icelandic, pronouns must raise.

The Spanish data in 22 and 23 patterns exactly with the Icelandic and German data if we understand accusative clitics as scope markers for presuppositionality, so that clitic doubling constructions appear as the covert counterpart to overt object raising constructions in Icelandic and German.

22. a. *Lo vi a Juan en el cine* ok  
ACC saw "a" John at the movies  
'I saw John at the movies'
- b. *Vi a Juan en el cine (y no a Pedro)* contrastive<sup>7</sup>
23. a. *Lo vi a él en el cine*  
'I saw him at the movies'
- b. \**Vi a él en el cine*

Not only with respect to full NPs, but also with respect to pronouns, we find the same pattern. The obligatory raising of the pronoun object found in Icelandic and German is paralleled in Spanish where, as is clear from 23a and b, pronoun objects MUST co-occur with an accusative clitic.

<sup>7</sup> To the extent that we can identify the contrast between the object in clitic constructions as familiar and the object in cliticless constructions as novel (refer to footnote 6) it should be possible to identify the object in 22b as contrastive even in absence of the explicit contrastive phrase. However, again consider the contrast in acceptability between 22a and 22b, if the explicit contrastive phrase is present in both:

22a'. ??*Lo vi a Juan en el cine y no a Pedro*  
22b'. *Vi a Juan en el cine y no a Pedro*

Again, here, 22a' becomes rather awkward, while the conjoined phrase in 22b' is a natural extension.

## 5. Proposal

### 5.1. Accusative clitics as strong determiners

With respect to the syntactic status of object clitics discussed in the introductory section, we propose that accusative clitics, like definite articles, are (i) functional heads, (ii) syntactic words and (iii) base-generated above the lexical head V/N. (Data relevant to argue for the syntactic word status of accusative clitics can be found in Appendix 1).

We propose 24 as the basic structure for accusative clitics and definite determiners, where 24a through 24c show the syntactic derivation necessary to satisfy the semantics for specificity and presuppositionality encoded in the definite determiner/clitic head:

24.	a.	_____ ...	[DP	los (cl/det)	[XP	X	[YP(pro/overt)
		TOP		D		N/V	
	b.	_____ ...	[DP	YP los	[XP	X	t
		TOP		spec D		N/V	
	c.	_YP_ ...	[DP	t los	[XP	X	t
		TOP		D		N/V	

Accusative clitics head the functional projection DP (cf. Uriagereka 95), above VP, and are coreferential with the nominal complement to the verbal head that is overt (definite or partitive) or *pro*. DP, in this proposal, is not CP at the level of the noun; we assume identical functional projections at the noun and verb levels, following Cardinaletti & Starke 1994.

We propose, it is the semantic properties of definite articles and accusative clitics that motivate their syntactic representation. With respect to the semantic properties associated with clitic constructions, we have identified (i) ‘presuppositionality’ or ‘familiarity’ and (ii) ‘specificity’ of the object (CPn) as definiteness / partitivity. The latter, rather than a semantic property, is a syntactic constraint on the ‘double’ object imposed by the syntax for presuppositionality/familiarity (i.e. (i) has to do with ‘interpretation’ of the object; (ii) with the ‘form’ of the object).

### 5.2. Accusative clitics as scopal markers for the presuppositional object

In section 3, we identified a common pattern in Icelandic object shift, German scrambling of the object and Spanish clitic doubling. In all, there appears to be a presuppositional interpretation that arises only as a consequence of either the object itself (Icelandic, German) or an accusative clitic associated with the object (Spanish) taking scope over the VP.

We propose that the motivation for clitic constructions is for accusative clitics to act as scopal markers to allow the presuppositional interpretation for the *in situ* object. This proposal is based on the following assumptions:

- i. semantics is compositional (bottom-up)
- ii. scope-taking elements have a tripartite structure: quantification, restriction, nuclear scope
- iii. the mapping hypothesis (Diesing 1992), where:  
quantification domain: above TP, restriction: above VP; nuclear scope: VP
- iv. VP is the domain of existential closure; existential closure binds all elements in its domain (Diesing, 1992)

We follow Diesing (1992, 1994) who proposes that for the object (in Icelandic/German) to be interpreted as presuppositional/familiar it must escape the domain of existential closure (VP) and raise to the domain of the restriction. We extend this claim to the Spanish data with clitic doubling. We also propose that as in the case of *wh*-phrases and NPIs (negative polarity items), specific-NPs must reach the domain of quantification (above TP), by LF, in order to be able to take the presuppositional interpretation.

25 shows the structure we ascribe to accusative clitic constructions:

25. [ t [TP T<sup>0</sup> [DP t D<sup>0</sup> [VP V<sup>0</sup> t=YP (CP<sub>n</sub>)

clitic

Quant.                  Restriction                  Nuclear Scope

Here, we are proposing 3 positions for the object:

(1) the base-generated position, (2) specifier of DP at the V-level (above VP, below TP), (3) specifier of a functional position above TP (FP in Uriagereka 1995) or TOPIC (as the highest position in the structure (adjoined to CP)).

Specificity checking (where the ‘double’ object must be definite/partitive) takes place under the functional projection DP, above VP but below TP; the presuppositional/ familiar interpretation is only present when an accusative clitic is present and arises as a result of raising of the specific-NP object to the domain of quantification, to a functional position above TP, by LF.

### 5.3. Account of Extraction Patterns

We now go back to the extraction facts repeated here as 26 (extraction out of NP with a definite article) and 27 (extraction out of VP with accusative clitic-doubling):

26. out of NP: a. \**De quién viste las fotos t ?*

‘who did you see the pictures of?’

- b. *De quién viste unas fotos t ?*  
 ‘who did you see some pictures of?’
- c. *De quién viste  $\emptyset$  fotos t ?*  
 ‘who did you see pictures of?’
27. out of VP: a. *\*A quiénes los viste t hoy?*  
 ‘who did you ‘them’-see today?’
- b. *A quiénes  $\emptyset$  viste t hoy?*  
 ‘who did you see today?’

We propose the structure in 28a for 26; the structure in 28b for 27.

28. a. \_\_\_\_ ... V...[\_\_\_\_ las [ N=fotos [*pro*/ de las que te hablé] [(de ellos)]  
 the pictures *pro*/of the that (I) you-talked (of them)  
 ‘the pictures *pro*/ that I told you about (of them)’
- b. \_\_\_\_ ... [\_\_\_\_ los [ V=viste [*pro*/ a los que te mencioné]  
 (you) them-saw *pro*’a’ the that (I) you-mentioned  
 ‘you saw them/ those I told you about’

The extractions differ only in that while in 27 it is the complement of the head selected by the clitic that raises out of VP, in 26 it is not this complement of NP (null in 26a-c), but a PP (possessor or argumental) that is extracted.

The basic structure is the same, but the reasons for ungrammaticality are different: 27a is ungrammatical because specificity checking between the +specific clitic head and the - specific wh-NP is not met, as pointed out in Suñer 1986. 26a is ungrammatical by Relativized Minimality since we are dealing with two independent quantificational NPs: +wh-NP, when raising out of the domain of the noun to take scope over TP becomes a potential A-bar binder for +specific-*pro* or its trace.

## 6. Conclusions

In this paper, we have proposed accusative clitics and definite determiners share the same structure where accusative clitics, like definite determiners, head a DP projection above VP, and definite determiners, like accusative clitics, are referentially linked with an overt or null NP, complement to the lexical N head. This structure provides a straightforward account of accusative clitic doubling with preverbal clitics base-generated above the verb, and also allows an account of extraction contrasts out of NP with a definite determiner in terms of Relativized Minimality by identifying a ‘specific-NP-chain’ independent of the wh-chain.

The common structure for definite determiners and accusative clitics was based not only on structurally similar patterns but also on semantic properties. We found that accusative clitics, like definite determiners, are incompatible with existential contexts. We identified a 3-way contrast between strong-definite, weak-partitive-indefinite and weak-indefinite NPs and found that a subset of those NPs that cannot occur in existential (hay/there-) constructions (strong-definite and weak-partitive-indefinite NPs) are precisely those that can occur as the *in situ* 'double' object in accusative clitic constructions. This led us to claim that accusative clitics, like definite determiners, are 'presuppositional' and that accusative clitic constructions are presuppositional constructions.

Presuppositionality in this paper is understood as a Discourse-related semantic property (specifically, as 'familiarity' (Heim 1982)). We have proposed that in order for an NP to take this presuppositional interpretation, a formal-lexical requirement and a structural requirement must be met. The first is for the NP to be definite/specific in its lexical form. This is a precondition so that the second requirement can be met: that the NP, to be interpreted as presuppositional must escape the 'domain of existential closure' (the VP in Diesing 1992) and reach the domain of quantification (above TP) by LF. We propose that for some reason (not discussed in this paper) the *in situ* object in accusative clitic constructions fails to satisfy the structural requirement overtly. The motivation for an accusative clitic is, then, to act as a scopal marker for the presuppositional interpretation of the *in situ* object (by overtly taking scope over the domain of existential closure). By LF, the object raises past the specifier position of DP (where agreement in 'specificity' takes place, cf. Sportiche 1992) to a Discourse-linked functional position above TP. Thus, we understand accusative clitic constructions as the covert counterpart to object raising constructions in Scandinavian and Germanic.

Returning to the experimental acquisition data mentioned in the introductory section, two main findings (for which we give qualitative data in Appendix 2) were the following: children show preference for (i) clitic-doubling over 'only object' or 'only clitic' structures (cf. Hurtado 1986), and for (ii) an NP-clitic pattern over a clitic-NP pattern<sup>8</sup>. These results could not be evidence in favor of accusative clitics as pure pronominals (the 'double' object would have to be interpreted as right and left dislocations (for postverbal and preverbal objects), however, no pause was found that would favor this analysis); nor could they be evidence for accusative clitics as pure agreement markers (for although preference for clitic-doubling was found, 'only object' and 'only clitic' structures were also produced, indicating accusative clitics are not considered obligatory agreement markers as dative clitics are in adult grammar, nor was there a significant omission of the accusative clitic that would

<sup>8</sup> With respect to the first finding, preference for clitic-doubling could mean children are giving a familiarity interpretation to the object, and for them this requires an overt clitic plus overt specification of the object (i.e. an overt referentiality link between clitic and object); with respect to the second finding, this could be showing overt LF semantics for the 'presuppositional'/'familiar' interpretation of the object in accusative clitic constructions.

suggest it plays a purely functional role, as compared to a much greater percent omission of the dative clitic that was found in the experimental study mentioned in the introduction (discussed in detail in Núñez del Prado, in prep.). Instead, the results mentioned appear compatible with our proposal that accusative clitics are determiners at the level of the verb that generate a construction that allows the verbal object to take a presuppositional-familiar interpretation by acting as scopal markers for the object.



- b. def art: *entrevistaron a los y las concursantes*  
 (they) interviewed “a” the-m.pl. and the-f.pl. participants  
 ‘the participants (male and female) were interviewed’
7. a. acc cl: *Ajá! osea que LOS viste*  
 so that (you) THEM-cl saw  
 ‘so you saw THEM’
- b. *... osea que los VISTe*  
 ‘so you DID see them’
- c. def art: *estos son LOS guantes*  
 ‘these are THE gloves’

Definite articles are not ad-nominal:

8. a. *\*los frecuentemente ves* acc cl  
 b. *los altos funcionarios* def art  
 the top officials

but both cliticize to a higher F head:

9. a. *lo vimos* cliticization to tense  
 b. *verlo* cliticization to INF in C<sup>0</sup> (CP<sub>v</sub>)  
 c. *al = a+el* cliticization to “a” in C<sup>0</sup> (CP<sub>n</sub>)  
 d. *del = de+el* cliticization to “del” (“of”) in C<sup>0</sup> (C<sub>pn</sub>)

## 2: Qualitative Data from an experimental acquisition study

- For: A: *Donald dice que quiere ayudar al gato*  
 Donald says that (he) wants to help the cat
- B: *René dice que quiere ayudar al oso*  
 Rene says that (he) wants to help the bear

Responses with clitic -doubling (children add *lo*):

- 301B: *René lo quiere, lo quiere ayudar al oso*  
 502A: *Donald dice que lo quiere ayudar al gato*  
 509B: *el ratón dice que lo quiere ayudar al oso*  
 511A: *Goofy dice que lo que quiere ayudar al gato*  
 511B: *Ese dice que lo quiere ayudar al oso*  
 514B: *René dice que lo quiere ayudar al oso*  
 604A: *Donald dice que lo quiere ayudar al gato*

- For: A: *Goofy le dice al pato que lo quiere empujar*  
           Goofy tells the duck that (he) him-wants to push  
       B: *Oscar le dice al burro que lo quiere empujar*  
           Oscar tells the donkey that (he) him-wants to push

Responses with clitic-doubling (children shift the object from main to subordinate clauses):

postverbal object with *a*:

- 504A: *Goofy dijo que lo quiere empujal al pato*  
 505A: *Goofy le dice que lo quiere al pato empujal*

preverbal object with *a*:

- 101A: *Goofy dijo que al pato lo quiere empujar*  
 301A: *Goofy 'e que al pato lo quieren piujar*  
 508A: *Goofy le dice que al pato lo quiere empujar*  
 602B: *Oscar dice que al burro lo quiere empujar*

other

- 101B: *Oscar dice que al de eso de lo quiere empujar*  
 201B: *Dice Oscar que al burro que lo quiere empujal*  
 309A: *Goofy le dice que al pato y lo quiere empujar*  
 306B: *Carlo dice que el burro lo quiere empujal*  
 603A: *Goofy dice que el pato lo quiere empujar*

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# The acquisition of phonology in an Optimality Theoretic framework

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## 1. Introduction

This paper has two parts: in the first I will examine some facts from the acquisition of English by one child, and suggest a way that these facts, and their change over time, can be captured in terms of the theoretical constructs made available by Optimality Theory (McCarthy & Prince 1993, Prince & Smolensky 1993); in particular, I will propose a revision of Prince & Smolensky's formulation of Lexicon Optimization which will allow a dynamic optimization of underlying forms during the course of acquisition.<sup>1</sup> This operation enables the language learner to keep underlying representations optimal, in the sense of economy and appropriateness to the evolving constraint hierarchy.

## 2. Liquids and lateral harmony

The data I will be subjecting to reanalysis come from Neilson Smith's (1973) study of his son Amahl's acquisition of the phonology of English between the ages of 2 years, 60 days and 3 years, 355 days. The first example bears on the following related phenomena, attested from Stage 1 (2;60-2;115) onwards:

- (1) a. (Adult) /l, r, j/ surface as [l] when there is an /l/ in the adult form:
- i. *lorry* → lɔli: (Stage 1)
  - ii. *yellow* → lɛlu: (Stage 1)
  - iii. *really* → li:li: (Stage 10)
- b. /l, r, j/ behave as all other coronal non-nasals elsewhere, i.e., are neutralized in initial position as the voiceless unaspirated lenis stop [d]. The following forms are all attested at Stage 1:
- i. *light* → ɖait
  - ii. *write* → ɖait
  - iii. *yes* → ɖet

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1. This paper has benefitted from useful discussions of the issues with a number of people, whom I thank for not sparing me when the analysis went off the rails. It is due to their comments that this paper improved over its earlier incarnations. In particular, I thank John Bowers, Nick Clements, Abby Cohn, Antony Green, Wayne Harbert, Martha Larson, Barbara Lust, Asun Martínez, Denise Meyer, and Draga Zec.

The observation that could be made on first considering the data in (1b) is that /r/, /l/, and /j/ surface as obstruents by virtue of a process of assimilation of the feature [-continuant] from the obstruents present in these forms, which is in fact the account offered by Spencer (1986: 12) for forms such as *light* [ɖait]. This account is incomplete, however, since there are forms showing that, when non-nasal sonorants are the only consonants in the word, they will nonetheless surface as [ɖ]:

- (2) a. *lie* → ɖai (ɖaun) (Stage 1)  
 b. *ray* → ɖe:/re: (Stage 2)  
 c. *you* → ɖu: (Stage 3)

These data indicate that there is a process neutralizing non-nasal sonorant consonants in Amahl's grammar at these early stages, independent of the presence of a [-continuant] segment: these segments will surface as the corresponding coronal obstruent, except when there is a lateral present, in which case they assimilate the feature [lateral].<sup>2</sup> I will argue that these phenomena, although related, call for a distinct treatment, in so far as neutralization of the non-nasal sonorants is the result of optimization of the underlying form with respect to the constraint hierarchy at an early stage of the development of Amahl's grammar, whereas lateral harmony can be adequately described only as arising from an optimization of the form of the underlying representation somewhat akin to a morpheme structure constraint, which in effect overrides the usual process of determination of the underlying form. For this reason, I will refer to these phenomena as "liquid neutralization" and "lateral harmony" respectively.

### 3. Digression

It should be a commonplace that the most desirable state of affairs for a theory of acquisition within a domain of grammar is to express a wide variety of developmental changes as resulting from changes in more general processes, instead of by means of a piecemeal descriptive account of the actual changes taking place. A theory is more highly valued to the extent that it allows observed changes to be explained as resulting from systemic changes with consequences elsewhere; in this sense, Spencer's (1986) demonstration of the interdependence of cluster acquisition and loss of labial attraction in Amahl's grammar is precisely the sort of evidence which argues strongly in favour of autosegmental representations, since it is by the use of these theoretical mechanisms that an

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2. At early stages of acquisition, the voicing quality of these obstruents is entirely positionally determined: all obstruents are voiceless, unaspirated, lenis initially; voiced unaspirated, lenis medially; and voiceless, fortis, (aspirated or unaspirated) finally (Smith 1973: 37). I will set these alternations aside in what follows, since they do not bear on the details of the analysis.

explanation can be offered which improves substantially on previous accounts.

I will show in what follows that Optimality Theory, along with the representational possibilities made available by autosegmental theory, provides a theoretical framework which allows us to capture various processes attested during the acquisition of phonology; furthermore, once we have established a vocabulary within which notions such as “optimal underlying form” can be clearly stated, we can account for these processes in a minimally stipulative and constrained manner. Furthermore, the extremely difficult problem of optionality of rule application, resulting in free variation between two or more surface forms, can be stated as the competition between two potential underlying forms in the context of a constraint hierarchy which is in a state of flux.

#### 4. OT & Lexicon Optimization

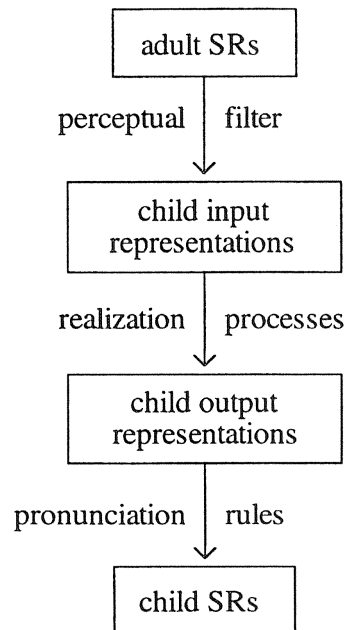
The phenomena described here, liquid neutralization and lateral harmony, serve as useful test cases for the validity of extending the theoretical constructs made available by Optimality Theory into the area of language acquisition. To the extent that the account given here of the phenomena in question is any more informative and economical than previous accounts, we may consider Optimality Theory successful as a theory not only of the final state of the grammar of a language, but as a theory which has something to say about the way that this grammar evolves during the course of its acquisition by speakers of the language.

Before giving the details of the analysis, it is worth setting out some of the theoretical assumptions I will be making. The first is that the phonological component of the lexicon consists of at least two distinct levels of representation, one of which holds the language learner/user’s perceptual representations, the other of which holds the underlying representations which are submitted to the realization component of the grammar.<sup>3</sup> This is essentially the response proposed by Menn (1976), Macken (1980), and Spencer (1986), to various properties of child phonology, and consists of the splitting of the lexical entry into a perceptual and a production component (see also Menn & Matthei 1992 and Macken 1995 for discussion). Spencer argues for a lexical level which consists of the child’s output representations, distinct from the perceptual representations; the mapping from the perceptual level to the underlying output level is accomplished by means of what he calls ‘realization rules’ (see Fig. 1); these rules perform the operations of impoverishment and underspecification on the perceptual representation, leaving the pronunciation rules to fill in all missing featural information. One advantage of this approach is that it enables us to separate the processes responsible for underspecification (deletion of information) from those

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3. In hopes of avoiding the terminological confusion which might arise, since the terms “input” and “output” have particular meanings within Optimality Theory, I will refer to Spencer’s “child input representations” as “perceptual representations”, and to his “child output URs” simply as “underlying representations”.

responsible for feature-filling (addition of redundant information); this allows him to assign the processes performing non-recoverable neutralizations to the realization component, and those performing recoverable neutralizations to the pronunciation rules.



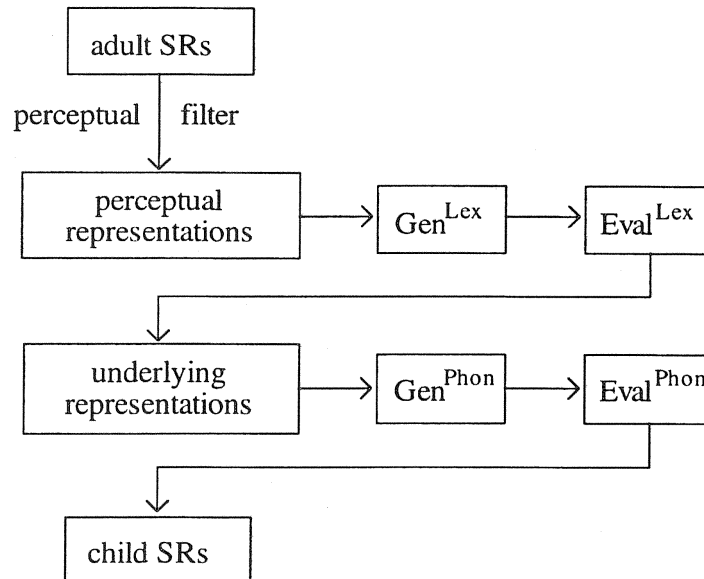
**Fig. 1: Spencer's (1986) model of the grammar**

In order to explain the course of acquisition in as constrained and unified a way as possible, we should hope that the processes operative in conveying segmental and structural information from the level of perceptual representation to the level of underlying representation are in all relevant respects identical to the processes responsible for conveying the information present in underlying representations to the surface (pronunciation) level. It is here—with respect to the nature of these processes—that Optimality Theory diverges from previous theories of phonology, since the assumptions about structural representation are largely carried over from autosegmental theory. In contrast with rule-based approaches to phonology, which assume an ordered set of rewrite rules (possibly organized into strata, as in Lexical Phonology; cf. Kiparsky 1982, Mohanan 1982, Kaisse & Shaw 1985), the leading idea of Optimality Theory is that lexical representations are submitted to a generative component, Gen, which performs all possible permutations of the information present in the underlying form, consistent with certain constraining principles.<sup>4</sup> The output of Gen thus consists of a potentially infinite set of candidate

4. These principles are: (i) Freedom of Analysis, which allows Gen a free hand in adding structure (up to violation of the other two principles); (ii) Containment, which forbids the removal of underlying information from any candidate; and (iii) Consistency of Exponence, which enforces preservation of all phonologically specified information present in a morpheme.

forms, which are submitted to the Eval component, responsible for the parallel evaluation of all candidate forms against a constraint hierarchy which exhibits strict domination, in the sense that violation of a given constraint is worse than any number of violations of a lower-ranked constraint (see McCarthy & Prince 1993, ch. 2 for discussion). The language-specific content of the grammar consists of the content of the lexical representations, as well as the ranking of universal constraints, and this is the locus of the problem of language acquisition within the assumptions of this theory: how does the learner come to determine the form and content of underlying representations, while at the same time determining the constraint ranking which will allow these forms to surface correctly?

The proposal I make here, that the mapping from perceptual representations to underlying representations is performed according to principles of optimality, offers a unified approach to the workings of the grammar, in the same spirit as Spencer's demonstration that the mechanisms of autosegmental theory and underspecification holding in these two mappings between levels of representation is conceptually and empirically desirable.<sup>5</sup> The essence of the proposal is this (see Fig. 2): underlying representations are determined by selection, from among the set of outputs from lexical Gen, of the form which is optimal with respect to the ranking of constraints in the phonology.



**Fig. 2: Optimality-Theoretic model of the grammar**

5. A further terminological clarification: since I am positing two Optimality-Theoretic mappings within the grammar, one within the lexicon (from perceptual representations to underlying representations) and the other within the phonology proper (from underlying representations to surface forms), I will use the terms  $Gen^{Lex}$ ,  $Gen^{Phon}$ ,  $Eval^{Lex}$ , and  $Eval^{Phon}$  to make it clear which mapping is being referred to (see Fig. 2).

“Optimal” here is intended in the sense of Smolensky & Prince’s (1993: 192) principle of Lexicon Optimization, as given in (3), although it will have to be modified somewhat.

- (3) **Lexicon Optimization.** Suppose that several different inputs  $I_1, I_2, \dots, I_n$  when parsed by a grammar  $G$  lead to corresponding outputs  $O_1, O_2, \dots, O_n$ , all of which are realized as the same phonetic form  $\Phi$  — these inputs are all **phonetically equivalent** with respect to  $G$ . Now one of these outputs must be the most harmonic, by virtue of incurring the least significant violation marks: suppose this optimal one is labeled  $O_k$ . Then the learner should choose, as the underlying form for  $\Phi$ , the input  $I_k$ .

The reason for modifying this principle is that it assumes a grammar in a stable final state, such that the outputs  $O_1, O_2, \dots, O_n$  are realized as the “correct” phonetic form, essentially identical to the perceptual form.

In order to perform evaluations of possible underlying forms with respect to their satisfaction of Lexicon Optimization, it is essential that the constraint hierarchy be in place, and that it be stable. To return to one of the examples given above: at the point at which Amahl Smith was producing *lie* as [ɖai], the application of the principle of Lexicon Optimization would have given as an optimal underlying form something closely approximating this surface form. Clearly this does not happen in acquisition, at least under normal circumstances; when the lexicon contains representations of the adult forms as perceived by the child, Lexicon Optimization must be postponed until the constraint hierarchy has stabilized. The problem with this approach is that, once Eval has stabilized, the learner has a constraint hierarchy which has developed such that these adult forms are optimal. Lexicon Optimization at this point will be vacuous. The paradox here is that the lexicon cannot be optimized until the point in acquisition at which optimization will have no effect.

To take a small example: let us suppose that the language learner is engaged in the task of learning a language with syllable types CV(C), where the onset is obligatory, but the coda is optional. For simplicity, let us assume no branching onsets or codas. Imagine that the language learner is at a stage in which she is able to produce only CV syllables, which we might characterize as the high ranking of the constraint \*CODA, forbidding coda consonants. If we make Smith’s (1973) assumption, that the child’s underlying forms are those of the adult, we will have the following:

(4)

	INPUT: CVC	*CODA	FILL	PARSE
a.	CV<C>			*
b.	CVC	*!		
c.	<C>VC	*!		*
d.	<C>V<C>			*! *
e.	CV.C		*!	

If the learner were to apply Lexicon Optimization at this stage, the best possible underlying representation for the form which actually surfaces will be simply CV; but to change the underlying representation in this way would be to lose information from the lexicon. Of course, a reply to this might be that this is not problematic since the child will continue to hear the correct form [CVC], and will be able to use this as input to the lexicon until such a stage as the constraint hierarchy allows this form to stand as a viable underlying representation. This is indistinguishable, as far as I can see, from decreeing that Lexicon Optimization can be postponed until the system of constraints is stable, and has the added disadvantage of having to assume that lexical learning of particular forms must be repeated until the output of the phonology matches the input.

Prince & Smolensky's formulation of lexicon optimization can work only in the presence of a stable constraint hierarchy; in contrast, a competing account of the learnability of phonology, that of Tesar & Smolensky (1993), requires that the determination of the optimal constraint hierarchy can take place only in the presence of a (presumably underspecified) lexicon. If we assume a model of the lexicon in acquisition which holds that the child's stored forms are the surface forms of the adult model, we are forced back into explaining how the optimal lexical representations can come about in the first place in order for Tesar & Smolensky's algorithm to work.

The problem of optimization of underlying forms at stages of acquisition at which change is still occurring within the grammar can only be dealt with by discarding the requirement of convergence on the phonetic form  $\Phi$ , since it is precisely this form which is undergoing change due to the development of the grammar. I thus restate the principle as follows:

- (5) **Lexicon Optimization (revised).** To every perceptual representation  $\Phi$  corresponds a set of potential underlying representations  $L_1, L_2, \dots, L_n$  ( $L_n \in \text{Gen}^{\text{Lex}}(\Phi)$ ), which when parsed by  $\text{Eval}^{\text{Phon}}$  lead to corresponding outputs  $O_1^1, O_1^2, \dots, O_1^m \dots, O_n^1, O_n^2, \dots, O_n^m$ . Now one of these outputs must be the most harmonic, by virtue of incurring the least significant violation marks: suppose this optimal one is labeled  $O_k^1$ . Then the learner should choose, as the underlying form corresponding to  $\Phi$ , the lexical representation  $L_k$ .

Thus, given a perceptual form  $\Phi$ , to which corresponds the set  $\text{Gen}^{\text{Lex}}(\Phi)$  of potential underlying representations resulting from submission of  $\Phi$  to  $\text{Gen}^{\text{Lex}}$ , the optimal underlying representation will be that one from the set which fares the best when submitted to  $\text{Eval}^{\text{Phon}}$ , the constraint ranking in the phonological component. Thus, for present purposes, the  $\text{Eval}$  component in the mapping from perceptual to underlying representations can be considered to be essentially identical to  $\text{Eval}$  in the phonology. This simplification will need to be amended, particularly in §8, when we consider lateral harmony, but it will suffice for now.<sup>6</sup>

### 5. Liquid neutralization

In order to evaluate the workings of the current proposal for lexical optimization, where this means selection of the best possible underlying form, given a perceptual form and a particular ranking of constraints, we now turn to the case of liquid neutralization, as illustrated above in (1b) and (2) above, repeated here for convenience:

- (1) b. /l, r, j/ behave as all other coronal non-nasals elsewhere, i.e., are neutralized in initial position as the voiceless unaspirated lenis stop [d]. The following forms are all attested at Stage 1:
- i. *light* → ɖait
  - ii. *write* → ɖait
  - iii. *yes* → ɖet
- (2) a. *lie* → ɖai (ɖaun) (Stage 1)
- b. *ray* → ɖe:/re: (Stage 2)
- c. *you* → ɖu: (Stage 3)

In order to provide an adequate account of this phenomenon, it is not sufficient merely to describe it at this early state of the grammar; it is incumbent on any

6. In an earlier version of this paper, I posited distinct sets of constraints within the lexicon and the phonology; the present proposal yields improved empirical coverage over the previous version, while also being conceptually much more desirable.

analysis to be in a position to explain how this behaviour changes at Stage 2, when it becomes optional, and at Stage 6, when it eventually disappears. I will show that a simple demotion of one constraint is responsible for the disappearance of liquid neutralization; furthermore, the intermediate stage, in which the demoted constraint is equally ranked with respect to another constraint, is characterized by optionality of this neutralization process. We will see that this stage is accounted for by two potential underlying forms in competition with one another.

The constraints needed for the analysis at hand are the following:

(6) **FILL(FEATURE)**

Positions in segmental structure are filled with underlying material.

**PARSE(FEATURE)**

Underlying features must be included in segmental structure.

**\*[+CONS, +SON]**

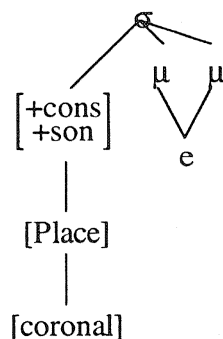
The features [+cons] and [+son] cannot co-occur within the same segment.

The first two constraints are obviously related to Fill (Prince & Smolensky 1993: 25) and Parse (ibid.: 85; see also McCarthy & Prince 1993, ch. 2), relativized here to the relation between features and segments, instead of between segments and syllabic positions. The third constraint, \*[+CONS, +SON], is in keeping with featural co-occurrence constraints as proposed by Archangeli & Pulleyblank (1994) and Pulleyblank & Turkel (1995), and is plausibly the type of constraint needed in adult grammars to express the sorts of co-occurrences of features characteristic of the phonological systems of particular languages. I will also assume, without much further discussion, the presence in the constraint hierarchy of a family of universal (and possibly language-specific) constraints on feature co-occurrences, which I will abbreviate as SEGSTRUC. The content of these constraints can presumably be stated in the same form as the sympathetic and antagonistic conditions of Archangeli & Pulleyblank (1994), and will consist of constraints such as \*[+NAS, -SON], \*[CORONAL, DORSAL], and so on.

The constraint hierarchy in place at the stage at which liquid neutralization is evidenced is given in (7):

(7) **\*[+CONS, +SON] » FILL » PARSE**

Starting with the simplest form, we will first examine the treatment of a form with an initial /r/; I give what I assume to be the perceptual representation  $\Phi$  of the word *ray* in (8). For our purposes, we need only take into account the intra-segmental make-up of this form, leaving aside the syllabic structure. Likewise, since the treatment of the vowels is not our concern, I will abstract away from these in what follows.

(8) **Perceptual representation of *ray***

Lexicon Optimization will proceed as follows: first, the form  $\Phi$  in (8) is submitted to  $\text{Gen}^{\text{Lex}}$ , which will carry out all possible parses of this information (subject to the three constraints given in fn. 3). Among the set of potential underlying representations, then, will be the liquid segment in (8) as is, as well as all possible subsets and supersets of the features in  $\Phi$ ; it is crucial to the proper functioning of Lexicon Optimization that the same assumption be made here as is made in all Optimality Theoretic analyses: namely, that any information which is underparsed is nonetheless present in the output of Gen (thanks to the principle of Containment), but will not receive interpretation (see McCarthy & Prince 1993: 21 for discussion of this notion of stray erasure within default interpretation). Since the component of the grammar which is responsible for interpretation of the outputs of  $\text{Gen}^{\text{Lex}}$  is the lexicon, this means that all underparsed information resulting from  $\text{Gen}^{\text{Lex}}$  will be omitted from the underlying form. This is entirely parallel to the treatment of underparsing in phonology, according to which any information not included in higher structure, while present in the candidate form, receives no interpretation in the component responsible for interpretation of the phonology, namely the phonetic component.

Among the set of potential underlying representations for the liquid segment in (8) will be the segmental matrices given in (9). I give these as matrices for the purposes of exposition, under the assumption that universal constraints on segmental structure will parse features into segments in a uniform way, observing universal well-formedness conditions on feature-geometric representations along the lines proposed by Clements (1985), McCarthy (1988), and others (see Clements & Hume 1995 for discussion). Here and in what follows, I will depict all candidate forms by means of feature matrices, showing underparsing of an underlying feature by enclosing it in <angle brackets>, and filling of a feature not present in underlying form with **boldface**. Recall that, under our assumptions concerning interpretation of underparsed material, that any feature not parsed into a potential underlying representation will be uninterpreted (i.e., deleted) in the component which is fed by this operation of Gen.

A crucial feature of this analysis is that Gen is unable to literally change

the value of a binary feature, since, in targeting a particular feature specification, Gen is able to perform only the operations of removal of material (giving rise to a Parse violation) or addition of material (yielding a Fill violation). In this sense, Gen is unable to carry out structure-changing operations: if a privative feature is unspecified in the input, Gen is free to fill it in; if a binary feature is unspecified, Gen is free to fill in either feature value.<sup>7</sup>

- (9) a.  $\begin{bmatrix} +\text{cons} \\ +\text{son} \\ \text{Cor} \end{bmatrix}$       b.  $\begin{bmatrix} <+\text{cons}> \\ +\text{son} \\ \text{Cor} \end{bmatrix}$       c.  $\begin{bmatrix} +\text{cons} \\ <+\text{son}> \\ \text{Cor} \end{bmatrix}$       d.  $\begin{bmatrix} +\text{cons} \\ +\text{son} \\ <\text{Cor}> \end{bmatrix}$
- e.  $\begin{bmatrix} <+\text{cons}> \\ <+\text{son}> \\ \text{Cor} \end{bmatrix}$       f.  $\begin{bmatrix} <+\text{cons}> \\ <+\text{son}> \\ <\text{Cor}> \end{bmatrix}$       g.  $\begin{bmatrix} +\text{cons} \\ +\text{son} \\ \text{Cor} \\ \text{Lat} \end{bmatrix}$       h.  $\begin{bmatrix} +\text{cons} \\ +\text{son} \\ <\text{Cor}> \\ \text{Dors} \end{bmatrix}$

The set of competing underlying representations in (9) corresponds to a subset of the set  $L_1, L_2, \dots, L_n$  from the definition in (5). The next step is to determine which of these underlying representations receives the optimal parse with respect to the constraint hierarchy in place in the phonology; here we must take into account the optimal parse for each candidate, and then determine which of these optimal parses is optimal. In this sense, we are looking for the optimal from among the optimal, which is closely akin to the procedure outlined in Prince & Smolensky's (1993: 192) definition of Lexicon Optimization.

Since this procedure may not be obvious, we will go through it in some detail in this case, in order that it is clear how Lexicon Optimization is intended to function. The best place to start is with the potential underlying form which represents the perfectly faithful parse of the perceptual form  $\Phi$  (9a), since, all other things considered equal, this is the candidate we might expect to be the best possible underlying form.<sup>8</sup>

- (10)  $\begin{bmatrix} +\text{cons} \\ +\text{son} \\ \text{Cor} \end{bmatrix}$

7. It is possible to conceive of changing of binary feature values by means of a simultaneous underparsing of the specified value and addition of the opposite feature specification; this would yield a Fill and a Parse violation in the input form to Eval. Although there seems to be no principle in place to exclude this possibility, I will assume here that it is in fact excluded.

8. A theory of acquisition must account for cases in which surface forms contain more information than their underlying forms (epenthesis, in the wide sense), as well as cases in which surface forms contain less information than their underlying forms (deletion, again in the wide sense). We leave aside for the time being the question of the extent to which a lexical representation may be unfaithful to its target surface form and/or its perceptual form in a grammar which has reached a steady state, returning to this extremely interesting and important issue later.

Treating this representation as we would any underlying form, we submit it to (phonological) Gen and Eval, as illustrated in the following tableau.

(11)

INPUT: [+CONS, +SON, COR]	SS	*[+CONS, +SON]	FILL	PARSE
a. ☞ +cons, +son, Cor		*		
b. <+cons>, +son, Cor	*!			*
c. +cons, <+son>, Cor	*!			*
d. +cons, +son, <Cor>	*!	*		*
e. <+cons>, <+son>, Cor	*! *			* *
f. <+cons>, <+son>, <Cor>	*! * *			* * *
g. +cons, +son, Cor, Lat		*	*!	

The constraint family SEGSTRUC (annotated here as SS) is responsible for assigning violation to all segmental representations which are ill-formed in crucial respects, notably in terms of phonetic interpretation. I am assuming here that all inputs to the phonetic interpretive component must be fully specified, at least in terms of the features at the level of the root node, and in terms of place features (although see Cohn 1995 for indications that underspecified features are valid as inputs to the phonetic level). Note that, if we were to consider [Coronal] to be the default value for place of articulation, nothing would substantially change in the tableau (11): the form (11d), which is assessed a violation of SEGSTRUC for not having a specification for place of articulation, would collapse with (11a), since there would be no way to distinguish them. All violations of SEGSTRUC in (11) thus correspond to failures of interpretability, with regard to the features [ $\pm$ cons], [ $\pm$ son], and place specification. It is thus an inviolable requirement of the phonetic component assumed here that these features must be specified, since there is no higher-ranked constraint which could mitigate failure of SEGSTRUC.

Violation of \*[+CONS, +SON] is straightforward: any segment containing these two features will incur a violation of this constraint. Likewise FILL and PARSE: these are violated when there is featural information not present in the underlying form (as in (11g)), or when information from the underlying form is not brought forward for subsequent interpretation by the phonetics (11b-f). Although it happens to be the case that all violations of SEGSTRUC in (11) also incur violations of PARSE, this is purely coincidental, since it is possible to violate PARSE without violating SEGSTRUC (as we shall see shortly).

Rather than pursue a brute-force (and tedious) approach to determining the optimal underlying form, we can take a more deductive approach: what we need

to do is find the potential underlying form whose optimal parse will fare better against the constraint hierarchy than the form in (10). This form (11a) violates \* $[+CONS, +SON]$  once, so we are seeking an underlying form whose corresponding phonetic output will either violate no constraints at all, or one or both of the lower-ranked constraints FILL and PARSE. It can be demonstrated that no potential lexical representation from among  $L_1, L_2, \dots, L_n$ , the set of outputs of  $Gen^{Lex}$  applied to the perceptual representation of *ray*, will pass through  $Eval^{Phon}$  unscathed: in order to avoid a violation of  $[+CONS, +SON]$ , the optimal output must be specified either  $[+cons, -son]$ ,  $[-cons, +son]$ , or  $[-cons, -son]$ . Given our proviso that Gen is unable to change the value of a binary feature (fn. 6), a phonetic output which is specified  $[-cons]$  or  $[-son]$  (or both) must correspond to a potential underlying representation in which this feature has no value. This automatically entails that this class of forms must violate FILL once or twice.

This is, in fact, the best that can be done under the circumstances. The only way to avoid a violation of \* $[+CONS, +SON]$  incurs a violation of FILL, and no form can violate only PARSE without violating a higher constraint. The reason for this is simple enough: in order to violate only PARSE, the lexical candidate in question must have featural information present which does not correspond to information present in  $\Phi$ , which is of course permitted by unconstrained  $Gen^{Lex}$  operating on  $\Phi$ . Let us consider the potential lexical form in (12), which has had the feature [Nasal] added to the input to  $Gen^{Lex}$ . Failure to parse [Nasal] into the output of the phonology will, indeed, incur a PARSE violation, but this candidate will also violate \* $[+CONS, SON]$ .

(12)

$$\begin{bmatrix} +cons \\ +son \\ Cor \\ \mathbf{Nasal} \end{bmatrix}$$

If we attempt to violate PARSE by underparsing either  $[+cons]$  or  $[+son]$  into the phonological output, we violate high-ranking SEGSTRUC, so no matter what the potential lexical form is, it cannot violate only PARSE.

Since the best we can do is violate FILL once, specifically in order to avoid a violation of higher-ranked \* $[+CONS, +SON]$ , we must consider the two possible ways that this FILL violation can come about. The two potential underlying representations whose optimal output violates FILL once only are given in (13).

(13) a.                      b.

$$\begin{bmatrix} <+cons> \\ +son \\ Cor \end{bmatrix} \quad \begin{bmatrix} +cons \\ <+son> \\ Cor \end{bmatrix}$$

Let us consider (13a) first. As before, a violation of SEGSTRUC will be assessed for every occurrence of a missing specification for either  $[\pm cons]$ ,  $[\pm son]$ , or place of articulation. The best possible output is thus (14c), which violates FILL once

only, but at a grievous cost: essentially, this segment will now be realized as a vowel, as a result of its being specified [-cons, +son]. I assume that this in itself is not sufficient to disqualify this candidate as a segment, but that there will be a failure of syllabification in this case.<sup>9</sup>

(14)

	INPUT: [+SON, COR]	SS	*[+CONS, +SON]	FILL	PARSE
a.	+son, Cor	*!			
b.	+cons, +son, Cor		*!	*	
c. ✗	-cons, +son, Cor			*	
d.	+cons, +son, Cor, Lat		*!	**	
e.	+cons, <+son>, Cor	*!		*	*
f.	-cons, <+son>, Cor	*!		*	*
g.	<+son>, <Cor>	*! *			**

If we consider the possible outcomes for (13b), we see that the best output will violate FILL once here, but without the additional cost associated with the best parse of (13a).

(15)

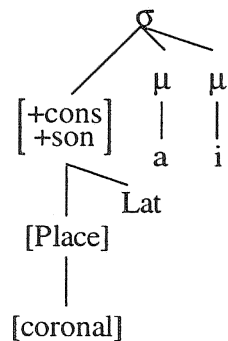
	INPUT: [+CONS, COR]	SS	*[+CONS, +SON]	FILL	PARSE
a.	+cons, Cor	*!			
b.	+cons, +son, Cor		*!	*	
c. ✗	+cons, -son, Cor			*	
d.	+cons, +son, Cor, Lat		*!	**	
e.	<+cons>, +son, Cor	*!		*	*
f.	<+cons>, -son, Cor	*!		*	*
g.	<+cons>, <Cor>	*! *			**

9. It may well be the case that the feature specifications for vowels and consonants are distinct enough that the parse (14c) will simply be ill-formed from the point of view of SEGSTRUC, in which case the optimal parse will be (14b). This potential phonetic output violates \*[+CONS, +SON] and FILL, which will in any case render the potential underlying representation (14b) the optimal underlying form.

The optimal lexical representation corresponding to the onset consonant of the perceptual form *ray* is thus the one specified [+cons, Cor], which will surface as the (voiced) coronal obstruent [d], exactly as desired. This is descriptive of the state of affairs holding in Amahl's grammar prior to Stage 2, when liquids are neutralized with obstruents in all cases (except the cases in which lateral harmony is attested, to be dealt with in §8).

Turning now to forms with initial laterals, exemplified here by the form *lie*, which is realized by Amahl as [ɖai], we see that the same procedure of Lexicon Optimization will yield the correct output form. The assumed perceptual representation for this form is given in (16):

(16) **Perceptual representation of *lie***



Again, the task of Lexicon Optimization is to find the underlying representation whose optimal output incurs the least serious constraint violations, given the ranking SEGSTRUC » \* [+CONS, +SON] » FILL » PARSE. The content of the perceptual form  $\Phi$  which interests us here is the featural content of the onset segment:

(17)



This segment will be submitted to  $\text{Gen}^{\text{Lex}}$ , yielding the set of potential lexical representations from among which will be selected the optimal form. Following the same logic as was used for the form *ray*, we can easily establish that no lexical representation corresponding to this perceptual form can pass through  $\text{Eval}^{\text{Phon}}$  without incurring a violation of FILL, and that the best possible form will in fact incur only one FILL violation. Again, we start with the candidate which we might consider *a priori* to be the best underlying representation of this form, the output of  $\text{Gen}^{\text{Lex}}$  which is perfectly faithful to the perceptual form:

(18)

INPUT: [+CONS, +SON, COR, LAT]	SS	*[+CONS, +SON]	FILL	PARSE
a. ☞ +cons, +son, Cor, Lat		*		
b. <+cons>, +son, Cor, Lat	*!			*
c. +cons, <+son>, Cor, Lat	*!			*
d. +cons, +son, <Cor>, Lat	*!	*		*
e. +cons, +son, Cor, <Lat>		*		*!
f. +cons, +son, <Cor>, <Lat>	*!	*		**

As before, the feature which is causing the violation of \*[+CONS, +SON] is [+son], so a better underlying representation will be one in which this feature is not present, and can thus be filled in with [-son]. Note, however, that this does not in fact yield the best underlying representation, since the filling in of [-son] conflicts with the feature [lateral], under the assumption that the co-occurrence of [-son] and [lateral] is ruled out, at least in English.

(19)

INPUT: [+CONS, COR, LAT]	SS	*[+CONS, +SON]	FILL	PARSE
a. +cons, +son, Cor, Lat		*!	*	
b. +cons, -son, Cor, Lat	*!		*	
c. +cons, +son, Cor, <Lat>		*!	*	*
d. ☞ +cons, -son, Cor, <Lat>			*	*

The best underlying representation for *lie* will be the same as the representation for *ray*, which is to say that the onset will be specified [+cons, Cor]. The surface manifestation of the lateral segment will be [ɖ], identical to that of the liquid /r/.

## 6. The strange case of free variation

According to Smith's description of the development of the initial liquids, at Stage 2 there began to be free variation between [ɖ] and [r] for adult /r/, and between [ɖ] and [l] for adult /l/, which persisted until Stage 6. Given the framework for the optimization of underlying forms along with the set of constraints outlined above, this free variation receives a straightforward account if

we assume that a change in the constraint ranking is responsible. In particular, if the constraint \*[+CONS, +SON] is not crucially ranked with respect to FILL during this period, these facts are accounted for in a natural way.<sup>10</sup>

Since the assumed constraint ranking is now as given in (20), the outcome of Lexicon Optimization will change accordingly, reflecting the fact that the relation between underlying forms and surface forms has altered.

(20) Constraint ranking (Stages 2-6)

SEGSTRUC » { \*[+CONS, +SON], FILL } » PARSE

Returning to the case of the initial liquid segment /r/, and holding constant all previous assumptions regarding its perceptual representation, we re-apply Lexicon Optimization, again starting with the potential lexical representation which most faithfully parses the information present in the perceptual form. The tableau in (21) is in all respects identical to that in (11), except that here there is no relation of dominance holding between \*[+CONS, +SON] and FILL (schematized by the absence of a borderline between these two columns of the tableau).

(21)

INPUT: [+CONS, +SON, COR]	SS	*[+CONS, +SON]	FILL	PARSE
a. ☞ +cons, +son, Cor		*		
b. <+cons>, +son, Cor	*!			*
c. +cons, <+son>, Cor	*!			*
d. +cons, +son, <Cor>	*!	*		*
e. <+cons>, <+son>, Cor	*! *			**
f. <+cons>, <+son>, <Cor>	*! **			***
g. +cons, +son, Cor, Lat		*	*!	

Recalling our earlier discussion, in which it was established that the underlying representation whose optimal output violated FILL once only (*viz.*, the feature matrix [+cons, Cor]), we see that once these constraints have “merged”, these two potential underlying representations are in direct competition, since they violate equally-ranked constraints to the same degree. Note that, interestingly, a metric which might be considered to play a role in the calculation of lexical optimality

10. We set aside for later consideration the underlying causes of constraint ranking, returning to some speculations on this question later.

does not appear to do so here: it is apparently not the case that faithfulness of the underlying representation to the perceptual representation steps in here to decide between the two competing underlying forms, since we would then expect the decision to fall in favour of the underlying form whose onset is specified [+cons, +son, Cor]. Since this underlying form is perfectly faithful to the perceptual representation, it should win out over the form whose onset is specified [+cons, Cor].

This is slightly problematic, however, given our assumptions up to this point about the operations underlying the determination of lexical well-formedness. Recall that we have not placed any constraints on  $\text{Gen}^{\text{Lex}}$  with respect to its freedom in positing any amount of structure (as per McCarthy & Prince's principle of Freedom of Analysis; see fn. 3). Given a perceptual form  $\Phi$ , whose onset is specified [+cons, +son, Cor], there is nothing to prevent  $\text{Gen}^{\text{Lex}}$  from adding, say, the feature [Nasal] to this feature matrix; the optimal parse of this potential underlying representation will be a faithful parse, since it will violate \*[+CONS, +SON] only once, bringing it into direct competition with the lexical representation in (21). In order to rule out this surely undesirable result, we must have recourse to notions of faithfulness of potential lexical representations to their related perceptual forms. The potential underlying form containing the feature [Nasal] will violate FILL in  $\text{Eval}^{\text{Lex}}$ ,<sup>11</sup> whereas the form in (21) violates no faithfulness constraints. In this case we need to invoke  $\text{Eval}^{\text{Lex}}$  as arbiter, when two potential underlying forms are otherwise equal with respect to Lexicon Optimization; why do we apparently not do so in the case of the competition between [+cons, +son, Cor] and [+cons, Cor]?

The solution, I believe, lies in the specific treatment given to cases of constraints which are unranked with respect to one another. There are two ways these cases can be seen: (i) unranked constraints are collapsed together to form a single 'super-constraint' which represents the union of its component sub-constraints; or (ii) the presence in a hierarchy of unranked constraints causes the hierarchy to splinter into sub-hierarchies, each one representing one of the possible strict-domination hierarchies compatible with the unranked constraints. If we take option (i), we should select [+cons, +son, Cor] in the case under consideration, since it fares as well as [+cons, Cor] with respect to the 'super-constraint' { \*[+CONS, +SON]  $\cup$  FILL }, but is more faithful to  $\Phi$  than any competing underlying form. If we take option (ii), we first consider the outcome of PhonEval, given the ranking SEGSTRUC » \*[+CONS, +SON] » FILL » PARSE; then we consider the outcome, given SEGSTRUC » FILL » \*[+CONS, +SON] » PARSE. The former ranking yields [+cons, Cor] as the optimal underlying form, since its best parse violates lower-ranked FILL, and the latter ranking yields

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11.  $\text{Eval}^{\text{Lex}}$  can be assumed here to consist simply of the faithfulness constraints FILL and PARSE, although we will see reasons to reconsider this extremely economical position in the discussion of lexical harmony.

[+cons, +son, Cor], since its best parse violates lower-ranked \*[+CONS, +SON], while being more faithful to  $\Phi$  than any other competing underlying form. The moral here is that the facts indicate that Lexicon Optimization incorporating option (ii) is preferable, although further research might suggest otherwise.<sup>12</sup>

Free variation in the surface manifestation of the lateral segment is explained in the same manner, assuming the correctness of option (ii). First we derive the optimal output given the constraint ranking SEGSTRUC » \*[+CONS, +SON] » FILL » PARSE, which will be as shown in the tableau (22), namely [d].

(22)

	INPUT: [+CONS, COR]	SS	*[+CONS, +SON]	FILL	PARSE
a.	+cons, +son, Cor		*!	*	
b. ☞	+cons, -son, Cor			*	
c.	+cons, +son, Cor, Lat		*!	**	
d.	+cons, -son, Cor, Lat			**!	

The optimal output for the ranking SEGSTRUC » FILL » \*[+CONS, +SON] » PARSE is given in (23) below. Here we need to invoke Eval<sup>Lex</sup>, in order to rule out the potential underlying form [+cons, +son, Cor, Nas], which is a possible output of Gen<sup>Lex</sup>, resulting from underparsing of the [lateral] feature of  $\Phi$  and insertion of the feature [nasal]. The optimal parse of this underlying form does as well as the underlying form in (23) against this ranking, but violates both FILL and PARSE in Eval<sup>Lex</sup>.

12. For example, it is conceivable that the optimal outputs of two potential underlying forms might fare equally well with regard to a particular strict-domination constraint ranking, while violating lexical faithfulness to an equal degree. The prediction is that this would also lead to free variation; whether it is desirable to have two distinct ways in which optionality could come about is a question for future research to settle.

(23)

INPUT: [+CONS, +SON, COR, LAT]	SS	FILL	*[+CONS, +SON]	PARSE
a. ☞ +cons, +son, Cor, Lat			*	
b. <+cons>, +son, Cor, Lat	*!			*
c. +cons, <+son>, Cor, Lat	*!			*
d. +cons, +son, Cor, <Lat>			*	*!

At this point, we can see how the eventual re-ranking of \*[+CONS, +SON] and FILL, such that the former comes to be dominated by the latter, gives the desired results, albeit with the addition of one further complication. Smith (1973: 77) states that at Stage 6, when laterals were more or less firmly established, /r/ was neutralized with /l/, and did not surface as [ɹ] until Stage 8, at which point it was in free variation with /l/. This free variation disappeared at Stage 10, from which point onward /r/ surfaced as [ɹ]. The whole process from the loss of neutralization of /r/ with /d/t/ up to the establishment of the correct phonetic output for /r/ lasted about three months (Stages 2-10).

### 7. Lexical constraints/reductionism

In terms of the framework developed above for Lexicon Optimization, it is not clear how to formalize this neutralization of /r/ with /l/, since the change in the ranking of constraints at Stage 2 should allow for the correct surfacing of the underlying non-lateral liquid segment (albeit in free variation with its neutralized variant [d]), but offers no simple explanation for the neutralization of underlying /r/ and /l/. Once /r/ is able to surface correctly, its optimal underlying form would be predicted to be identical to its perceptual form, the reason being that, although underlying /l/ performs as well as underlying /r/ with respect to Eval<sup>Phon</sup>, a  $\Phi$  with no specification for [lateral] should not surface with this feature, due to the intervention of Eval<sup>Lex</sup>.

It thus appears that the usual course of Lexicon Optimization is being overridden in this case, since the expected underlying form appears not to be the one chosen. In order to accommodate this sort of behaviour into the framework developed here, I propose one final addition to the mechanisms underlying the determination of lexical forms, consisting of constraints on lexical representations which override the process of Lexicon Optimization. What I have to say here remains tentative, although something of this sort will almost certainly need to be incorporated into any theory of phonological development which seeks to account for the sometimes strange forms produced during the course of acquisition (see, eg., Ingram 1985 and Priestly 1977).

Up to now, we have assumed that  $\text{Gen}^{\text{Lex}}$  is an unconstrained function applying to perceptual representations ( $\Phi$ ) and outputting the entire set of possible parses of  $\Phi$ , which are subsequently evaluated for relative well-formedness against  $\text{Eval}^{\text{Phon}}$ . Cases such as the otherwise unmotivated appearance of the feature [lateral] in the surface form of forms which hitherto have given evidence of not having this feature suggest that, for reasons which remain somewhat obscure, constraints on the form of the underlying representation take precedence over the simple operation of Lexicon Optimization. In the case at hand, we posit a constraint such as the one in (24), which will apparently take effect at Stage 6, persisting until Stage 10.

(24) \*NON-LATERAL LIQUID

All segments specified as [+cons, +son] and not specified as [nasal] must be specified as [lateral].

This constraint, and others of this type, act as filters on the output of  $\text{Gen}^{\text{Lex}}$ , constraining the set of potential underlying forms which will be considered as competitors for the underlying representation. Thus at Stage 6, when unconstrained Lexicon Optimization would predict the underlying representation of perceptual /r/ to be the feature matrix [+cons, +son, Cor], this possibility will be excluded off the top by the constraint (24). In this sense, (24) acts as a hard constraint on the possible form that a lexical representation can take.<sup>13</sup>

Although this may seem like a weakening of the theoretical proposals made above, it appears to be well-motivated, as we shall see in the next section when we consider the case of lateral harmony. Furthermore, there are many cases in the literature which suggest that constraints on possible lexical forms are common in early grammars. Priestly (1977) discusses one such case, in which the child mapped segments from the perceptual representation to a template of the form CVjVC. Although this templatic mapping did not occur for all forms in the child's vocabulary, it suggests that in some cases information about the form of the lexical representation is able to override the normal course of constructing lexical forms. Another similar case is given in Smith, who notes that Amahl replaced most (but not all) initial unstressed syllables with the dummy syllable [ri(:)] during Stages 26 to 29, even though these syllables in many cases had been previously pronounced correctly (up to Amahl's articulatory capacity, at least). An interesting aspect of this type of lexical constraint is that, in many respects, it is identical to constraints (such as \*[+CONS, +SON]) which place conditions on the form of the output of Gen without regard to the fidelity of the mapping from underlying form to output, the rightful province of faithfulness constraints such as PARSE and FILL. Although it is assumed in all Optimality-Theoretic analyses that

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13. That (24) appears to act as a hard constraint is only the result of the fact that it is the only constraint on lexical form proposed here. Nothing excludes the possibility that constraints of this type form a hierarchy as well; in fact, this is what we should expect, given our assumptions.

faithfulness constraints are essential to phonological explanation, we have hitherto assumed that faithfulness is not the prime concern in  $\text{Eval}^{\text{Lex}}$ . Instead, what matters most is that the optimal underlying form be that one whose best parse in the phonology is optimal when compared to the best parse for any other potential underlying form. Only in case of a tie are lexical faithfulness constraints invoked.

We can schematize the overall shape of the process by which lexical well-formedness is determined as in (25). The idea is that  $\text{Gen}^{\text{Lex}}$  first produces the set of candidate lexical representations, which is subsequently filtered through the set of lexical constraints. This set is then submitted to Lexicon Optimization, consisting of the determination of the best possible lexical representation by means of  $\text{Eval}^{\text{Phon}}$  and  $\text{Eval}^{\text{Lex}}$ .

(25)  $\text{Gen} \gg \text{Lexical constraints} \gg [\text{Gen} \gg \text{Eval}^{\text{Phon}} \gg \text{Eval}^{\text{Lex}}]_{\text{Lexicon Optimization}}$

Although this may seem like a complex picture, it is simplified considerably once we recognize that the two instances of Gen are not distinct parts of the grammar, but two instances of the same univocal structure-building component. In this sense, the diagram of the grammar given in Figure 2 is somewhat misleading, since  $\text{Gen}^{\text{Lex}}$  and  $\text{Gen}^{\text{Phon}}$  are really one and the same. Furthermore, we have seen no reason to consider the content of  $\text{Eval}^{\text{Lex}}$  as consisting of anything other than the pure faithfulness constraints PARSE and FILL; in fact, what we have called  $\text{Eval}^{\text{Lex}}$  to this point may consist simply of the constraint hierarchy  $\text{Eval}^{\text{Phon}}$  minus the constraints which refer specifically to the structure of the phonetic output, which, as constraints on the output of the phonology, have no jurisdiction over questions of the faithfulness of a potential lexical representation to its corresponding perceptual representation.

A further simplification to the final state of the grammar is possible, given that, in all likelihood, lexical constraints of the type considered here represent strategies employed by the language learner either to increase lexical consistency, or to facilitate production. Efforts to provide an empirically and theoretically adequate account of the course of phonological acquisition have been underway since at least the publication of Jakobson (1941[1968]), and although many proposals have been put forward for explaining the systematicity of a great deal of early phonological behaviour (see Ingram 1974, 1985, 1992; Smith 1973), much of the observed phenomena of early phonology seem to stem from general principles of economy, both at the level of the phonetic output (cluster reduction, neutralization) and at the level of the lexicon (templates, default syllable types). If it should turn out to be the case that lexical constraints of the type under consideration here are simply early strategies for reducing the cognitive load of the language learner, they will have no place in the adult grammar.

## 8. Lateral harmony

We turn now to the case of lateral harmony, as shown in (1a), repeated here:

- (1) a. (Adult) /l, r, j/ surface as [l] when there is an /l/ in the adult form:
- i. *lorry* → lɔli: (Stage 1)
  - ii. *yellow* → lɛlu: (Stage 1)
  - iii. *really* → li:li: (Stage 10)

The interesting aspect of lateral harmony, in light of the analysis developed here for the treatment of syllable-initial liquid segments in non-harmonizing forms, is that it seems to override the general constraint against lateral segments holding before Stage 2, and does not exhibit the optionality seen between Stage 2 and Stage 6: lateral segments are fully stable whenever the adult form contains more than one liquid segment, of which at least one is specified as [lateral].

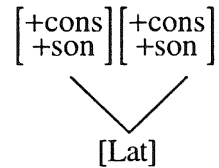
All other things being equal, we would expect the form *lorry* to surface prior to Stage 2 as [dɔɖi:]: for the same reasons outlined in the discussion of the forms *lie* and *ray*, we predict the syllabic onsets of the optimal underlying representation to be specified [+cons, Cor], and thus to surface as [+cons, -son, Cor]. Our first reaction might be to posit an additional constraint in the phonology, to the effect that the feature [lateral] must be multiply linked to higher structure, but this will not help, since the optimal output will avoid a violation of this constraint by virtue of simply not being specified [lateral] at all. If we posit a constraint stating that all (non-nasal) sonorant consonants must be specified [lateral], there is no way to place it in the constraint hierarchy ( SEGSTRUC » \* [+CONS, +SON] » FILL » PARSE ) so that it will enforce a [lateral] specification in the cases which correspond to a  $\Phi$  meeting the description for lateral harmony, without at the same time forcing all laterals in all  $\Phi$  to surface faithfully.

Spencer's (1986) account of this phenomenon relies on an autosegmental analysis of feature spreading, based on Clements & Sezer's (1982) mechanisms for the description of vowel harmony processes. The essence of Spencer's proposal is that the P-segment [lateral] is targeted in perceptual representations and placed on an autosegmental tier in the course of the mapping from perceptual representations to underlying representations, where it will spread in the phonology to the class of P-bearing segments, defined as the class of sonorant non-nasal coronals. This works for the cases of genuine spreading of [lateral], but Spencer offers no account of why we do not see spreading in forms such as *light* [dait]. Since the initial segment in this form should be as good a P-bearing segment as the syllable-initial segments in the forms *lorry*, *yellow*, etc., we would expect it to bear the P-segment [lateral], unless other principles rule this out.

This apparent paradox is avoided if we consider lateral harmony not as a constraint on well-formedness in the phonology, but rather as a constraint on lexical well-formedness, in the sense outlined in the previous section. As given in (26), this positive constraint will filter the output of Gen( $\Phi$ ), passing on to Lexicon Optimization only those potential underlying representations meeting

(26).<sup>14</sup>

(26) LATERAL HARMONY



Thus, among the set of potential underlying representations for *lorry*, *yellow*, and *really* submitted to Lexicon Optimization will be all and only those representations in which [lateral] is associated with the root nodes of both segments. Thus, although the optimal parse for each of these forms will violate \*[+CONS, +SON] in Eval<sup>Phon</sup>, no competing parse will do better; the best that can be done under the circumstances is to avoid violating the remaining constraints, by remaining as faithful as possible to the underlying representation.

## 9. Conclusions

In this brief discussion, I have outlined some ways in which Optimality Theory might be minimally elaborated in order to account for changes in the system of constraints and underlying forms over time. I hope to have shown that Optimality Theory provides a framework which can shed light not only on the constraints operative on the mapping from the child's underlying forms to the attested forms at stages at which the system of constraints is relatively stable, but which can also give an account of how changes in the system might be characterized.

In Smith's (1973) formulation of the rules and morpheme structure constraints which derive the surface forms of Amahl's early production, there is no possibility of unifying the rules and constraints into a cohesive system, except in so far as the rules, as stated and ordered, are adequate to produce the correct surface forms given the underlying representations assumed by Smith. Of course, this is not intended as a criticism specifically of Smith's method, but is a critique which applies to any theory of the acquisition phonology, the present one included. It is always possible to use the mechanisms devised for the description of the steady state of a grammar (rules, underlying forms, constraints, etc.) to characterize development over time, by means of loss, acquisition, or change in

---

14. This is a somewhat necessary simplification, although little hinges on the precise formulation of this constraint. For the perceptual form of a word such as *lion*, which surfaces as [læ:n], we want to exclude the possibility that the feature [nasal] of the final segment will be underparsed, with subsequent spreading of [lateral] to the coda segment. This is a possible output of Gen, and will meet the positive constraint (26), but should be ruled out somehow. Another interesting question is posed by the great number of perceptual representations which cannot meet (26) at all, by virtue of not having two root nodes specified [+cons, +son]. In this case, the set of potential underlying representations will be empty; the simplest solution is to propose that, in cases such as this, the constraint is simply ignored.

the form or substance of these devices. For Smith, who assumed that Amahl's underlying forms were virtually those of the adult language, acquisition largely consisted of loss of the rules, idiosyncratic to Amahl's system, which stood between the targetlike underlying forms and the surface forms. Likewise for Spencer (1986), who postulates processes at two distinct levels of the grammar, which impoverish the underlying representations and perform operations of feature-filling and -spreading to produce surface forms.

In the approach outlined here, a potentially more natural account is available of the ways in which changes in a developing phonological system can be explained; namely, as the result of the re-ordering of constraints over time. What needs to be fleshed out in such an account are the answers to the following questions: What are the constraints which are necessary and sufficient to derive the observed facts? Which principles determine the ways in which constraint re-ordering takes place? What drives constraint re-ordering? Answers to these questions can come from a full analysis not only of one child's developing grammar, but from crosslinguistic evidence—or rather, crossgrammatical analysis, since individual variation in the acquisition of the phonology of one language guarantees that while the end-state might be the same, the means by which that end-state is reached will differ significantly between learners.

The first question above is perhaps *the* central question in the theoretical framework adopted here. In order to constrain the possible analyses which might be given of a phenomenon, it is necessary that there be a theory of constraints which will forbid the analyst from proposing ad hoc and possibly unlearnable constraints (or combinations of constraints). At present, there appears to be no such theory on the horizon, so all accounts of phenomena in terms of Optimality Theoretic devices are somewhat on thin ice, including the present sketch of lexicon acquisition in the face of ever-changing constraints on production.

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