Binarity and Singularity in Child Grammar

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0. Abstract

According to Roeper (1996), the operation of Merge(r) (Chomsky 1993, 1995), is the only structure building operation in the child's grammar. This paper pursues the main empirical prediction made by Roeper's hypothesis namely, that acquisition data will provide evidence of this binary operation. Below, data from the early period of multiword speech is shown to support this hypothesis. Even the initial lack of binary functional structures supports the hypothesis that the child's phrase marker builds gradually in a binary fashion from a single binary branching structure.

1. Structure Building via Merge

In the Minimalist Program of Chomsky (1995), a derivation which has reached a certain stage

> ... can be interpreted only if it consists of a single syntactic object. Clearly then, C_{HL} must include a second procedure that combines syntactic objects already formed (1995:226).

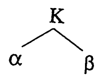
According to Chomsky, Merge is the simplest operation which

> takes a pair of syntactic objects (SO_i, SO_j) and replaces them by a new combined syntactic object SO_{ij} (1995: 226).

The operation Merge is a binary operation which concatenates only two syntactic objects (or two phrase markers). For example, in (1) below α and β have been Merged into the phrase marker K.

New Perspectives on Language Acquisition

(1)



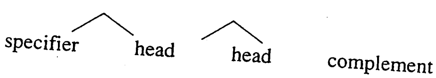
According to Chomsky (1995) "Applied to two objects α and β, Merge forms the new object K, eliminating α and β".

If Merge is the only concatenation operation in child grammars, at least one stage in which this binarity is directly observable is predicted to occur. According to Roeper (1996):

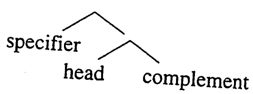
> Once the numeration is set, the operation of Merge then combines the MP (maximal projection) as Spec-head or Head-complement with other MP projections. In a word, any two elements are syntactically connected by assigning Head to one, and Spec or COMP to the other (1996:421).

This predicts that only binary structures (in 2) will emerge before the doubly binary specifier-head-complement structure in (3) below.

(2)

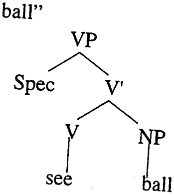


(3)



The hypothesis that all structures in the child's grammar are built via Merge (Roeper 1996, Powers 1997) contrasts with GB tree-building acquisition accounts (e.g. Lebeaux 1988, Radford 1990, Powers 1996) which in the X-bar component of the grammar built phrase markers (as in 4).

(4) for child utterance: "see ball"



Merge structures are simpler than these X-bar trees as there is only a binary structure which corresponds to either specifier-head or head-complement.

2. Supporting Language Acquisition Data

2.1 From Single Word to Early Multiword Speech

According to Powers (1997), early multiword speech could be viewed as the combination of the syntactic objects of the prior stage in development, single word speech.

	Single Word Speech			*Early Multiword Speech*
(5)	[see]	[ball]	Merge	
	α	β	⟶	*see ball*

The fact that the same lexical items appear in both single word speech and early word multiword speech supports the hypothesis that early multiword speech reflects the Merger of two syntactic objects (or phrase markers) from single word speech.

Strict binarity is observed in the acquisition sequence as only two-constituent word combinations are attested before any three-constituent combinations appear (Bowerman 1990). This is predicted by the Merge analysis, but not a GB account in which each phrase marker is minimally a specifier-head-complement structure. The initial lack of three-constituent utterances supports the hypothesis of LaPorte-Grimes and Lebeaux (1993) that the child's initial phrase marker is a singular binary branching structure like (2). Trees which are doubly binary branching trees like (3) will be found only later in development.

2.2 Word Order in Verbal Clauses in Child English

A clear example of the initial binarity is found in the domain of verbal word order in child English. Only two-constituent orders are initially attested (Bowerman 1990). Table 1 (from Powers under review) shows the emergence of word order in verbal clauses for two children acquiring American English (as recorded by Bowerman).[1]

Table 1. Emergence of Word Orders (Bowerman Diary Notes)

	Eva	Christy
SV	16;4	17;1
VO	16;4	17;2
VS	18;3	17;3
OV	19;2	18;4
SVO	19;1	21;1

[1]Thanks to Melissa Bowerman for giving me access to her diary notes.

Initially, only VO and SV and VS orders are attested.[2] The first three constituent word order, SVO, emerges only later at Stage 2 (Bowerman 1990) as shown in Table 2 below.

Table 2. Examples of Early Word Orders

	Order	Example	
Stage 1:	SV	Christy see	(Bowerman 1990)
	VO	ride horsie	(Bowerman 1990)
	VS	go truck	(Gruber 1967)
Stage 2:	SVO	Daddy show a siren	(Bowerman 1990)
	SV (unaccusative)	bear come	(Bowerman 1990)
	OV	horsie ...ride	(Bowerman 1990)

The earliest verbal clauses are as Roeper predicts: binary combinations of specifier-head or head-complement as in (6).

(6)

SV	specifier head
VO	head complement
VS	head complement (unaccusative verbs)

The lack of three constituent combinations is not predicted by GB analyses in which the child's phrase marker for these combinations would be at least a VP. These falsely predict the presence of both specifier and complement positions.[3] The later emergence of the three-constituent combination SVO further argues that a VP is not an accurate syntactic description of the earliest verbal word combinations.

According to LaPorte-Grimes & Lebeaux (1993), the child's initial phrase marker is a simple binary branching structure. Similarly, Powers (under review) claims that the initial appearance of the orders VO and SV is due to the simple binary tree in (7) below.

(7)

VP

S	V	specifier head
V	O	head complement
V	S	head complement (unaccusative)

The initial lack of three-constituent utterances is unexpected when the phrase marker is at least a VP as in (4) but predicted when it is a binary phrase marker as in (7). The binary nature of Merge(r) in fact predicts that only two word combinations should be attested.

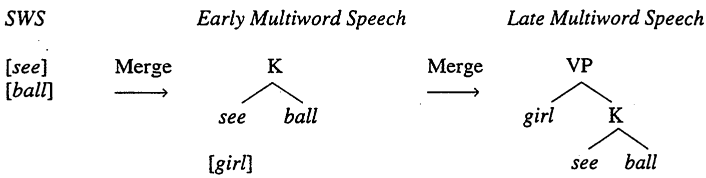
At the next period in development, three and four word combinations emerge. According to Powers (1997), this change reflects a crucial step in the derivation: the child

[2]For both children, SV and VO orders emerge before VS. The probability of exactly this emergence pattern for two children is extremely low (p = .0002767, significant at .05)

[3]B. Plunkett (p.c.) points out that such a GB account could be maintained if specifiers are optionally projected. This does not account for the initial lack of objects in combinations with transitive verbs.

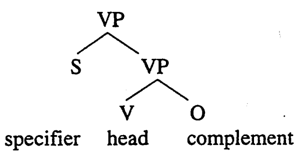
treats phrase markers formed via Merge (at Stage 2) as an new syntactic object as ".... Merge forms the new object K, eliminating and α and β" (Chomsky 1995: 243). The phrase marker expands as soon as the child treats the phrase markers of early multiword speech as new syntactic objects as in (8) below.

(8)



From this point on, the operation Merge applies and reapplies to the syntactic objects (the phrase markers already constructed) yielding longer and more complex structures. The Stage 2 word orders indicate the switch from the single binary structures in (7) to doubly binary structures like in (9).

(9)

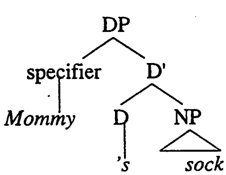


This analysis is compatible with the observation that the first three constituent combinations emerge only later at Stage 2 (Bowerman 1990).

2.3 Early DPs

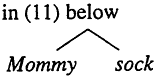
According to Abney (1987), possessives like *Mommy's sock* are DPs as in (10).

(10)



The child version of *Mommy sock* (Bloom 1970, Radford 1990), suggests the simple binary structure in (11) below

(11)



The first possessives in a number of child languages including Hebrew (Armon-Lotem 1997), German (Penner & Weissenborn 1996) and Bernese Swiss German (Penner & Weissenborn 1996) are consistent with the child English pattern. For example, consider Armon-Lotem's (1997) data on child possessives in Hebrew.

(12) a. Yadel sefer — Smadar 1;06.05 (Armon-Lotem 1997)
Yadel book
'Yadel's book'

b. buba pe — Smadar 1;06.11 (Armon-Lotem 1997)
doll mouth
'a dolls mouth'

Interestingly, these examples reflect the possessor-possessed order which is ungrammatical in adult Hebrew (see Armon-Lotem 1997 for a detailed analysis). In addition, Armon-Lotem (1997) reports examples with *more* in (13).

(13) a. od ecem — Leor 1;09.00 (Armon-Lotem 1997)
more bone
'another bone'

b. od sefer — Leor 1;09.00 (Armon-Lotem 1997)
more book
'another book'

c. od oto — Leor 1;09.04 (Armon-Lotem 1997)
more car
'another car'

Similar examples where a word like *more* occurs pre-nominally are also attested in child English (see Powers and Lebeaux 1997).

These early DPs can be accommodated by simple binary structures. Similar to the verbal word order data above, the early non-possessive DPs also reflect head-complement structure as in (14a).[4] However, rather than head-complement combinations, the early possessives could be viewed as specifier-complement combinations as in (14b).

(14) a.
head — complement
more — *car*
od — *oto*

b.
specifier — complement
Mommy — *sock*
Yadel — *sefer*

More acquisition data comes from Modern Greek (Marinis 1997). Unlike the adult DP *this book* in (15), children produce ungrammatical utterances like (16)

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[4]Following Powers & Lebeaux's (1997) analysis of *more* and *no* as heads.

(15) afto to vivlio
this the book
'this book'

(16) e zo a(f)to vivlio Spiros 1;9.2 (Stephany 1986)
hey give this book

According to Horrocks & Stavrou (1987), in constructions like (15) the demonstrative *this* occupies a pre-head position (i.e. the specifier of DP) and the determiner *the* occupies the head. Again, either a head+complement combination *the book* or what could be described as a specifier-complement combination *this book* appears. These examples further support analyzing the earliest possessives as a simple binary branching tree as in (14b).

3. Functional Singularity

The DP data can be explained if the category D is either realized by a head-like element (e.g., *more*) or a specifier-like element (e.g., *Mommy*) in combination with an NP complement. The reason for describing pre-nominal possessors like *Mommy* as specifier-like is because if the adult structure in (10) were present, the possessor would occupy the specifier of D. Following the hypothesis that the full specifier-head-complement structures are lacking, these elements are rather called specifier-like. Interestingly, the functional categories I and C also seem to manifest the same restriction: either a lexical item which corresponds to an adult specifier of IP (e.g., a nominative subject) or an auxiliary verb (I^0) is initially found as shown in Table 3 below

Table 3. Realization of IP elements in Naomi's Data (Sachs 1983)

Age (year;month.day)	auxiliary	nominative subject	subject + auxiliary
1;8.0	want.	I get off . (n=3)	
1;9. 10		I found the brush	
1;9.26	want juice . want it off . want this . (n=3)		
1;10.3			I want shop .

Initially, either the pseudo-auxiliary verb *want* appears or a nominative subject with a lexical verb (e.g., *get*) appears (Powers 1996). Nominative subject appear with *want.* only later. Similarly, the nominative pronoun *I* emerges in isolation before it appears followed by an auxiliary (even a contracted one) for five different children as shown in Table 4 below.

Table 4. Use of I versus I+aux (Age of First Use)

	I	I'm	I'll	I'd	I've
Adam	2;3.4	2;6.3	3;0	n/a	3;1
Eve	1;6	1;10	2;0	2;2	n/a
Naomi	1;8.6	1;10.10	2;4.30	3;3.26	3;3.27
Nina	1;11.29	2;0.3	2;2.6	n/a	2;3.14
Sarah	2;3.5	2;3.7	2;10.24	2;10.24	3;1.10

Similar data is attested for the functional category C. In (17), a wh-word corresponding to the specifier of CP appears adjacent to a clause.

(17) where the other Joe will drive — Klima & Bellugi (1966)
why he don't know how to pretend
why kitty can't stand up?
what I did yesterday
what he can ride in
how he can be a doctor?
how they can't talk?

In (18), a C^0 element (e.g., an auxiliary verb which has undergone subject-auxiliary inversion) appears as in the data from Johnson (1981).

(18) are you put this on me?
are you get this down?
are you help me?
are you know Lucy's name is
are you want one?
are you got some orange juice?
are you sneezed?
are you hurt yourself?
are this the orange juice came from?
are this for putting on?
are this a big one to carry?
are you don't know Sharon's name is?
are this is hot?
are this is broke?
are this is lion?

Similar patterns are reported in the literature for *can* and *is* as in (19) below.

(19) a. can you broke it ? (Marastos & Kuczaj 1978)
b. can I will go? (Menyuk 1969)
c. is this is the powder? (Menyuk 1969)

The observed initial phase in question formation when subject-auxiliary inversion with wh-words (as in 17 above) is not observed could be explained by assuming that it is not that children fail to move the auxiliary to C, rather there is no projection of C at all

(Guilfoyle & Noonan 1992). Similarly, the data in (18) suggest that the early target-like inversion of subject and auxiliary in yes-questions is only apparent: it is rather due to the presence of an auxiliary (*are* or *is*) to the left of a subject. This is especially obvious in example (19b) where two different auxiliaries appear.

The accurate empirical generalization seems to be that each functional category is first realized by either a head-like element or a specifier-like as summarized in Table 5 below.

Table 5. First Realizations of Functional Categories in Child English

	Functional Category		
	D	I	C
head-like	more	want	are
specifier-like	Mommy	I	why

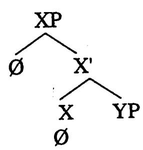
While it standardly assumed that specifiers are optional, the indeed more radical claim that when specifiers of functional heads are overtly realized, the functional heads are not overt, is made more precise in Section 4 below.

4. The Singular Slot Hypothesis

According to Roeper "...a child's grammar is a radical instance of Economy of Representation" (1996:415). In fact, the acquisition data above are compatible with Speas' (1994) Principle of Economy of Projection in (20)

(20) The Principle of Economy of Projection (Speas 1994)
Project XP only if XP has content (either the head or the specifier is overt)

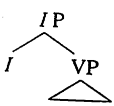
(21)



In (21), if XP dominates no phonological or semantic material other than what is contained in YP then XP lacks content and will not be projected. This definition of content straightforwardly permits the "motivation" of functional projections (e.g., AGRSP) to differ across languages. For example, languages like Italian in which agreement (AGR) is base-generated as a morpheme in the head of $AGRS^0$ (or I^0), the head has content making the projection of AGRSP/IP licit. This contrasts with languages like English where following Chomsky (1992) AGR is base-generated on the verb, not as a separate head. According to Speas, in this type of language, the specifier position must be filled in order for the projection AGRSP to have content so "... either an NP must move to [Spec, IP] or a pleonastic must be inserted" (1994:187). Either the head or the specifier must be filled (or overt) in order for the projection to be licit. This means that IP in English cannot be projected unless the specifier is filled, because there are no agreement morphemes base generated in I^0 in English (Speas 1994).

While the acquisition data reviewed above clearly reflect this type of economy projection as either the head or the specifier of each functional projection is overt, how to accommodate these data in terms of Merge is not as straightforward. Possibly specifiers and heads are merged with existing phrase markers in different derivational steps. If only a specifier of IP (a nominative subject) is overtly realized, perhaps then only the specifier of IP is Merged into the tree as in (22) below.

(22)



Under Merge, the nominative subject (or its features) could project to define the node label (see Roeper 1996, Powers to appear). This analysis does not however account for the appearance of head-like elements discussed above unless we claim that either the head or the specifier can appear but for some reason not both. According to Whitman (1992):

> null X^0 elements are licensed whenever they have grammatical features with an overt phrasal category in the specifier position (1992: 285)

If the overt presence of either head or specifier is sufficient to license a null instance of the other then, the presence of only a functional head or a functional specifier is explained. While this is compatible with the acquisition data, it is not with a GB analysis of it which lacks an explanation of why only one functional element (either the head or the specifier) is attested when both specifier and complement positions are present.

An alternative structure would be one in which there is a single slot for any given functional category as in (23).

(23)

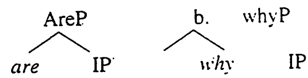
The reason that either a functional specifier or a functional head is realized is because there is initially only a single slot present in the structure.[5] In a similar vein, Roeper (1988) claimed that the specifiers of the projections NP, VP and CP each require a separate trigger. According to this hypothesis, there is initially one slot which is either realized by a specifier-like instance or head-like instance of a functional category. There is no initial misanalysis (e.g., treating a wh-element as a C^0), rather, there is only one possible position in the phrase marker.

The Merger analysis as postulated above does not explain why two functional

[5]Thanks to Doug Saddy for suggesting this.

elements cannot be merged one after the other; however, the conception of lexical items as sets of features inherent to the Minimalist Program, suggests the following solution. There are no functional specifier+head combinations because the same feature is mapped to each one of these lexical items. This is also consistent with Whitman's (1992) claim that because the head and the specifier share features the over presence of one is enough to license the other. For example, wh-word + auxiliary verb sequences are not attested because both wh-elements and auxiliaries (e.g., *are*) bear a +Q (= question) feature.[6]

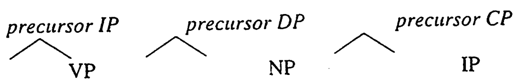
(24) a.



This explains the well-known fact that children acquiring English initially fail to invert the subject and the auxiliary verb in wh-questions. According to this analysis, either a wh-word or an auxiliary is merged with IP. The observed pattern is not due to a failure to invert but rather to the merger of a lexical item bearing a +Q feature with IP.

Why should functional projections be initially realized by a single slot? As Roeper (personal communication) points out, this follows from assuming that the phrase structure tree is built up in a binary fashion. Each functional category is first realized as a single binary branch which takes an XP complement as in (25).

(25)



This approach where each functional category is realized by a single slot explains the data and is consistent with assuming that the phrase structure tree builds gradually from a simple binary branching structure as suggested by LaPorte-Grimes & Lebeaux (1993). Furthermore, the restriction of an initial single slot for functional elements is due to the binary nature of the operation Merge.

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[6] In fact it is probable that these two items beer different +Q features as wh-elements mapping to WH-question features and are encodes a yes/no question feature. See also Roeper (1996) and Powers (to appear).

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