

The Acquisition of Subject Agreement in Xhosa

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1. Introduction

1.1. Goals

The goal of the present paper is to describe development of the system of subject agreement in children acquiring Xhosa as a first language. In particular, we assess the extent to which subject agreement is dependent on the child's appropriate marking of noun class on the subject. The data will be used to evaluate different possible models of subject agreement as they predict acquisition.

1.2. Xhosa - General

Xhosa is a Bantu language of the Nguni family spoken by approximately 8.2 million South Africans, or about 18% of the population. Like other Bantu languages, the morphology is very rich. There are 15 noun classes and these noun classes dictate the agreement marking that accumulates on the verb stem. Subject agreement is obligatory but object agreement is conditioned by a variety of other factors that we will not discuss in this paper (du Plessis, 1997; Gxilishe, de Villiers, & de Villiers, 2006). The verb stem has a number of positions for such morphemes as agreement, tense, derivational suffixes and mood as follows:

Umama uyamfundisa umntwana

"The mother teaches the child"

NClass-Subj	SubAgr.-Tense-(ObjAgr.)-Verb	Root-(Deriv. Suffixes)-Mood	NClass-Obj
U mama	u ya m fund	is a	um ntwana
The mother	present (him/her) learn	cause indicative	child

Xhosa noun classes are not referentially transparent: the semantic categorization is neither systematic nor consistent. The noun class markings resemble a set of fifteen grammatical gender classes. For example: names for humans occur in noun classes 1, 2, 3, 4, 7, 8, 10 and 11. National names occur in noun classes 1, 2, 5, and 6. Inanimate objects occur in noun classes 3, 4, 9, 10 and 11. Loan words from other languages occur in noun classes 5, 6, 9 and 10.

Xhosa has SVO word order but allows many variations of this order for stylistic and literary purposes as well as emphasis. The subject noun can be dropped (pro-drop) leaving only the subject agreement on the verb appropriate to the class of the absent subject noun. The basic sentence form is thus:

U-m-fundi	u-funa	i-moto
Class 1-N	SAgr 1-V	Class 9-N
"The student	wants	the car"

but it could also be expressed with an extraposed subject as in:

U-funa	i-moto	u-m-fundi
SAgr 1-V	Class 9-N	Class 1-N
"Wants	the car	the student"

or with pro-drop:

U-funa i-moto
 SAgr 1-V Class 9-N
 “Wants the car”

In traditional grammars, it is said that morpheme prefix on the verb is a pronoun when the subject is absent, and an agreement marker when the subject is present. However it is more usual now to argue that the prefix is an agreement marker in either case, with the explicit subject optionally dropped as in pro-drop languages like Italian or Spanish (du Plessis, 1997).

1.3. Theories of Agreement

The consensus is that noun class marking is a lexical process, with the prefixes denoting class membership generated in the lexicon (DuPlessis, 1997). However subject agreement is a syntactic process, with the verb inflection determined by the noun class of the subject. By what process does a child come to produce the correct subject agreement on a verb in such a complex system? What simple solution might there be to approximating the adult system? One such solution might be a straightforward “copy” of the prefix from the subject onto the following verb. In this case a child would:

- 1) Master the nouns with marking attached.
- 2) Once the noun is marked, "copy" the marking onto the verb as an agreement marker.
- 3) Optionally, drop the explicit subject but retain the subject agreement.

If this simple model were true of acquisition, what predictions would follow? It would follow that subject agreement would be contingent on the child correctly supplying noun class marking on explicit subjects at first before they could optionally drop the subject. Therefore, early use of subject agreement should require an explicit subject present and marked for noun class. Copying is assumed to be directional from subject to verb.

An alternative is provided by the theory of Hierarchical Phrase Structure Grammar (HPSG) (Pollard & Sag, 1994; Murphy, 1997). They question the last assumption that copying is necessarily directional from subject to verb. Instead, they suggest that both the noun class marking on the subject and the prefix marking on the verb are dictated by a referential index in the world, so each can be supplied independently and achieve concord by sharing this index. Murphy suggests that agreement in Bantu languages might be “nondirectional”. If this model is correct, then the acquisition of noun class marking and subject agreement marking on the verb might be independent, and there is no expectation that subject agreement on the verb should be different for explicit versus absent (dropped) subjects.

The third alternative is the one presented by contemporary generative models of Bantu, in which the noun marking is generated in the lexicon. The subject begins in its base position inside the VP, and the subject noun moves from there to SpecAgrS. The verb moves to AgrS (after tense) and in that position is licensed to take the appropriate subject agreement marking by the subject, determined by its noun class. The subject can then be optionally dropped, or extraposed, leaving the subject agreement on the verb (See Figure 1).

The logical possibilities are as follows. If the subject rises to SpecAgrS, it can dictate subject agreement on the verb in AgrS. Such a verb would also have moved through the Tense node, so it would have tense as well:

Umfundi ufune imoto
 “The student wanted the car”

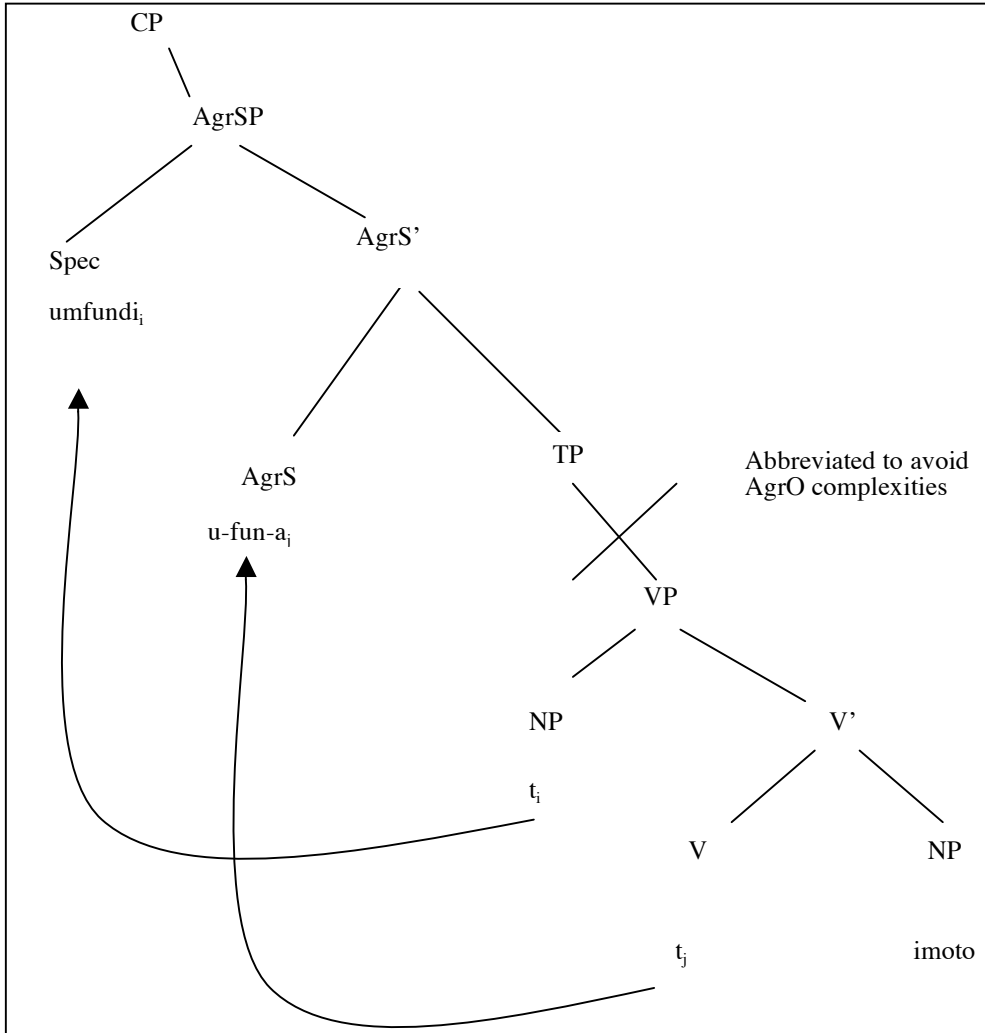
If the subject stayed in the verb phrase, the verb could move past the subject but then it could only get Tense, *not* subject agreement, because the subject would not be in the right position to license agreement. This is ungrammatical in adult Xhosa.

*Fune umfundi imoto

A final option is that the subject could move to AgrS and then outside the clause, then the verb should be marked for subject agreement (and Tense) and the subject would be after the object (Bearth, 2003).

Ufune imoto umfundi

Figure 1. *Movement of Subject and Verb from Base Positions.*



The generative model with movement and licensing predicts no particular difference for verb agreement between present and absent subject nouns, since the subject can be optionally dropped after movement. Subject noun marking *should* be present when subject agreement is marked, because it is generated in the lexicon and reflects the same noun class that dictates the subject agreement. However, since the noun class is an inherent feature of the noun, the noun could license agreement even if the noun class marker were absent. For example, the child could learn from the input that *mama* is a class 1 noun by hearing it used with that marker *umama*, but then produce it (e.g. for phonological reasons) just as *mama*. The distinctive prediction of the generative model is that it can predict variations in subject position correlated with subject agreement marking.

1.4. Summary of Predictions

<i>Simple Copy Model</i>	<i>HPSG Model</i>	<i>Generative Model</i>
<ul style="list-style-type: none"> • Subject noun class marking is obligatory if subject agreement is to occur in the verb. • Subject agreement on the verb should first emerge when there is an explicit subject present. • The subject will tend to appear before the verb when subject agreement is provided. 	<ul style="list-style-type: none"> • Subject noun class marking and subject agreement on the verb are independent of each other. • Subject agreement on the verb should be as likely whether an explicit subject is present or not. • There will be no particular connection between word order and subject agreement on the verb. 	<ul style="list-style-type: none"> • Subject noun class marking is expected when subject agreement is present on the verb. • Subject agreement on the verb should be as likely whether an explicit subject is present or not. • Subjects will appear both before the verb and after the verb in focus position when subject agreement is provided.

2. Method

2.1. Spontaneous Speech Samples

Eleven monolingual Xhosa speaking children from the township of Gugulethu outside of Cape Town were studied in naturalistic situations speaking with adults, usually a research assistant whose mother tongue was Xhosa. Transcripts were made of the speech of all participants and were checked by two native Xhosa-speaking researchers. The target adult-form utterance for each child utterance was provided, as well as an English gloss. Transcripts were recorded longitudinally once a month or once every two months for just over a year for two cohorts of children, ranging from 12 –28 months for the five 1-year-olds, and from 24 to 39 months for the six 2-year-olds (See Tables 1 and 2). Transcripts were combined into 6-month age bands to generate enough utterances for analysis.

Table 1. *1-year-old Cohort: Number of Utterances and Number of Samples () by Age Band.*

<i>Age</i>	<i>C1</i>	<i>C2</i>	<i>C3</i>	<i>C4</i>	<i>C5</i>	<i>Total</i>
<i>12-18m</i>	106 (4)	168 (4)	84 (5)	70 (4)	145 (6)	573 (23)
<i>18-24m</i>	79 (4)	186 (7)	113 (5)	112 (6)	92 (4)	582 (26)
<i>Total</i>	185 (8)	354 (11)	196 (10)	183 (10)	237 (10)	1155 (49)

Table 2. *2-year-old Cohort: Number of Utterances and Number of Samples () by Age Band.*

<i>Age</i>	<i>C6</i>	<i>C7</i>	<i>C8</i>	<i>C9</i>	<i>C10</i>	<i>C11</i>	<i>Total</i>
<i>24-30m</i>	80 (3)	152 (3)	142 (4)	45 (3)	149 (4)	72 (4)	640 (21)
<i>30-36m</i>	124 (3)	132 (3)	56 (2)	75 (3)	86 (3)	54 (2)	530 (16)
<i>36-39m</i>	69 (2)	92 (3)			104 (3)	50 (2)	315 (10)
<i>Total</i>	273 (8)	376 (9)	198 (6)	120 (6)	339 (10)	176 (8)	1485 (47)

2.2. Scoring Procedure

For each utterance containing a lexical verb we coded the noun class of the target subject and whether the subject noun was explicitly expressed or not. If the subject noun was present, the frequency with which the children marked its noun class (obligatory in the adult language) was scored. Nouns for which copulative prefixes were required were not considered in this analysis, since the copulative prefix modifies or replaces the noun class marker. Also coded was the position in the sentence (preverbal or post verbal) of any explicit subject noun. Then the verb was inspected for evidence of subject agreement marking. Since the research assistants had used the linguistic and non-linguistic context of the conversation to determine the target utterance the child was aiming at, it was possible to determine whether subject agreement was correctly supplied or not. Finally, the different noun roots and verb roots were identified to examine the lexical specificity of the children's acquisition of noun class marking and subject agreement. The percentages of both noun class marking and subject agreement markers supplied in obligatory contexts were computed for each child for each age band. Table 3 shows the number of obligatory contexts for subject agreement noted at each age.

Table 3. *Number of Obligatory Contexts for Subject Agreement.*

	<i>12-18m</i>	<i>18-24m</i>	<i>24-30m</i>	<i>30-36m</i>	<i>36-39m</i>	<i>Total</i>
<i># Contexts</i>	43	36	87	82	47	295

3. Results

3.1. *Pattern of Acquisition and Errors in Subject Agreement*

There was parallel development over this age period 1;0-3;3 in both noun class marking on the nouns and subject agreement marking on the verbs (see Figure 2). As found in other studies of Bantu language acquisition (Deen, 2004), agreement marking did not appear to be learned in any piecemeal fashion, verb by verb or noun class by noun class. Instead, marking of subject agreement in obligatory contexts increased probabilistically across many verb roots and several noun classes, especially between the ages of 24 and 36 months. For example, between age 24 and 30 months the children correctly used subject agreement markers on between 5 and 16 different verb roots, 41.7% to 84.2% of the total number of verb roots that appeared in obligatory contexts for subject agreement marking for the different children. Across all the children, 66.7% of the verb roots that were marked for subject agreement also appeared without a marker in obligatory contexts. The individual children produced subject agreement markers for between 4 and 7 different noun classes in this same time period. Errors were almost all errors of omission: 139 out of 143 errors of subject agreement across all the transcripts were omissions (97.2%). That is, substitution errors were vanishingly rare, as has been reported previously for Sotho and Swati (Demuth, 2003).

3.2. *Relation between Noun Class Marking and Subject Agreement*

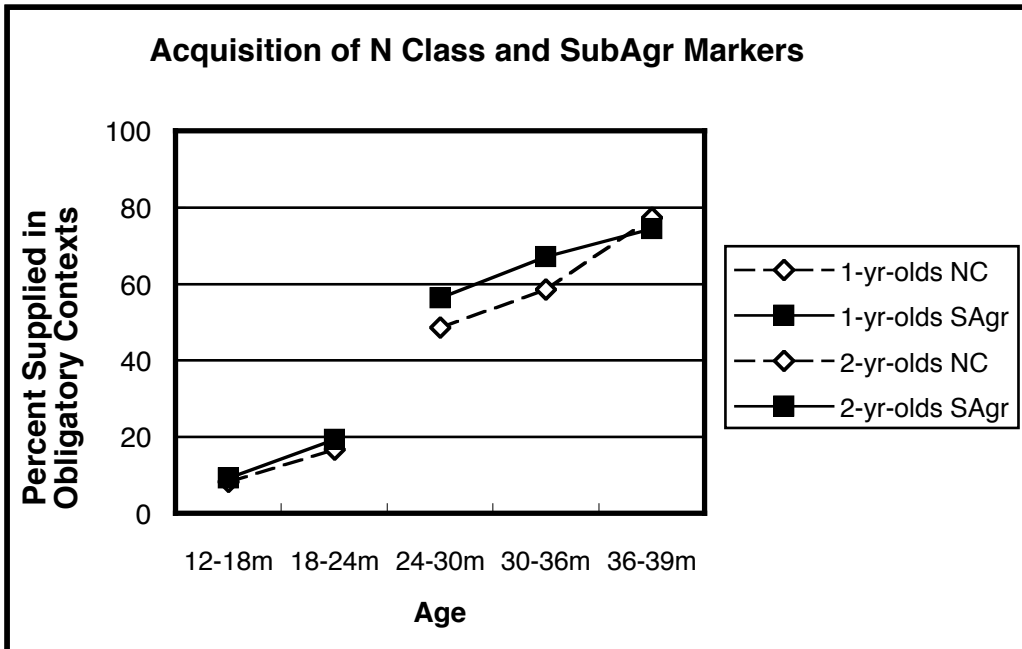
The next question is, what is the relationship between noun class marking and subject agreement when an explicit subject noun is used in the sentence? The simple Copy theory would predict an essential relation between them, since the marker is copied from the subject noun to the verb. The prediction would be that the following two patterns should occur:

1. noun class marker present → subject agreement present.
2. noun class marker absent → subject agreement absent.

A third pattern could occur if there was a failure of copying:

3. noun class marker present → subject agreement absent.

Figure 2. Acquisition of Noun Class and Subject Agreement Markers.



However, on a simple Copy theory the noun class marker should not be absent when the subject agreement is supplied:

4. *noun class marker absent + subject agreement present.

In contrast, HPSG predicts that supplying each marker is independent of the other since both are dictated by a referential index out in the world, so all four possibilities should occur. The generative model in its simplest form would also predict that the first three possibilities are most likely. However, given considerations of phonological constraints, the fourth is not a contradiction.

The results in Table 4 reveal that option 4, in which the noun class marker is missing from the subject noun but the agreement is nevertheless present on the verb, accounts for 31% of the cases observed, in fact being the most frequent of the four possibilities.

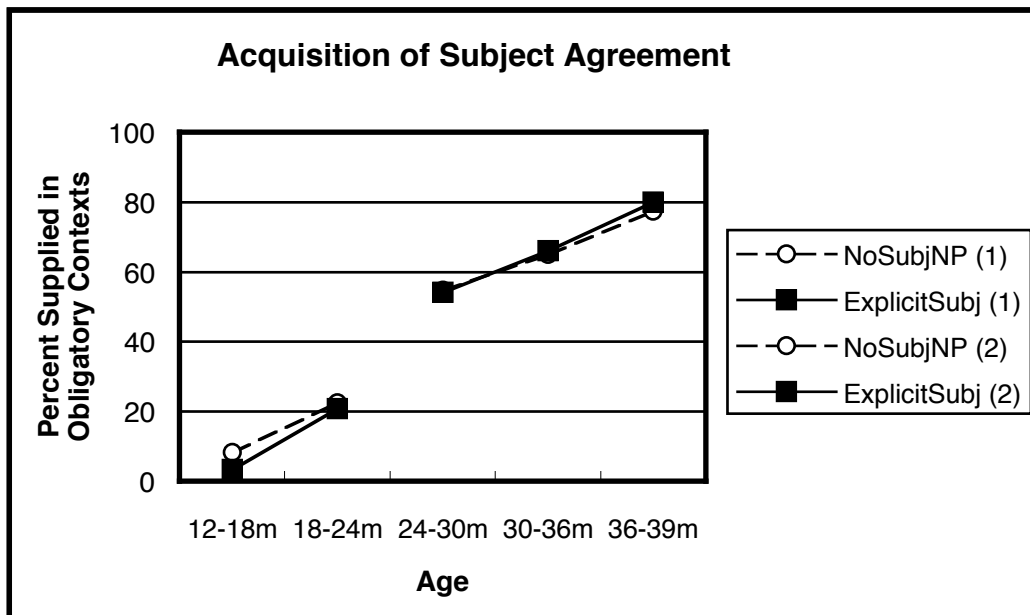
Table 4. *Different Patterns of Occurrence of Noun Class Marking and Subject Agreement Marking with Explicit Subject Nouns.*

	<i>NounClass + SubjAgr+</i>	<i>NounClass 0 SubjAgr 0</i>	<i>NounClass + SubjAgr 0</i>	<i>NounClass 0 SubjAgr +</i>
<i>% Observed</i>	27.3%	22.7%	18.2%	31.8%

3.3. *Explicit versus Empty Subjects*

A simple Copy model would also be incompatible with subject agreement being present on the verb when there is no explicit subject in the sentence to host the noun class marking. However, the children produce frequent sentences in which there is no explicit subject and yet subject agreement is present on the verb. Figure 3 shows that there is in fact no difference at any age in the likelihood of the child supplying the subject agreement as a function of whether the subject is explicit or not. There was not enough data from each child in the 1-year-old cohort for meaningful statistics to be performed, but a repeated measures ANOVA on the data from the 2-year-olds revealed a significant main effect for age ($F(2,2)=37.95$, $p=.026$) but no effect for whether there was an explicit subject noun or not ($F(1,3)=1.85$, $p=.267$).

Figure 3. *Acquisition of Subject Agreement Marking on the Verb with Explicit or Empty Subjects.*



3.4. Order of Subject and Verb

Only the generative model makes specific predictions about the relative order of subject and verb as a function of the presence of subject agreement. The graph in Figure 4 reveals a surprising change occurring at around 2 years of age. The youngest cohort significantly prefers to have post verbal subjects, and most often leaves off subject agreement in these sentences. However the older children increasingly prefer preverbal subjects, and increasingly mark subject agreement on their verbs. These data are predicted under a generative model in which the post verbal subjects have not moved from the VP, hence have not entered the correct position to license subject agreement on the verb. By age 2, there is increasing evidence from the children's grammars that the subject has moved to SpecAgrS and the verb to AgrS.

The question that this raises is: does the verb move at all in the first stage? In fact, in the one-year olds' sentences with *post* verbal subjects, verbs are often marked for tense. This means the verbs have moved to T, but not to AgrS. The most likely account is that the subjects stayed in their base position in the VP, and the verbs moved over them to T.

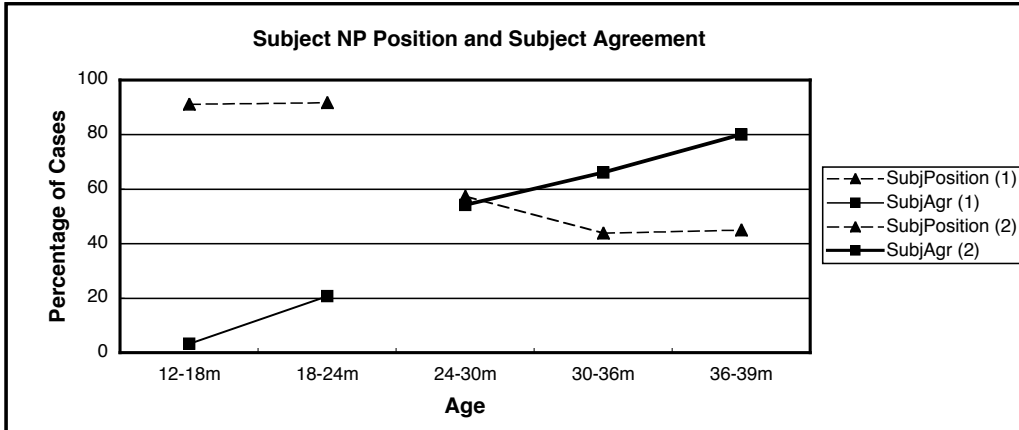
A smaller percentage of subjects in the one-year-old data are preverbal, and the verb lacks subject agreement. For this to happen, both subject and verb must have stayed in base position, therefore such a verb should necessarily lack tense as well. A tensed V would necessarily *precede* a subject left in VP. Unfortunately there are only three relevant cases with preverbal subjects and no subject agreement (because post verbal subjects predominate). Two of these utterances are apparently spontaneous and lack tense, as predicted. The third is an imitation of a preceding utterance, that drops noun marking and subject agreement but retains tense. So the very tentative conclusion is that early subjects are still VP internal.

4. Discussion

4.1. How the Different Theories Compare

The simple Copy theory is clearly defeated by these results. Two facts stand in its way: the agreement on the verb occurs in the absence of the noun class marker that is supposed to "copy", and agreement appears as often when there is no explicit subject than when the subject is present.

Figure 4. *Relationship between Subject and Verb Ordering and Emergence of Subject Agreement.*



HPSG can account for both of these results with its assumption of non-directionality, or the idea that both markings are dictated by a referential index independent of either subject or verb. However, the cost to an HPSG account is the need to posit a referential index in addition to the lexical marking of the noun class. If the noun classes in Bantu were semantic in nature, there might be some value in positing e.g. a referential index carrying a feature say, of “humanness” that dictated noun class and agreement. But any such semantic features, if they existed in the past, are now thoroughly dispersed and the best characterization of the noun classes is formal, not semantic. Finally, HPSG offers no special account of why the order of verb and subject noun position might vary with agreement.

A generative approach makes several assumptions that go beyond surface considerations. For example, subjects are presumed to be “dropped” when they are absent in the surface structure. Also, the absence of noun marking must be given a phonological explanation, because the noun class must be established in order to license the correct subject agreement, and the noun class marker is the only guide to noun class.

However, there is one possibility to be explored further. Recent analyses of Xhosa have differentiated it from most of the Bantu languages by positing that the noun marking is actually bi-morphemic. What has traditionally been held to be a single morpheme designating noun class seems to have two parts in Xhosa (and Zulu). The first part is traditionally called the pre-prefix, and contemporary linguists have good evidence that it may carry some of the functions of a determiner (du Plessis, 1997; Visser, 2006). The second part is the prefix, and has close phonological and historical ties to the noun prefixes in related Bantu languages. In standard texts that teach Xhosa, there is discussion of how sometimes it is the pre-prefix that carries over as the subject agreement marking, and sometimes it is the prefix itself (notice that this alone vastly complicates the simple Copy model). The contemporary analysis in terms of a pronominal determiner simplifies the discussion by arguing that sometimes the prefix is null. For example, in Class 1, the noun marking is /u/. This is traditionally said to carry over to the verb agreement, wherein the verb also starts with /u/:

Utata uhamba
The father goes

On the analysis of pre-prefixes as determiners, the /u/ is actually the determiner, and the prefix or noun class marking is 0. The subject agreement marking is conditioned by this noun class, but no “copying” occurs. This raises the question of the correct analysis of the child’s early utterances such as:

Tata uhamba

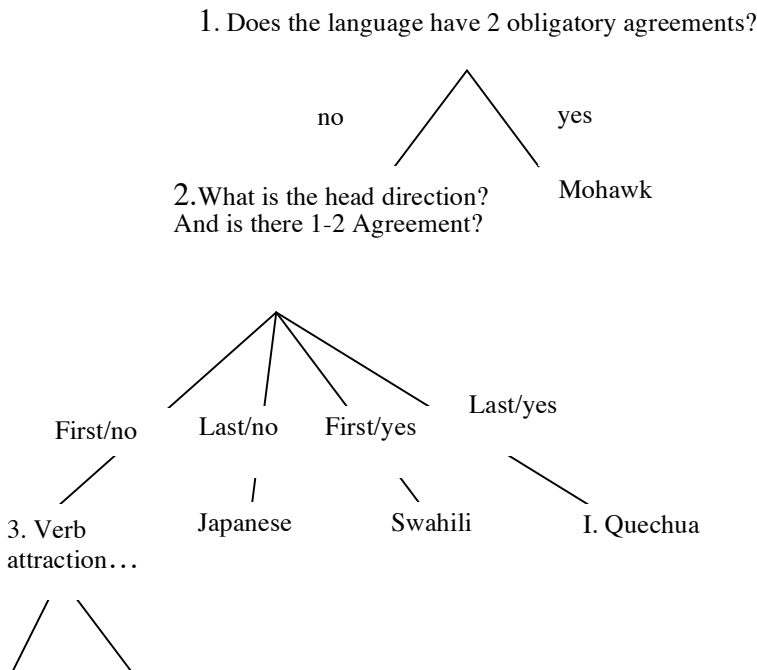
In fact, the child might be correctly supplying the noun class prefix (zero), but dropping the pre-prefix or determiner. We examined all the cases in the one-year-old data that had both an explicit subject and a present subject agreement marker. There were only thirteen such cases (explicit subjects being rare at this stage). Ten of the thirteen cases are instances in which under the new analysis, the subject noun agreement is actually zero. So the need to posit a special phonological reduction rule applying to nouns is much reduced: a grammatical account, in which the determiner is initially subject to deletion but noun class marking is present, may cover most of the data.

4.2. Baker's Hierarchy

The question that remains is why does the change in grammars happen from one to two years old? In lots of respects the changes in the grammar seem gradual and continuous, for example in the graphs of percentages of supplied noun marking, or the rate of subject agreement. However the figure of subject-verb order suggests more of a contrast between the one and the two year olds, as if the grammar has shifted in some crucial respect. Here we introduce a speculation that the child has set two parameters related to head direction and agreement in the latter half of the second year of life.

Baker (2005) put forward a hierarchical tree of how parameters for the worlds' languages might be set in child grammars. He posits that the very first decision is not in fact Head direction, but whether or not the language is of the rare type that obligates subject *and* object agreement, like Mohawk. It is interesting to note that Bantu languages have both subject and object agreement, but object agreement is not obligatory. It is conditioned by such aspects as specificity (see Deen, 2004, for Swahili) and type of grammatical verb tense (see Gxilishe et al., 2006, for Xhosa; Buell, 2006, for Zulu). This might necessarily take some evidence from the input to sort out, evidence that seems to be accumulating by age two when object agreement begins to co-vary with verb tense in Xhosa (Gxilishe et al., 2006).

Figure 5. *The first portion of Baker's hierarchy of parametric decisions.*



Once the 2-agreement parameter is established, the next decision in Baker's hierarchy is a joint setting of two parameters: Head Directionality and 1-2 Agreement (i.e. whether the language has obligatory subject and optional object agreement). His examples of the settings "head direction =

first” and “1-2 agreement = yes” are the Bantu languages, Chichewa and Swahili. Xhosa has the same parameter settings.

Baker’s model fits our observed data. At about age 24 months, the children’s grammars seem to undergo a change in which preverbal subjects appear and verbs take on subject agreement (and optional object agreement (Gxilishe et al., 2006)). The suggestion is that the one year olds have set *neither* the 1-2 Agreement nor Head Directionality parameters, and the pattern of subject position and agreement after age two reflect the systematization of the grammar following this parameter setting.

Notes

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