Abstract

This study investigates the acquisition of inflectional prefixes in Swahili, an eastern Bantu language. The order of morphemes in adult Swahili is: Subject Agreement – Tense – (Object Agreement) – Verb Root – (derivational suffixes) – Mood Vowel. I present data from an original corpus of 4 Swahili-speaking children (ages 1;8-3;0) who were recorded in Nairobi, Kenya. An analysis of the children's verbal utterances reveals that four clause types occur in the speech of all four children:

a.   Agr–T–Verb Stem   Full Clause

b.   Ø–T–Verb Stem   [-SA] Clause

c.   Agr–Ø–Verb Stem   [-T] Clause

d.   Ø–Ø–Verb Stem   Bare Verb Stem

Of these four, only full clauses and [-SA] clauses are permitted by adults in this non-standard dialect of Swahili. A review of five influential theories on the acquisition of morphosyntax (the Metrical Omission Model, Gerken, 1991; the Truncation Hypothesis, Rizzi, 1994; the Underspecification of T, Wexler, 1994; the underspecification of Agr, Clahsen *et al.* , 1996; and the underspecification of Agr and T, Schütze & Wexler, 1996) shows that the data support the Agr-Tense Omission Model (Schütze & Wexler, 1996) in showing that agreement and tense may be optionally and independently underspecified.

The Acquisition of inflectional Prefixes in Nairobi Swahili:

It is well known that children from a wide variety of languages omit various inflectional morphemes. Children acquiring English, for example, commonly omit determiners, copula verbs, agreement markers, etc. (Brown, 1973). Moreover, the omission of such functional elements is not restricted to a small number of languages or to particular typological groups. The omission of functional elements is observed in languages as diverse as English, French (Pierce, 1989), German (Behrens, 1993), Dutch (Haegeman, 1995), Spanish (Grinstead, 1994), Japanese (Sano, 1995), Basque (Meisel & Ezzeizebarreña, 1996), Sesotho (Demuth, 1992a; 1992b), Siswati (Kunene, 1979), Zulu (Suzman, 1991), Quechua, Navajo (Courtney & Saville-Troike, 2000), etc.

This study investigates the acquisition of verbal morphology in a dialect of Swahili spoken in Nairobi, Kenya. Swahili is an agglutinative language with phonologically distinct affixes for subject agreement (encoding person and number, and in some cases gender), tense/aspect, object agreement and mood. The study focuses on the acquisition of subject agreement and tense, with some discussion of the acquisition of mood. I find that Swahili children omit both subject agreement as well as tense at early stages. I conclude that phonological theories on the omission of functional morphology do not adequately explain the Swahili data, but that the data are more consistent with syntactic underspecification models for the omission of inflection. Specifically, I argue that Schütze & Wexler's Agreement-Tense Omission Model (ATOM) accounts for all the omission facts. This article is divided into five sections.

Section 1 provides an overview of the morphosyntax of Swahili with particular attention given to the facts pertinent to the acquisition data. An analysis of Swahili as a null subject

language is provided, as well as the description of a new set of facts about the omission of subject agreement in adult Nairobi Swahili. A topic construction is proposed to account for this new fact, a proposal that becomes useful in the analysis of the omission of subject agreement in child language.

Section 2 provides the methodological details of the study (including the information on the children, the amount and quality of data, the way the data were organized and analyzed, etc.). Section 3 starts with a discussion of various theories of the omission of inflection in child language, including phonological accounts (e.g., Gerken's (1991) Metrical Omission Model), and syntactic accounts (e.g., Rizzi's (1994) Truncation Hypothesis, Clahsen, Eisenbeiss & Penke's (1996) underspecification of Agr theory, Schütze & Wexler's (1996) Agr-T Omission Model). The Swahili acquisition data are introduced in section 4, showing that children omit subject agreement and tense seemingly optionally and independently. In section 5 each theory is evaluated against these new facts and it is found that the theory most compatible with the Swahili facts is Schütze & Wexler's (1996) ATOM. I conclude in section 6.

1.0 Swahili morphosyntax

Swahili is an eastern Bantu language spoken in Kenya, Tanzania and other areas of East and Central Africa.   This study investigates the acquisition of Nairobi Swahili, a dialect that differs from Standard Swahili in significant ways. Henceforth, when I refer to Swahili I am referring to Nairobi Swahili, unless otherwise noted.

The minimal verbal complex in Swahili consists of the following elements:

(1)   Subject Agreement – Tense – Verb Root – Indicative Mood

In addition to these elements, object agreement may occur between tense and the verb root when the object is specific, and up to three additional suffixes may occur between the verb root and the Indicative Mood final vowel. Neither of these are relevant for the remainder of this review, and so I will not describe them further, instead focusing on subject agreement (henceforth SA) and Tense (henceforth T).

SA is a portmanteau morpheme that encodes both person (1st, 2nd, and 3rd) and number (singular and plural). The full paradigm for animate SA is given in table 1. T is also portmanteau morphology encoding tense and aspect. Table 2 shows a sample of T markers that occur in Swahili (see Ashton (1947) for a full discussion of these markers).

Table 1. Subject Agreement Paradigm

Subject Agreement Marker	Specification
Ni	1st person, singular
U	2nd person, singular
A	3rd person, singular
Tu	1st person, plural
Mu	2nd person, plural
Wa	3rd person, plural

Table 2. A selection of T markers

Tense/Aspect Morpheme	Meaning
li	past
na	present on-going/habitual
ta	future
ka	Narrative, resultative
me	present perfect
sha	present perfect completive
ku	infinitival

While the canonical word order of Swahili is Subject-Verb-Object, the subject may be left null, as in example (2b):

(2)   a.   Juma   a - na - m – pend - a   Mariam   S – V – O
            Juma   SA$_{3s}$-Pres- OA$_{3s}$- like - IND   Mariam
            'Juma likes Mariam'

b.   A - na - m – pend - a   Mariam   Null Subject
            SA_{3s} - Pres- OA_{3s}- like- IND   Mariam
            'He likes Mariam'

Swahili conforms to Rizzi's (1986) theory of null subjects in which it is argued that the correspondence between null arguments and 'rich agreement' (Taraldsen, 1978) is due to the requirement that null elements be identified. The presence of rich agreement provides a mechanism for identification of the silent element. The examples in (2) show that Swahili allows null subjects, and thus SA in Swahili is sufficiently rich to identify the null subject.

Assuming Baker's (1988) Mirror Principle, which states that the linear order of morphemes is a function of the hierarchical order of functional projections, I assume the following structure of an adult Swahili sentence (with irrelevant projections omitted) [1]:

(3)

      AgrSP
        2
    SA   TP
           2
       T   AgrOP
              2
          OA   MoodP
                2
         V_i - Mood   VP
                  2
              $[t_i]$

The linear order of preverbal functional morphemes in Swahili (SA-T-OA) follows directly from this structure. However, as a reviewer points out, the postverbal position of Mood appears to contradict the Mirror Principle, i.e., if the Mirror Principle is taken literally, the expected order of morphemes is SA-T-OA-Mood-Verb. I assume, following Ngonyani (1996), that the verb in Swahili raises minimally to Mood, thus deriving the relative order SA-T-OA-Verb-Mood.

1.1   The Omission of SA

In this section I report on a new phenomenon in which adult speakers in this dialect of Swahili allow the omission of SA in certain discourse contexts. I refer to such clauses as [-SA] clauses, exemplified below:[2]

(4)   Ø ta – ku – chapa – a   1st sing.
       fut–OA$_{2s}$ – slap–IND
        '(I) will slap you'

(5)   Ø na – ju – a   ku–wach– a   kelele ?   2nd singular
         pres–know–IND inf–leave–IND noise
       '(Do you) know how to stop making noise?'

(6)   n–dege   Ø na – ruk – a   3rd singular
       9-bird   pres–fly up–IND
       'The bird is flying up'

As can be seen above, the omission of SA is not restricted to any particular tense (present and past are shown here, but other tenses are also possible) or any person (1st, 2nd, and 3rd person are shown here). These facts (along with the additional facts presented below regarding [-SA] clauses in adult Swahili) were confirmed with grammatical judgments from two native speakers from Nairobi.

Given Rizzi's theory of identification, in the absence of agreement (as in these [-SA] clauses), null subjects are expected to be completely absent. In other words, because 'rich' agreement is absent in these clauses, null *pro* is not identified and thus cannot arise. Therefore every [-SA] clause should occur with an overt subject.

A naturalistic corpus of adult-child interaction was collected in Nairobi, Kenya. Four children and their primary care-givers were recorded individually and the utterances of the parents and children transcribed and coded in CHAT format (MacWhinney, 2000). More details of the children will be given further below. An analysis of the parents' speech revealed that in

the [-SA] clauses that they produced, null subjects occurred at great frequency (see table 3 below).[3]

Table 3. Overt and null subjects in full and [-SA] clauses

	Overt Subjects	Null Subjects	Total
Full Clauses	230 (16%)	1150	1380
[-SA] Clauses	29 (40%)	43	72

While the rate of overt subjects is elevated relative to that in full clauses (40% versus 16%), it is far from the expected 100%. Assuming Rizzi's identification requirement, this is a surprising fact – 43 out of the total 72 [-SA] clauses are examples of null subject sentences in which there is no obvious identifier. In order to account for this apparent violation of the identification requirement, Deen (2002) proposed an analysis of the omission of agreement that involves a null-constant Topic-Operator construction[4], as in Rizzi (1992; 1997). It is proposed that the omission of agreement occurs when the subject position is occupied by a null constant – an element that checks case but has no phi-features to license agreement. This null constant is silent, and thus like all other silent elements is subject to the identification requirement. Following Rizzi (1992), I argue that the null constant is bound by an anaphoric topic operator, and it is through this binding relationship that the null constant receives identification. Rizzi claims that this topic operator in languages such as German is typically optionally null, i.e., it can optionally occur null or overt, depending on discourse considerations. Applying this to Swahili, the overt 'subject' that occurs in 40% of [-SA] clauses is the overt manifestation of this topic operator, while the 60% of null 'subject' [-SA] clauses are the null manifestation of this topic operator. I propose the structure shown in (7) below for [-SA] clauses.

(7)

```
┌─────────────────┐
│ Discourse Topic │
└─────────────────┘
        │          TopP
        │          2
        │   Operator    Top'
        │      │        2
        │      │           AgrSP
        │      │           2
        └──────┘        nc      AgrS'
                                2
                              Ø      TP
                                     2
                                        T'
                                        2
```
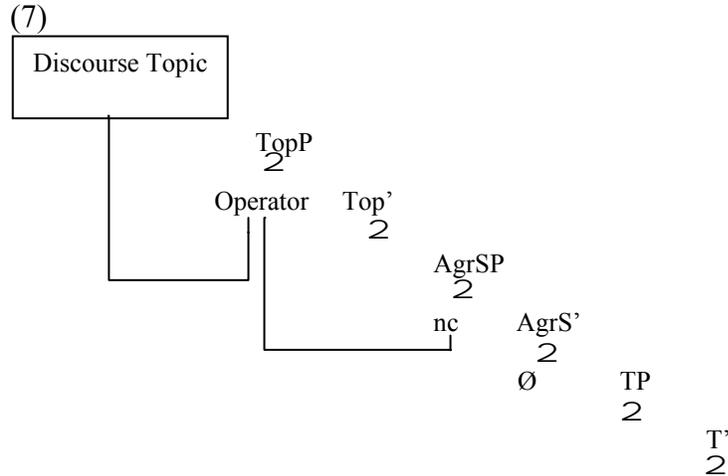
In order to test this hypothesis, I conducted several well-known tests of topic-hood on [-SA] clauses in adult Swahili using two native speaker consultants. Topics in general cannot be quantifiers, and cannot be the answer to a wh- question (as exemplified in the a. examples in 8 and 9 below). I show that the preverbal DP in a [-SA] clause cannot be a quantifier (8c) and cannot be the answer to a wh- question (9c). This strongly suggests that the preverbal DP in a [-SA] clause is in a topic position.

(8) a. *Everything, I did (it)
         *Nothing, (it) is impossible

     b. Kila mw-anafunzi a – na – som – a   ki – tabu
          Every 1-student   SA$_{3s}$–pres–read–IND 7–book
          'Every student is reading a book.'

     c. * Kila mw-anafunzi Ø – na – som – a   ki – tabu
           Every 1-student   Ø pres–read–IND 7–book

(9) a. Who arrived early?
         - John arrived early
         - ?? As for John, he arrived early

     b. nani   a – li – fik – a   mapema
         who SA$_{3s}$–past–arrive–IND early
         'Who arrived early?'

7

c.   ?? Juma   Ø – li – fik – a   mapema
           Juma,   past–arrive–IND early
           'Juma, he arrived early.'

I thus conclude that in adult Nairobi Swahili the omission of SA involves a null constant topic construction.

2.0   Methodology

The data were collected in Nairobi, Kenya. Four children were identified who were between the ages of 1;8 and 3;0 at the first recording time, had Swahili as the primary language in the home, had no physical or neural impairment that impeded speech, and were available for recording at the appropriate intervals. Below is the relevant information for each child:

Table 4. Children's names, age ranges and number of recordings

Child	Age Range	Number of recordings
Hawa (girl)	2;2.01 – 2;6.05	07
Mustafa (boy)	2;0.16 – 2;10.10	23
Fauzia (girl)	1;8.19 – 2;2.07	10
Hassan (boy)	2;10.13 – 2;11.25	04

Table 5. Mean Length of Utterances for the four children

Child	Starting MLU	Ending MLU
Hawa	1.54	2.46
Mustafa	1.52	3.57
Fauzia	2.97	3.35
Hassan	3.15	4.23

The children were recorded in their homes every two weeks or so. Hawa was recorded for four months; Mustafa was recorded for ten months; Fauzia was recorded for six months; and Hassan was recorded for 2 months. I traveled to each home with the recording equipment and some toys. The recording equipment consisted of a Sony Pro Walkman and one Sony external microphone, both of which were minimally conspicuous. The toys included dolls, toy cars, etc., all of which were culturally appropriate.[5] I attempted to have the primary care-giver present, as

this eased the child's anxiety and thus resulted in the most productive sessions. I also requested that all other children below the age of 7 not be included in the sessions as this tended to result in physical play rather than verbal conversations. Each recording session lasted between 1 hour and 1.5 hours.

Transcription began as soon after the recording session as possible, and morphological coding was conducted simultaneously. Coding was then independently verified in the following two manners. First, 50 random utterances from each transcript were extracted and checked by a second native speaker within two weeks of the initial recording.[6] Second, one year after the initial transcriptions and coding, 30 random utterances from each transcript were extracted and re-coded by the experimenter. In both the above cases, a reliability rate of over 95% was achieved.

I used three measures of grammatical maturity to group the data into four developmental stages.[7] The measures were Mean Length of Utterance (MLU), V ratio (the proportion of verbal utterances to the overall number of utterances, a measure used by, for example, Valian, 1991), and the proportion of Mono-syllabic Placeholders, or filler syllables (Peters, 1993; Bottari, Cipriani & Chilosi, 1993).   I found that the corpora could be broken into four stages, with three children falling into three different stages, and the fourth child spanning three stages. This is shown below.

Table 6. Division of corpora into four stages

Stage 1	Hawa, Mustafa01
Stage 2	Mustafa02
Stage 3	Mustafa03, Fauzia
Stage 4	Hassan

3.0   Theories of the Acquisition of Inflection

In this section I present several influential theories in child language that have attempted

to account for the omission of inflectional morphology in child language. Each theory is based

on (primarily) Western European languages (English, French, Dutch, German, Italian, and a few

other languages). It should be noted that none of these theories were posited with a language

such as Swahili in mind, but because of the individual marking of tense and agreement in

Swahili, it is an excellent test case for each theory. I discuss the core features of the following

theories: The Metrical Omission Model (Gerken, 1991; Gerken & McIntosh, 1993), the

Truncation Hypothesis (Rizzi, 1994), the underspecification of Tense (Wexler, 1994), the

underspecification of Agr (Clahsen et. al. 1996), and the underspecification of Tense and Agr

(Schütze & Wexler, 1996). I discuss the predictions that each theory makes about the acquisition

of inflectional prefixes in Swahili. I then present the results of my analysis of the child corpora,

followed by an evaluation of how well each theory does against this new child data.

3.1   Metrical Omission Model (Gerken 1991; Gerken & McIntosh, 1993)

It has long been noted that children learning English typically omit determiners in

obligatory contexts (Brown, 1973; Radford, 1990; Hoekstra & Hyams, 1995; Hoekstra, Hyams

& Becker, 1996).

(10)   a.   Eve sit floor   (Brown, 1973)
        b.   Hayley draw boat   (Radford, 1996)

Gerken (1991) and Gerken & McIntosh (1993) propose that children have less processing

capacity than adults, which leads to constraints on the production of phonological segments.[8]

These production constraints prevent children from expressing a full linguistic representation by

forcing them to produce only syllables that conform to their language-appropriate metrical

pattern. Specifically, children omit weakly stressed syllables that either fall outside the metrical pattern that is typical of their language or syllables that occur as part of a non-typical metrical foot. There are two possible metrical patterns in languages, and individual languages differ as to their preferred metrical pattern. A trochaic foot is one in which the syllabic stress pattern is Strong-Weak (11a), while an Iambic foot has the pattern Weak-Strong (11b)[9]. The trochaic foot is the basic meter used in the production of English words (see Cutler & Carter, 1987), while French makes use of Iambic feet as the basic metrical pattern.

(11)   a.   monkey   Trochaic foot
                 S - W

        b.   giraffe   Iambic foot
                 W - S

      Gerken proposes that there is a trochaic template operating at the level of foot formation or head location.[10] Because of the constraints on production, children must target material for optional omission. The Metrical Omission Model (MOM) states that weakly stressed syllables are targeted for omission, never strong syllables. Furthermore, children prefer binary feet, and cannot leave any strong syllables unparsed[11]. Because English is a trochaic language, English speaking children apply a trochaic template to their production system and maximize the number of trochaic feet in any particular string. Furthermore, in a trochaic language such as English, children tend to drop weak syllables that are part of an iambic foot (the dispreferred pattern, as in (12a)), and weak syllables that precede a fully formed trochaic foot (as in 12b). Crucially, however, weak syllables in a trochaic foot are not subject to omission (12c).

(12)   a.   the ball
                [W-S]   Weak Syllable in Iambic foot
                └─────────────────── Subject to Omission

        b.   the mon key
                W [S - W]   Weak pretonic syllable
                └─────────────────── Subject to Omission

c.   mon key
                [S – W]   Weak syllable in Trochaic foot
                     ↑_____ Not Subject to Omission

Notice that in both (12a) and (12b) the syllables that are subject to omission are

determiners.   This has the desirable prediction that determiners will be particularly prone to

omission because of the metrical pattern of English and the placement of determiners in English.

As the child's processing capacity improves, the omission of determiners decreases until they

reach adult-like proportions.

Demuth (1994) uses the MOM to show that Sesotho children omit both noun class

prefixes and verbal prefixes based largely on these principles. She shows that Sesotho has

penultimate lengthening which produces trochaic feet at the end of all prosodic words. This

creates a trochaic bias, which when coupled with the principles of the MOM predicts omission of

preverbal affixes. Following are her examples (18) from a child aged 2;1:

        (13)   a.   ta hâ:na
        adult form: [ke – a – hán – a +]
                         SA_{1s} – pres – refuse – IND
                        'I refuse.'

                b.   áy shépa
        adult form: [ó – a – sháp – a +]
                        SA_{1s} – pres – lash – IND
                        'S/he is lashing.'

        These results being from Sesotho, a related Bantu language, may be indicative of

what may be expected in Swahili. Because Swahili too has primary stress on the penultimate

syllable, Swahili children may behave like Sesotho children in omitting the verbal prefixes. One

complicating factor is that Swahili has secondary stress that usually falls on the SA marker,[12]

making SA a strong syllable. Thus a typical Swahili verbal complex is parsed in the following

way:

(14)   secondary   primary
           stress   stress
             | |

ni – me – fik – a
SA_{1s}–PERF–arrive–IND
   [S   W] [S   W]   ←   Parsed as two trochaic feet

Because trochaic feet are preferred in Swahili and in order to maximize the number of feet, this string would be parsed as two trochaic feet. This means that the MOM predicts that Swahili children (unlike Sesotho children) should omit no verbal prefixes when the T marker is monosyllabic. As the T marker increases in length, all initial syllables will be omitted since they are unparsed weak syllables.

3.2   Truncation (Rizzi 1994)

Rizzi (1994) proposes that early grammars optionally fail to project the entire CP, producing truncated structures. Rizzi's primary concern involves Root Infinitives (RIs). RIs are optional, they occur in unraised positions, and typically do not occur in wh- questions. Based on these facts, Rizzi proposes that young children differ from adults in that the adult axiom of 'Root=CP' is not operative in child grammar. Children can optionally specify the root as any projection, and can thus have a truncated structure. While the adult must project a structure as high as the root CP for every declarative clause, the child can optionally project to a lower position, e.g. AgrOP. In the case of RIs, the child projects to a position lower than TP, and hence produces a tenseless clause.

(15)

CP
  C
  AGRSP
    AGRS
    TP
      T
      AGROP
        AGRO
        MoodP
          Mood
          VP
            V

Root=CP

AGROP
  AGRO
  MoodP
    Mood
    VP
      V

Root=AgrOP
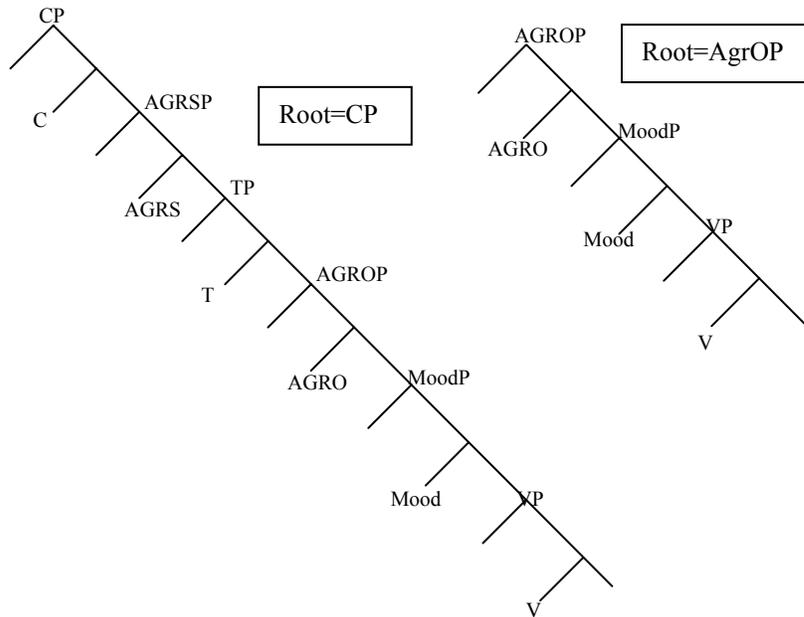
The optionality of RIs is accounted for by the absence of the axiom root=CP. Since children can optionally specify the root as any projection in the structure, RIs can optionally occur. Furthermore, according to Rizzi, RIs occur in structures that are truncated below TP. Thus RIs occur in structures that are missing all projections above TP, including the CP. Recall that RIs rarely occur in wh- questions: a fact that is elegantly accounted for under this proposal since the presence of a wh-question necessarily entails a CP projection, hence everything below the CP (including Tense) must also be projected.

A crucial property of truncation is that when a particular projection is specified as the root by the child, all the structure up to that point is projected. This means that any omission in the grammar of the child occurs at the higher periphery, and cannot target specific projections internal to the sentence. This is important when considering the predictions that the Truncation hypothesis makes for child Swahili.

Assuming a strong version of Baker's (1988) Mirror Principle that states that the linear order of morphemes is a reflection of the hierarchical phrase structure, and further assuming that

the mapping from morphology to syntax is transparent, the Truncation Hypothesis predicts that

the following clause types should be possible:

(16)   Possible clauses according to truncation:
        I.   SA-T-V-IND   Full Clause
        II.   Ø-T-V-IND   [-SA] clause
        III.   Ø-Ø-V-IND   Bare Stem
        V.   Ø-Ø-V-Ø   Bare Root

Furthermore, Truncation makes predictions regarding what sorts of clauses should NEVER occur

in Swahili – the child cannot omit any intervening material. Therefore the following clause types

are excluded by truncation:

(17)   Excluded clause types, according to truncation:
        I.   SA-Ø-V-IND   [-T] clause with SA
        II.   SA-T-V-Ø   [-Mood] clause
        III.   SA-Ø-V-Ø   [-T] clause without Mood
        IV.   Ø-T-V-Ø   [-SA] clause without Mood

The remaining three theories assume that children project each sentence all the way to

CP, and so are often referred to as Full Clause Hypotheses. However, in order to account for the

particular unadult-like characteristics of child speech, specific heads are assumed to be

underspecified. Underspecification can mean either that a feature matrix on a particular head is

empty (be it an entire feature bundle or an individual feature, e.g., a case feature), or that the

feature has no value. Thus the difference between adults and children is localized to a particular

head or heads. I will now discuss the three versions of underspecification that I believe have the

most relevance to Swahili.

3.3   Underspecification of Tense (Wexler 1994)

        Wexler (1994) points out that infinitives in adult languages like German and Dutch occur

in embedded clauses, they license PRO, and they can be used gerundively. These properties are

thought to derive from the absence of tense in infinitives. Wexler argues that children have the

option to underspecify tense in main clauses, giving rise to RIs.   This leads to the natural

correlation of null subjects and RIs as PRO is licensed in non-finite contexts.

There are three pieces of evidence that suggest an underspecification of Tense in child

RIs:

(i)   The form that occurs is an infinitive, which in the adult language is tenseless;

(ii)   RIs occur in unraised positions, which correspond to tenseless verbs in the adult

language;

(iii)   RIs correlate with null subjects, which by hypothesis are PRO licensed in tenseless

environments.

Furthermore, Wexler argues that English bare verbs as in the examples in (18) and

RIs in German, French, etc. result from the same underlying mechanism.

(18)   a.   He fall down   Nina (2;1.29), Suppes, 1971
       b.   Hayley draw boat   Hayley (1;8), Radford, 1996

Wexler groups English bare verbs, bare participles / null auxiliaries and null copulas with RIs

and refers to them as Optional Infinitives, arguing that they are all the result of the

underspecification of Tense.

The underspecification of T theory predicts that Swahili children should omit Tense and

nothing else. Thus the only two possible clause types that are expected according to this theory

are the following:

(19)   Permissible Clause types, according to Wexler (1994):
        I.   SA-T-V-IND
        II.   SA-Ø-V-IND

Crucially, Wexler's theory does not allow SA to be omitted, and it does not allow Mood to be

omitted.

3.4   Underspecification of Agr (Clahsen *et al*. 1996)

Clahsen *et al*. are concerned with the correlation between the acquisition of lexical

knowledge (in terms of inflectional morphology) and certain syntactic effects. Putting aside the

question of lexical learning versus full clauses[13], let us focus on their underspecification

proposal. Clahsen *et al.* are concerned with accounting for four pieces of evidence that are

established in Clahsen (1990) for child German, listed in (20):

(20)   a.   Subject-verb agreement, accusative case and dative case have not been acquired.

        b.   Finite verbs raise to first or second position, while non-finite verbs remain in

                clause-final position.

        c.   Subjects never intervene between the finite verb and negation (hence, in contrast

                to adult German, subjects never raise).

        d.   Wh-elements and complementizers are completely unattested.

They propose that children have a single functional projection above VP which is specified for

+finite. This position cannot be identified with IP or AgrSP because the specifier of this position

is not restricted to subjects. This position cannot be identified with CP because at this stage

German children never produce wh- elements or complementizers (Clahsen, 1990). Therefore

Clahsen *et al*. refer to this projection as FP – a general functional projection that is specified as

<+finite>. They describe the feature <+finite> as a syntactic feature that allows its head to

function as the landing site for a finite verb. The only reason they posit such a projection is

because finite verbs quite robustly raise to first or second position. So FP accounts for the

position facts in early German (finite verbs raise while RIs remain in final position). The

absence of any other features and structure also accounts for the absence of wh- questions and

complementizers. They go on to show that as the subject-verb agreement paradigm is acquired, syntactic processes associated with AgrSP develop, i.e., subject raising to [spec, AgrSP].

I interpret Clahsen *et al.*'s FP position as most closely resembling TP. According to Clahsen *et al.*, the FP projection carries <+finite> features[14], which can include temporal features, as well as agreement, aspectual and mood features (Rizzi, 1997). However, since subject-verb agreement is seen as being integral to AgrSP (which has not developed, according to Clahsen *et al.*), finiteness here cannot include agreement features. Aspect and mood are generally seen not to affect verb raising in German, and so it is unlikely that FP includes aspectual or mood specification. I therefore interpret finiteness in this case as being tense specification. Thus, another way of interpreting Clahsen *et.al*'s claim is that AgrSP (as well as AspectP and MoodP) is underspecified in early German.[15]

The predictions made by the underspecification of Agr theory for Swahili children are exactly opposed to those of Wexler's underspecification of T theory in that SA is predicted to be optional and T is predicted to occur in every utterance, as shown below:

(21)   Permissible Clause types, according to Clahsen *et al.* (1996):
        I.   SA-T-V-IND
        II.   Ø-T-V-IND

3.5   ATOM (Schütze & Wexler, 1996; Schütze 1997)

Schütze & Wexler (1996) and Schütze (1997) argue that both the preceding possibilities (underspecification of T and underspecification of AgrS) are allowed in child grammar. They argue in fact that a single underspecification is inadequate to account for the various syntactic effects that are observed in RIs and English bare verbs. The correlation of RIs and verb raising and the correlation of RIs and null subjects can be accounted for through an under-specification

of just one feature, but case effects cannot. Assuming independent Agr and T projections

(Pollock, 1989; Chomsky, 1991) they argue that children can optionally and independently

underspecify these features. They call their model the Agr-Tense Omission Model (ATOM).

They assume that agreement and tense have distinct properties and play distinct roles in licensing

of subjects and inflection. They also assume that tense governs the overt vs. null status of

subjects, while Agr licenses case features on the subject. They argue that the independent

underspecification of tense and agr are options available in adult grammar. Schütze (1997)

shows that European Portuguese allows agreeing infinitives (22), while Belfast English allows

tensed verbs without agreement (23):

(22) Eu vi eles correrem   European Portuguese
       I saw they to.run-3pl
      'I saw them run.'

(23) a.   These cars goes/go very fast   Belfast English
      b.   The eggs is/are cracked
      c.   The children shouts/shout all the time
      d.   *This car go very fast
      e.   *The egg are cracked

Under their theory, when agreement is fully specified in English, NOM case must be assigned.

When agreement is underspecified, NOM case cannot be assigned, and a default case may arise,

which in English is accusative case. Thus all non-NOM subjects occur with OIs[16] and not with

fully inflected verbs. When Tense is underspecified, a bare verb occurs. When Tense is fully

specified, it can occur as either past or present. When specified for past, then the *-ed* suffix

occurs on the verb. When Tense is specified for present (and the subject is 3rd person singular),

the suffix *–s* occurs. In all other cases, the bare verb occurs. Thus six possibilities occur: four

from the combination of ±Agr and ±T, plus two additional for the tense distinction between past

and present.

ATOM, being the loosest of the underspecification theories, makes the widest predictions. ATOM predicts that the following clause types should be possible in child Swahili:

(24)   Permissible Clause types, according to Schütze's (1997) ATOM:
       I.   SA-T-V-IND   [+Agr, +T]
       II.   Ø-T-V-IND   [-Agr, +T]
       III.   SA-Ø-V-IND   [+Agr, -T]
       III.   Ø-Ø-V-IND   [-Agr, -T]

ATOM predicts that SA and T may be optionally and independently omitted, but that Mood may not be omitted.

3.6   Root Infinitives in Swahili

Swahili has an infinitive marker that occurs in the position of T: *ku*. The infinitive occurs in complementary distribution with all other tense markers, occurs in typical infinitival contexts (embedded clauses, gerunds, etc.), licenses PRO, etc. Therefore it is entirely possible that Swahili children produce Root Infinitives. A child RI would include the infinitive marker, an indicative final mood vowel, but no SA (as SA and *ku* do not cooccur in adult Swahili). This is schematized below, with a hypothetical example.

(25)   INF-V-IND   RI Schema
       ku – anguka – a   Hypothetical Example
       INF – fall – IND
       'I might/may/want to fall'

Moreover, if children were to make errors of omission and not errors of commission (as is typical in child language), below are some possible clause types that Swahili children may produce, along with labels that I assign the particular clause types.[17] The relative omissions of SA and T are crucial to the evaluation of the theories presented earlier (especially the underspecification theories).

(26)   Logically Possible Omission types in child Swahili:
 SA – T –V – Mood   Full Clause
 Ø – T – V – Mood   [-SA] Clause
 SA – Ø – V – Mood   [-T] Clause
 Ø – Ø – V – Mood   Bare Stem

Thus these four clause types plus RIs are all logical possibilities in early Swahili. Of these four

clause types, full clauses are the only clause type that is permitted in prescriptive Standard

Swahili, while Nairobi Swahili permits full clauses and [-SA] clauses. [-T] clauses and bare

stems are virtually unattested in adult speech in indicative contexts (that is, excluding

subjunctives, imperatives, some negatives, and relative clauses) and are clearly judged by native

speakers as ungrammatical (see Polome, 1967, p.115).

Summarizing then, the Metrical Omission Model predicts no omission of any prefixes,

while the Truncation model predicts that no intervening functional element will be omitted if a

higher element (one that occurs linearly to the left) is present. Thus Truncation predicts that [-T]

clauses should never occur, but all other logically possible omissions may occur. Conversely,

the underspecification of T model (Wexler, 1994) predicts that [-T] clauses should be the only

omission type that occurs, and the underspecification of Agr model (Clahsen *et al*, 1996) predicts

that [-SA] clauses should be the only possible omission to occur. Finally, ATOM (Schütze &

Wexler, 1996) predicts that all four clause types shown in (26) above may occur in child Swahili.

Table 7. Summary of Predictions

MOM:	SA and T should never be omitted, but OA and onset syllables of long verb stems are subject to omission.
Truncation:	Tense should never be omitted when SA occurs, and Mood should never be omitted when any prefixes occur. Other clause types are permitted.
Underspecification of T:	The only clauses permitted are full clauses and [-T] clauses.
Underspecification of Agr:	The only clauses permitted are full clauses and [-SA] clauses
ATOM:	Mood omission is excluded, otherwise all four combinations of prefix omission are permitted: Full clause, [-SA] clause, [-T] clause, Bare Stem

4.0   Results

        I present the results in the following order. First I show which clause types are attested in

the corpus. I then discuss in detail the development of each clause type across stages. I show

that, quite expectedly, unadult-like clause types diminish across time, while the adult-like clause

types increase in proportion. However, the relative proportions of each clause type and the

differential rates of development are of great interest. I then evaluate the five theories of

language acquisition presented above and conclude the article with a note on future research.

4.1   Attested Clause Types in Child Swahili - Overview

        CLAN programs (MacWhinney, 2000) were used to run automated counts of the clause

types. A first level of analysis revealed the following facts:

(27)   General facts about early Swahili:
        -       SA omission is extremely frequent
        -       T omission is also frequent
        -       Mood Omission is almost completely absent
        -       RIs are almost completely absent

In the entire corpus, the mood final vowel is omitted a total of 12 times out of a total of 2662

verbal utterances (an omission rate of 0.45%). Upon inspection, these 12 tokens are clearly

speech errors because they usually occur in broken speech (i.e., when communication breaks

down and the child is struggling for her next utterance), or the final vowel is assimilated to the

following vowel making it difficult to determine whether it is present or not. As an anonymous

reviewer points out, Swahili has a phonotactic requirement that all words end in a vowel, and so

the absence of mood omission may simply be a phonotactic effect. If it were the case that the

absence of mood omission were a phonotactic effect, one would expect no correspondence

between the final vowel and the intended mood of the sentence. Deen & Hyams (2002) and

Deen (2002) show that this is not the case, but that children appear to use mood correctly from very early on (alternating between indicative and subjunctive correctly). I thus conclude that the omission of mood is unattested, and I will not consider it further. Similarly, RIs (root clauses with infinitival morphology) are virtually unattested. Of all the 2662 utterances, there are a total of 14 RIs, which represents an RI rate of 0.52%. I assume that RIs are not part of the grammar of early Swahili, a fact that represents a marked difference between Swahili and languages such as German, French, Dutch, etc.

Having concluded that RIs are not permissible in early Swahili, the only remaining possibilities are listed in (26) above. Automated CLAN programs were used to count the number of each clause type, and the results are presented below[18] [19]:

Table 8   Frequencies of clause types, by stage

	Stage 1	Stage 2	Stage 3	Stage 4	Total
Files from	Hawa 2;2-2;6, Mus 2;0-2;3	Mus 2;4-2;8	Fau 1;8-2;2, Mus 2;9-2;10	Has 2;10-2;11	
Full Clauses	39	58	235	225	557
[-SA] Clauses	60	154	166	104	484
[-T] Clauses	42	25	21	26	114
Bare Stems	67	55	34	15	171
Total	208	292	456	370	1326

Table 9   Proportions of clause types, by stage

	Stage 1	Stage 2	Stage 3	Stage 4
Files from	Hawa 2;2-2;6, Mus 2;0-2;3	Mus 2;4-2;8	Fau 1;8-2;2, Mus 2;9-2;10	Has 2;10-2;11
Full Clauses	18.8%	19.9%	51.5%	60.8%
[-SA] Clauses	28.8%	52.7%	36.4%	28.1%
[-T] Clauses	20.2%	8.6%	4.6%	7.0%
Bare Stems	32.2%	18.8%	7.5%	4.1%
Total	208	292	456	370

The proportions in table 10 are the sum of each clause type in a particular stage divided by the total number of indicative clauses in that stage (i.e., data is pooled across children). Below is a

line graph of these proportions. For comparison, I have included the relevant proportions from the adults' speech in this corpus on the right-hand side of the figure.

[Insert Figure 1 about here]

4.2   Full Clauses

Full clauses (FCs) are easy to identify in the corpus: all verbs that have SA and T.   This includes those with and without Object Agreement (OA).   FCs occur with a full range of tense markers (28a-c), a wide range of SA (1,2,3 singular, and 1,3 plural), as well as more complex constructions. Due to space limitations, I can only exemplify a few of these distinctions. Example (28e) is a complex tense construction (grammatical in adult Swahili) and is composed of an auxiliary verb kuwa 'to be' that is fully inflected with SA and T, followed by a main verb that is also fully inflected with SA and T.   Example (28f) is a biclausal utterance with two fully inflected clauses (grammatical in adult Swahili).

(28)   a.   ni – na – zim – a   tuu ile   Haw06, line 1160
                 SA$_{1s}$–pres–finish–IND only that   (Present tense)
                 'I just finish that'

        b.   mimi ...ni – li – tow – a   Mus12, line 1546
                  I   SA$_{1s}$–past–remove–IND   (Past tense)
                 'I…removed (it)'

24

c. siku gani u – ta – end–a ?
day which SA_{2s}–fut–go–IND
'On what day will you go?

Fau03, line 226
(Future tense)

d. a – ka – end – a
SA_{3s}–cont–go–IND
'He (then) went.'

Has01, line 547
(Continuative tense)

e. tu – li – kuw – a   tu – na–kul – a pilau!
SA_{1pl}–past–be–IND SA_{1pl}–pres–eat–IND pilau
'We were eating Pilau.'
(lit: We were we are eating Pilau)

Has01, line 794
(Plural SA and complex tense)

f. Baba, u – li – sem – a
Father SA_{2s}–past–say– IND

Has01, line 333
(Embedded clause)

u – ta – nunu – a   nini ?
sa_{2s}–fut–buy–ind what
'Father, what did you say you will buy?'
(lit: Father, you said you will buy what?)

FCs occur with overt as well as null subjects, with and without OA, and they occur with grammatical function changing suffixes. In all respects, they are adult-like.

4.3   [-SA] Clauses

[-SA] clauses are the most frequent clause types in the early stages, accounting for more than half of all the indicative clauses in stage 2. They occur with overt subjects (29) as well as null subjects (30); with OA (31) and without OA; and with grammatical function changing suffixes such as applicative or passive. In each case [-SA] clauses occur with various T markers.

Overt subjects:
(29)   a.   mimi Ø – na – ruk – a
target: mimi ni – na – ruk – a
   I SA_{1s}– pres–jump –IND
'I am jump down.'

Mus22, line 478
(Present tense)

b.   ndege Ø – me – end – a   juu
target: ndege   i – me – end – a   juu
bird SA_{inanim}–p.perf.–go–IND up
'The bird has gone up.'

Mus21, line 172
(Pres.perfect)

25

Null Subject:

(30) a. Ø – na – lal – a   Haw07, line 681
target: ni – na – lala – a   (Present tense)
           SA_{1s}–pres–sleep–IND
           'I am sleeping.'

      b. Ø – li – tumbu – a   Mus18, line 378
target: a – li – ni – sumbu – a   (Past tense)
           SA_{3s}–past–OA_{1s}–disturb–IND
           'He disturbed me.'

      c. Ø – ta – po – a   Mus20, line 431
target: ni – ta – po – a   (Future tense)
           SA_{1s}–fut–relax–IND
           'I will relax.'

(31) a. Ø – ta – ku –pig – a   Mus20, line 135
target: ni – ta – ku –pig – a
           SA_{1s}– fut–oa_{2s}–hit–IND
           'I will hit you.'

Finally, [-SA] clauses occur with grammatical function changing suffixes such as the applicative

(32a) and the passive (32b). Example (32c) is the only case of a [-SA] clause occurring with

stacked suffixes. This extremely complex example has an applicative, causative and a passive

suffix. The majority of [-SA] clauses, however, are simple mono-prefixal clauses (i.e., tense)

with no suffixes other than the mood final vowel.

(32) a. Ø – ta – nunu – li – a   hii soda?   Fau06, line 528
target: u – ta – nunu – li – a   hii soda?   (applicative)
           SA_{2s}–fut–buy–applic–IND this soda
           'Will you buy (for me) this soda?'

      b. Ø – na – it – w – a   Tafa   Fau03, line 808
target: a – na – it – w – a   Tafa   (passive)
           SA_{3s}– pres – call – passive – IND Tafa
           'He is called Tafaa.'

      c. Ø – na – vaa – li – sh – w – a   Fau08, line 1649
target: a – na – vaa – li – sh – w – a
           SA_{3s}–pres–wear–applic–causative–passive–IND
           'He is dressed'
           (lit.: He is caused to have the clothes to be put on.)

26

Turning now to the development of [-SA] clauses, in stage 1, 28.8% of indicative verbs occur without SA. SA omission increases in stage 2 to over 50% and then begins diminishing. However, by stage 4 [-SA] clauses are still very common, with 28.1% of all indicative clauses missing SA. Notice that the starting proportion (28.8%) and the final proportion of [-SA] clauses (28.1%) is approximately the same. In adult Swahili [-SA] clauses occur at a rate of approximately 5%, which is in stark contrast to child Swahili (at any stage or for any child). Therefore the principles that are responsible for the reduction of [-SA] clauses in child language develop at a stage beyond the last files in this corpus. This is an area for future research.

4.4   [-T] Clauses

[-T] clauses are the least common clause type amongst the four clause types, and are the first to diminish to under 10%. They begin at a rate of over 20%, but immediately fall to under 10% in stage 2, and remain under 10% through to stage 4. Therefore I consider stage 2 the point at which [-T] clauses cease to be a possibility in early Swahili. Recall from section 3.6 that [-T] clauses are completely ungrammatical in adult Swahili, not occurring in naturalistic discourse nor being accepted in grammaticality judgments by native speakers.

A variety of [-T] examples are given in (33) below.   Examples (33a-c) are from Fauzia. Notice that each utterance has a different SA – 1st, 2nd, and 3rd person singular.   This shows that SA is used productively in [-T] clauses and reference is not limited to any particular person. Furthermore, a wide range of intended temporal meanings are represented, showing that temporal reference appears to be free in [-T] clauses.[20]

(33)
a.   ni – Ø – kw – ambi – a   Fau04, line 95
target: ni – na – kw – ambi – a
       SA$_{1s}$–pres–OA$_{2s}$–tell–IND
       'I am telling you.'

b.   u – Ø – kingi – z – a ?   Fau07, line 1044
target: u – li – kimbi – z – a?
        SA2s–past–run–causative–IND
        'Did you make (him) run?'

c.   a – Ø – sem – a   nini ?   Fau04, line 464
target: a – li – sem – a nini?
        SA3s–past–say–IND what
        'What did he say?'

d.   alafu a – Ø – rud – i   Haw07, line 905
target: alafu a – li – rud – i
        then SA3s–past–return–IND
        'Then he returned.'

e.   u – Ø – on – a nimó   Has01, line 1396
target: u – na – on – a Nimó?
        SA2s– pres – see – IND Nimó
        'Do you see Nimó?'

f.   ni – Ø – pit – a   Mus05, line 316
target: ni – me – pit – a
        SA1s– p.perf. – pass – IND
        'I have passed (through).'

g.   a – Ø – tup – a   Mus03, line 2163
target: a – li – tup – a
        SA3s– past – throw – IND
        'He threw (something).'

4.5   Bare Stems

Bare stems are verbs that are missing SA and T, but have an indicative mood final vowel.

In stage 1 they are the most common clause type of the four attested indicative clause types.

They quickly diminish, going from 32.3% in stage 1, to 18.8% in stage 2, to under 10% by stage

4.   By stage 4 bare stems occur a mere 4% of the time. Examples of bare stem clauses from

each child are presented below. In (34a-e) I present examples from Hawa's files (similar

examples occur for the other children as well). Notice that the interpretation includes past,

present and present perfective, and 1st and 3rd person are attested[21].

(34) a.   Ø – Ø – anguk – a hivi   Haw07, line 210
target: ni – li – anguk – a hivi
               SA$_{1s}$–past–fall–IND like this
               'I fell like this.'

      b.   Ø – Ø – tak – a   tuwadh–a   Haw07, line 5
target: ni – na – tak – a   tuwadh–a
               SA$_{1s}$–pres–want–IND bathe–IND
               'I want to bathe.'

      c.   Ø – Ø – ndik – a   Haw05, line 2946
target: ni – me – andik – a
               SA$_{1s}$–p.perf.–write–IND
               'I have written.'

      d.   Ø – Ø – ka – a hapa   Haw04, line 130
target: a – na – ka – a hapa
               SA$_{3s}$–pres–live–IND here
               'She lives here.'

      e.   Ø – Ø – end – a job   Haw03, line 128
target: a – me – end – a job
               SA$_{3s}$–p.perf.–go–IND job
               'He has gone to work.'

      f.   Ø – Ø –   um – a   Mus17, line 632
target :   a – li – ni – um – a
               SA$_{3s}$–past - OA$_{1s}$–hurt – IND
               'He hurt me.'

      g.   Ø – Ø – kasilik – a   Fau01, line 1709
target: ni – me – kasirik – a
               SA$_{1s}$–p.perf.–get angry–IND
               'I am angry.'
               (lit: I have gotten angry)

      h.   Ø – Ø – shuk – a chini   Has01, line 687
target: a – ka – shuk – a chini
               SA$_{3s}$–cont–alight–IND down
               'He then got down.'

i.   baba   Ø – Ø – end – a   hoa   Has03, line 1309
target: Baba   a – me – end – a   hoa
               Baba SA$_{3s}$–p.perf.–go–IND hoa
               'Father has gone home.'

Wexler (1994) suggests that English bare verbs should be assimilated to RIs. Under this view, morphological differences between English on the one hand and German/French/Dutch on the other result in the occurrence of bare stems and RIs respectively. For example, the infinitive in English is not a true infinitive in that it is not a bound affix on the verb (material may occur between the verb and the particle: 'to boldly go where no one has gone before'). Furthermore, the infinitive marker in English is preverbal while in RI languages it is a suffix. Moreover, adult English uses bare verbs in contexts in which adult RI languages use infinitives, e.g., as complements to causatives, or perception verbs.[22]

(35)   Il nous a fait   chanter.   French
        He us has made sing-infin
        'He made us sing.'

The appeal of this idea is that it unifies the analysis of English bare verbs and RIs. However, true RIs generally have a modal or irrealis meaning (Wijnen, 1996; Blom & Wijnen, 2000). This has been shown to be true for Dutch, French, German and Swedish, although the evidence for other RI languages is not so clear. However, English bare verbs, as noted by Hoekstra & Hyams (1998), tend to have a temporal meaning, usually present tense here-and-now, but also past tense (Deen, 1997; Madsen & Gilkerson, 1999; Torrence, 2000). Hoekstra & Hyams attribute the irrealis meaning associated with RIs to the presence of infinitival morphology, which they note, cross-linguistically is generally associated with irrealis or modal meaning in adult languages. Therefore there is a clear semantic difference between true RIs and English child bare verbs. This argues against an RI analysis of English bare verbs.[23]

Returning to Swahili bare verbs, it is possible that Swahili bare stems are actually RIs with the infinitival prefix missing. After all, an infinitival verb (INF-V-IND) would have the correct metrical structure so as to allow metrical omission of the INF prefix. The infinitive prefix, being in a preverbal position, would take weak stress. Being in a pre-trochaic position, it would thus be subject to omission by the MOM.

(36)   w   s   w   →   w [s – w]
syllabic: ku–en–da
morphemic: ku – end – a
               INF – go – IND
               'to go'

Additionally, unlike English, the infinitive in Swahili is a true infinitive: a bound affix on the verb. The only other material that can occur between it and the verb is OA, which is expected given that AgrOP occurs below TP. Furthermore, complements to perception verbs occur in the subjunctive or as fully inflected verbs, but not as bare verbs. Thus Swahili does not have the same properties of English that purportedly result in bare verbs in child language.

However, I argue that bare verbs in Swahili are not RIs with omitted infinitival morphology, but that they are more closely related to bare verbs in English. Deen & Hyams (2002) find that the bare stems in Swahili (like English bare stems) do not have a modal meaning.   Of the 164 bare stems in the corpus whose interpretation could be adequately ascertained, only 5 (3%) occurred in contexts that were compatible with a modal meaning. This suggests that infinitival morphology (which licenses MoodP) is not syntactically present, and thus the bare verb in Swahili is not an infinitive. Moreover, as in adult English, RIs are completely unattested in adult Swahili. Thus, Swahili appears to be parallel to English in several ways. I conclude that the Swahili bare verb is indeed a bare verb and not an RI with omitted infinitival morphology.

4.6   Tense Omission versus SA omission

   Thus far I have shown that Swahili children permit four clause types: full clauses, [-SA] clauses, [-T] clauses and bare stems. I showed in section 2 that Swahili adults only allow two clause types: full clauses and [-SA] clauses. Therefore the crucial difference between adult Swahili and child Swahili is the omission of T. I will therefore examine clauses that are missing T as a single class. Below is a graph showing the occurrence of tenseless clauses ([-T] clauses and bare stems) across the developmental stages and the occurrence of those clauses in which SA is omitted (including [-SA] clauses and bare stems, labeled 'SA-less').[24]

[Insert figure 2 about here]

   Overall, the omission of SA and the omission of T tend to diminish as the children mature. However, tense omission ceases to be a possibility much earlier than SA omission. By stage 3, tense omission is rare (12%), while SA omission at that same stage occurs at a rate of more than 40%. Similarly while T omission in stage 4 is rare, SA omission is still above 30%. Another way to view this is that SA omission is tolerated longer than T omission. I will return to this point in the section in which I review ATOM's (Schütze & Wexler, 1996) applicability to the Swahili data.

5.0   Discussion

        Earlier I discussed five influential theories of the acquisition of early morphosyntax. I

discussed the Metrical Omission Model which proposes that children omit syllables that occur in

particular metrical configurations. I also discussed Rizzi's (1994) Truncation Hypothesis, which

proposes that children can optionally specify the root of the clause as a lower projection than CP.

I then discussed three underspecification theories: an underspecification of T theory (Wexler,

1994), an underspecification of Agr theory (Clahsen et al. 1996) and a theory of

underspecification of both T and Agr (Schütze & Wexler, 1996). I will evaluate each of these

five theories in the following sections.

5.1   Metrical Omission Model

At first glance, the MOM appears to have promise. The morphemes that are optionally omitted

in Swahili are individual syllables, and so can be individually targeted for metrical omission.

The inflectional prefixes in Swahili are preverbal, and we know that Swahili is a trochaic

language. I showed that in verbal complexes with disyllabic verb stems, MOM predicts no

omission (37a) [25]. In verbal complexes with trisyllabic verb stems, MOM predicts omission of

only the onset syllable in the verb stem[26]. Therefore no omission of prefixes is predicted.

(37)   a.   s – w – s – w   →   [s – w] [s – w]

                ni – ta – pik – a (chakula)
                sa1s–fut–cook–ind (food)
                'I will cook food'

                s – w – w– s – w   →   [s – w] w [s – w]

                ni – ta – anguk –a
                sa1s–fut– fall – ind
                'I will fall'

33

This is plainly contradicted by the data. Not only are prefixes omitted by children, at stage 1

over 80% of indicative verbs are missing either SA, T or both. The overwhelming frequency of

prefix omission thus is not compatible with MOM. The one clause type that is particularly

incompatible with MOM is the [-SA] clause.

(38)   Ø – ta – po – a
target: ni – ta – po – a
            SA$_{1s}$–fut–relax–IND
            'I will relax.'

Target metrical structure: [s w] [s w]
SA Omission: Ø   w [s w]

The MOM is a conservative and principled model in that it does not freely target segments for

deletion. The MOM targets a specific sub-class of weak syllables (those that are pre-trochaic or

unparsed), and nothing else. The omission of SA means that a strong syllable has been targeted

for omission, a fact that is clearly incompatible with the MOM.

This result contrasts with Demuth's (1994) finding that the MOM (at least in part)

accounts for the omission of noun class prefixes in Sesotho. Apparently, SA-omission in child

Swahili is of a different nature than the omission of noun class prefixes in Sesotho.

5.2   Truncation Hypothesis

The Truncation Hypothesis makes the following predictions:

(39)   Predictions for Truncation:
        (i)   Full clauses should optionally occur
        (ii)   [-SA] clauses should optionally occur
        (iii)   Bare stems should optionally occur
        (iv)   [-T] clauses should be impossible.

Clearly predictions (i) – (iii) hold, which provides evidence for Truncation. However, prediction

(iv) is false, as in early stages [-T] clauses occur at substantial levels (over 20% in stage 1).

Truncation can not account for [-T] clauses because they contain SA (which necessarily entails

that the root has been specified at or above AgrSP), but are missing T (which occurs below

AgrSP). Because the root is specified as AgrSP or above, the structure must project at least up to

SA, including TP. Therefore whatever the reason for T omission in [-T] clauses, it cannot be due

to truncation.

(40)   ni – Ø – kw – ambi – a   [-T] clause is incompatible with the
target: ni – na – kw – ambi – a   Truncation Hypothesis
        SA$_{1s}$–pres–OA$_{2s}$–tell–IND
        'I am telling you.'

Furthermore, the fact that Mood is obligatory in every utterance cannot be dismissed.

Truncation makes no distinction between functional projections other than their respective

hierarchical positions. Without the stipulation of a lower limit of what can be specified as the

root, Truncation holds no potential to explain why Mood is obligatory and not any of the other

functional affixes.

5.3   Underspecification of T

        Wexler (1994) argued that in English and other RI languages children have the option to

underspecify T. For Swahili, as presented in section 3.3, the underspecification of T hypothesis

predicts that child grammar permits full clauses and [-T] clauses. While these clause types are

attested, they are by no means the only clause types that occur in child Swahili. In fact, at stage

1, full clauses and [-T] clauses account for only 39% of all indicative verbs, suggesting that the

underspecification of T is only partly responsible for the typology of child clauses. Bare stems

and [-SA] clauses are not accounted for under this theory.

(41)   a.   Ø – ta – ku –pig – a   [-SA] clauses are incompatible with
target: ni – ta – ku –pig – a   the Underspecification of T theory
                SA$_{1s}$– fut–oa$_{2s}$–hit–IND
                'I will hit you.'

b. Ø – Ø – ka – a hapa   Bare Stems are incompatible with
target: a – na – ka – a hapa   the Underspecification of T theory
            SA₃ₛ–pres–live–IND here
            'She lives here.'

5.4.   Underspecification of Agr

Conversely, Clahsen et al. (1996) argued that AgrS is optionally underspecified. I

showed that their theory predicts that Swahili children should allow full clauses and [-SA]

clauses. However, they cannot account for the occurrence of [-T] clauses and bare stems. In

fact, neither underspecification of T nor underspecification of Agr *alone* can account for bare

stems.

5.5   ATOM

The natural conclusion from the preceding discussion is that the underspecification of T

as well as Agr is permitted by child grammar – precisely the proposal of Schütze & Wexler

(1996). They propose that both Agr and T can be optionally and independently omitted,

resulting in the predictions that Swahili children should allow full clauses (no underspecification,

example 42a), [-SA] clauses (AgrS underspecification only, example 42b), [-T] clauses (T

underspecification only, example 42c) and bare stems (underspecification of both AgrS and T,

example 42d). Thus our results are consistent with ATOM.

(42) a.   mimi ...ni – li – tow – a   [+Agr, +T]
             I   SA₁ₛ–past–remove–IND
            'I…removed (it)'

       b.   ndege Ø – me – end – a juu   [-Agr, +T]
target: ndege i – me – end – a juu
            bird SA_inanim–p.perf.–go–IND up
            'The bird has gone up.'

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      c.   ni – Ø – pit – a   [+Agr, -T]

target: ni – me – pit – a

              SA_{1s}– p.perf. – pass – IND

              'I have passed (through).'

      d.   Ø – Ø – shuk – a chini   [-Agr, -T]

target: a – ka – shuk – a chini

              SA_{3s}–cont–alight–IND down

              'He then got down.'

As pointed out earlier, ATOM is the least restrictive of the theories presented here, and thus is the most permissive with respect to what should be possible in Swahili. The importance of these results is to show that while the underspecification of T and underspecification of Agr theories were on the right path, they were each too restrictive. Thus while ATOM may be the least restrictive, the fact remains that it is the only theory that accounts for all the data presented here.

Recall from section 4.6 that the omission of SA persists into stage 4 while the omission of T fades out by stage 3. An anonymous reviewer points out that this may be construed as evidence against ATOM and in favor of Clahsen *et* al.'s (1996) underspecification of Agr model. The reasoning is that if Agr and T were truly independent and optional, SA omission and T omission should persist equally, and be acquired according to roughly equal schedules. This is true only if we ignore the role that language-specific properties play in the process of acquiring these inflectional elements. We saw earlier that adult Swahili allows the omission of SA, but does not allow the omission of T under any circumstances. This is evidenced by the fact that adult Swahili allows [-SA] clauses, but does not allow bare stems. A closer look at the child data reveals that children, by stage 4, behave in precisely this manner: they allow [-SA] clauses but not bare stems. The majority of clauses in which SA is omitted are [-SA] clauses (from table 8, 104/119 = 87%). I assume that this represents an overgeneralization of [-SA] clauses from the

restrictive discourse contexts that license [-SA] clauses in adult Swahili to a larger set of contexts. The other two ungrammatical clause types ([-T] clauses and bare stems) are almost completely absent by stage 4.

Thus I argue that the persistence of SA omission in child Swahili is not in fact evidence of underspecification of Agr nor evidence against ATOM. Rather, the over-omission of SA in the late stages is simply an overgeneralization of a construct that occurs in adult Swahili in restrictive contexts.[27]

6.0 Conclusion and Future Research

This study represents the first study of the acquisition of Swahili. Swahili has the characteristic of marking SA and T as independent prefixes that are obligatory in most contexts. Thus I compared the emergence of agreement and tense in a single language: something that has not been done before. While these findings are theoretically informative, there are many issues that remain to be resolved. Further investigation is necessary to determine the developmental path of object agreement. I did not report on it here, but Swahili children appear to have knowledge of the restrictions on OA fairly early on (see Deen 2003d for further details). In fact, there appears to be a distinct difference between the acquisition of SA and the acquisition of OA. Experimental data are required in order to verify this. There has been a growing body of work that points to there being a relationship between inherent lexical aspect (aktionsart) and inflectional morphology in child language. Future research will address this issue with regards to these Swahili children: do omissions occur on certain types of predicates?

Additionally, because the data come from a naturalistic corpus, there were several things that could not be studied. The children tended not to use syntactic negation, and so the complex

negation morphology that is evident in Swahili was almost never exhibited by the children. Because negation and SA are fused into a single morpheme, it would be interesting to see whether [-SA] clauses occur in negative contexts. Similarly, it would be interesting to see if children in early stages produce the correct negative final vowel in the appropriate contexts. Other questions include whether children truly obey the syntactic restrictions on [-SA] clauses (e.g., no quantified subjects) or is this simply a product of naturalistic discourse? All these questions involve some measure of experimental elicitation, which was not part of the methodology of this study. With further experimental and naturalistic data collection and analysis, I hope to provide further results that will add to our growing body of knowledge in the acquisition of inflection.

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Figure 1. Proportions of the four clause types in child stages and adults

Figure 2. Tense Omission and SA omission across stages

40
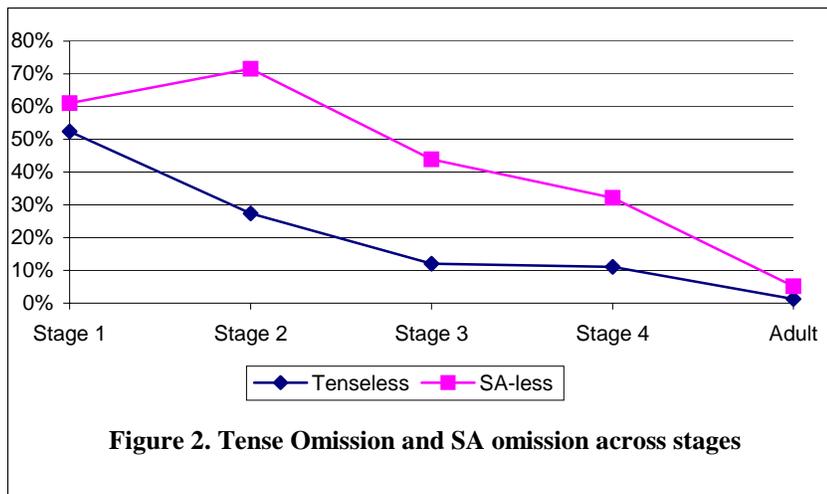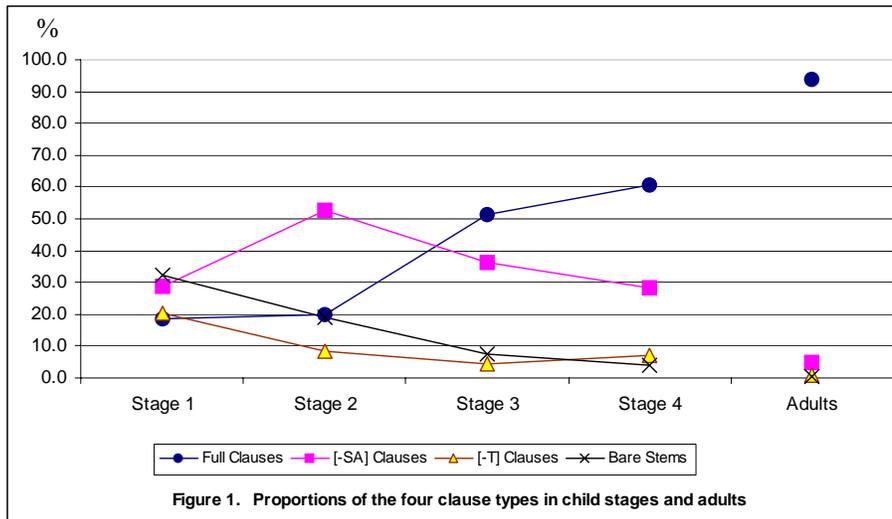
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[1] See Deen (2002) for more details; see also Ngonyani (1996) for a similar proposal for the Swahili structure; Kinyalolo (1991) for a similar analysis of a closely related Bantu language KiLega, Demuth & Gruber (1995) and Demuth (1998) for similar analyses of Sesotho.

[2] These examples are taken from the adult speech in the naturalistic data collected for this study.

[3] A reviewer pointed out that SA omission is fairly frequent in Swahili motherese, and wonders if this is something that is limited to motherese. Although I have not seen any published descriptions of Swahili motherese, I am confident that SA omission is not limited exclusively to motherese in Swahili. The reasons are (i) in the recordings there were several examples of adult-adult interaction in which SA was omitted, (ii) native speaker informants confirm that this is possible in contexts not involving children, and (iii) Scotton (1969) as well as Duran (1975)

report on the omission of SA in up-country dialects of Swahili, without mention of this being restricted to child directed discourse.

[4] Space limitations prevent a full justification of this proposal here, but see Deen (2002), chapter 2 as well as Deen (2003a,b,c) for greater justification and further details on this proposal.

[5] That is, the toys did not consist of things that were obviously foreign, e.g., Barbie dolls. The figurines that I provided were novel, but not strange to the children, and since this is such an urban society, cars and trucks were not unusual in any way. The toys were simply provided as objects to spur conversation.

[6] Thanks to Z. Shatry for his help in this matter.

[7] Refer to Deen (2002), chapter 3 for a rational for using each of these three measures of grammatical development.

[8] See Gerken (1991) for a full discussion of the nature of these production limitations. Due to space limitation I am unable to review them here.

[9] Gerken argues (following Hayes, 1982) that binary feet are preferred over both ternary feet and unbounded feet, and I follow her on this. Furthermore, the strength of a syllable is determined by the pitch, the stress, the length, etc. (Gerken, 1991; Gerken & McIntosh, 1993).

[10] The reasons for this are somewhat controversial, but see Allen & Hawkins (1978) for the first such proposal, as well as Fletcher (1985); Echols & Newport (1992); Fikkert (1992).

[11] Weak syllables, however, may be left unparsed.

[12] Secondary stress is always on SA if T is monosyllabic. When T is disyllabic, as in the somewhat rare perfect completive *mesha*, secondary stress falls on the first syllable of T (i.e., *mésha*). When T is trisyllabic, as in the emphatic perfect completive *mekwisha*, secondary stress falls on the second syllable of T, i.e., *mekwísha*. In other words, secondary stress falls on the penultime syllable from the right edge of T, suggesting that this may be a word boundary. See Barrett-Keach (1986) for additional details.

[13] They are primarily concerned with the Lexical Learning Hypothesis which states that the acquisition of inflectional morphology drives the development of syntax in general. Thus they investigate the acquisition of subject-verb morphology and try to draw parallels in real time with the development of other syntactically related phenomena. This is not crucial to what follows, and so I shall put it aside.

[14] They describe this feature as being hosted by FP, and allowing the hosting head to act as the landing site for finite verbs. However, 'finiteness' is a general descriptive term that is usually composed of several distinct features. For example, Rizzi (1997) describes finiteness as including tense, aspect, mood and sometimes agreement features. I assume this definition of finiteness. What is important for Clahsen *et al.* is that there be one and only one position to which verbs and only verbs may raise. Therefore this position cannot be associated with subjects (hence AgrSP is ruled out), and it cannot be associated with wh- elements or complementizers (hence CP is ruled out). This is why I say that their FP can be thought of as TP.

[15] Clahsen *et al.* are very concerned with the issue of Continuity (Pinker, 1984), and are very careful to make clear that their position is one of Continuity. Thus the more minimal the difference between adult and child grammars, the more faithful their system is to Continuity. Therefore I think an underspecification of AgrSP reading of their proposal is entirely appropriate as this maintains weak continuity, and minimizes the problem of how a child retreats from the position of having a truncated structure.

[16] Schütze & Wexler use OI as an alternative to RI, but include in this category both English bare verbs and German, Dutch, French, etc. matrix infinitives. Their description of OIs essentially entails a less than fully specified INFL, i.e., either Agr or T (or both) are underspecified.

[17] I do not consider the omission of OA or Mood in this review, although see Deen 2003d for fuller discussion of OA in child Swahili, and Deen & Hyams (2002) for discussion of the acquisition of Mood in child Swahili.

[18] In Deen (2002) I show that all clause types are attested in the speech of all four children, and I also present data for each child by month, verifying that the developmental picture shown here is not an artifact of the staging design.

[19] Monosyllabic placeholder used in unambiguous position (e.g., MPH-T-V-IND) were excluded from these counts.

[20] Determining that a particular utterance is a [-T] clause and not, say, a subjunctive with an incorrect final vowel was a challenge. Due to space limitations I cannot fully explain the details of my methodology here, but they included phonologically matching morphemes to the target morpheme, as well as taking into account the context and intended meaning. All unclear tokens were not included in the data.

[21] Deen & Hyams (2002) find that the bare stems in Swahili do not have a modal meaning, parallel to English bare stems (Hoekstra & Hyams, 1998). Of the 164 bare stems in the corpus, only 5 (3%) occurred in contexts that were compatible with a modal meaning. This supports the idea that infinitival morphology licenses MoodP. Thus the irrealis meaning of RIs (Hoekstra & Hyams' Modal Reference Effect) is not a result of a simple lack of temporal specification, but rather arises from the presence of infinitival morphology.

[22] Thanks to Carson Schütze for discussion on this point and the French example.

[23] Additionally, several of the syntactic correlations that have been noted in RIs in true RI languages (German, Dutch, French, etc.) do not hold in English. For example, null subjects predominate in non-finite contexts in RI languages, but not in English. Also, RIs generally do not occur in wh- questions in languages such as German and Dutch, but in English wh- questions occur with bare verbs (see Roeper & Rohrbacher 1994 and Bromberg & Wexler, 1995, who look at wh- fronting and null subjects in finite and non-finite contexts). Therefore English bare verbs differ from true RIs in some significant syntactic ways. These tests cannot be applied to Swahili because Swahili allows null subjects and wh- words remain in situ.

[24] Including bare stems in both categories is necessary because I wish to compare SA omission on the one hand and T omission on the other. Bare stems fall into both categories.

[25] One objection could be that the addition of OA may affect the parsing of the string such that metrical omission becomes relevant. However, the crucial fact is that SA carries secondary stress, and hence is a strong syllable. Two side-by-side strong syllables are dispreferred, and so because SA is a strong syllable, T is a weak syllable. Therefore SA and T will always form a trochaic foot. The addition of OA will only add a weak syllable between the trochaic foot of the prefixes and the verb stem. Therefore MOM may have predictive power for the omission of OA, but it cannot explain the omission of SA or T. The addition of any other affixes (e.g., the applicative suffix, the passive suffix, etc.) will only affect the metrical structure of the latter portion of the string and will leave SA and T in a trochaic foot.

[26] In fact, there is sporadic evidence that this may be correct: verbs such as *anguka* occur frequently as [ŋuka] – the onset [a] being omitted. This occurs when the verb is bare, as well as when the verb has some or all prefixes. Thus this is evidence that MOM actually does apply as Gerken (1991) proposes, but it does not explain the omission of the inflectional prefixes.

[27] ATOM makes strong predictions with respect to subjects in child language: Schütze & Wexler use ATOM to explain the occurrence of non-Nominative subjects in child English by proposing the underspecification of Agr results in default case. In English, the default case is accusative, resulting in child utterances such as *him eat cake*. In other languages (such as German) in which the default case is nominative, non-nominative subjects should not arise. Instead, as Schütze & Wexler point out (p.679), if AgrO is underspecified, non-Accusative objects may (and indeed do) occur. Underspecification of Agr coupled with the underspecification of T links the phenomenon of non-Nominative subjects and RIs. We might therefore expect an effect of Agr/T underspecification on the occurrence of overt subjects in Swahili. Because Swahili is a null subject language, and because [-SA] causes allow null constants, this effect is not as obvious as it is in a language such as English. However, the pattern of overt/null subjects that is exhibited by the Swahili children is not only consistent with ATOM but also confirms the null constant analysis of [-SA] clauses.

Briefly, overt subjects in full clauses occur at a rate of 23% in child Swahili, a rate that is similar to the rate of overt subjects in adult Swahili (18%). In [-SA] clauses, children allow overt 'subjects' at a rate of 40%, while adults exhibit a rate of 34%. Less than 1% of [-T] clauses (which only occur in child speech) occur with overt subjects, a fact that follows directly if we assume that T assigns case, and the absence of T results in the absence of an overt subject. In Bare Stems, which recall are missing both Agr as well as T, we expect a similar rate as that found in [-T] clauses, but in fact children allow overt subjects at a rate of 12%. This unexpected result can be explained if we assume that the null constant – topic operator construction occurs in the absence of Agr (as it does in [-SA] clauses), and that the 12% of overt subjects that occur in bare stem constructions are in fact overt topics, not subjects. For reasons of space, I am not able to elaborate this point, but see Deen (2002, 2003a) for details.