3.0 Swahili data

In this section we will discuss the methodology used to collect the Swahili data, the children who participated, the materials used, the transcription method and the coding procedures.

3.1 Children

The data for this study come from four Swahili speaking children who were recorded in naturalistic settings in Nairobi, Kenya. All sessions were audio recorded using a Sony ProWalkman with an external microphone either by me or by the parent. The children were of varying ages (see Table 3.1), and came from similar socio-economic, ethnic and linguistic backgrounds (see below).

Table 3.1 Age ranges and number of recordings for each child

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

Hawa's family lived in a Kikuyu suburb area of Nairobi called Kabete. She lived in a communal environment in which she had lots of play partners and care-givers. She had one younger sister (age 0;6 at the time of her first recording), and an older male cousin (age = 14), who was her primary interactant on several of the recordings. Due to personal problems in the family she was forced to go up-country four months into the study. While her ethnic background is Kikuyu, her primary care-givers considered Swahili their first language, and so reported that the child was spoken to primarily in Swahili. She could not understand Kikuyu[1], and knew only a few words of English.

Mustafa was an abandoned child, found by his now-father in an overgrown field outside the family home in the Komarock area of Nairobi. He was estimated to be 4 weeks of age when he was found, and was adopted by the family. The father was a Meru, and the mother was from a neighboring tribe, leaving the couple with Swahili as their common language. For this reason, there was very little influence from any outside languages except English. The amount of English used in the household was minimal, with a few common lexical items being repeatedly used. Mustafa's primary interactants were his father, mother and step-brother (age = 16). Also, about six months into the study, the family took in a number of homeless teenage girls, and they became Mustafa's companions.

Fauzia and Hassan were children of two neighboring families in the Majengo slum (also known as Pumwani) of Nairobi's east side. They spent their time with each other usually, along with several other children of varying ages. There were too many people in their immediate circle to count, but for the purpose of the recordings, their primary interactants were their parents as well as their common uncle. In this area of Nairobi, the

[1] This was evident by the fact that she would not respond to people who spoke to her in Kikuyu, and ignored commands in either Kikuyu or English, but complied readily to commands in Swahili. Kikuyu was certainly present in her environment but was not a language of communication or interaction for her.

only language spoken was Swahili, with some Sheng (a local street dialect) and a little English. The families were ethnically mixed, and so there is no tribal language to speak of, although there was some Luo and Kikuyu spoken around the neighborhood. All four children in this study were of Muslim parents, and so there was a little Qur'anic Arabic being recited here and there. All four children spoke Swahili of the variety described in chapter 2. It should be noted that Standard Kiswahili (Kiswahili Sanifu) was less common in these areas than English, and in some cases Kikuyu. The only source of Kiswahili Sanifu was from radio broadcasts. A major issue in research in these sorts of complex sociolinguistic communities is language homogeneity. In other words, we must ascertain whether the children in this study all spoke the same dialect of Swahili, and if not, what the differences are. The only way to do this is to examine the language of the adults with whom the children spend most of their time. Thus the speech of adults in the recordings was coded and analyzed. The results show that the adults are remarkably similar in a number of measures (see Appendix 3A for the comparisons and statistics). We conclude that the four children in this study spoke varieties of Swahili that did not differ significantly.

3.2 Data Collection

Each recording session was between 60 and 90 minutes long. At each session, either a parent/care-giver or I (or both) were present to interact with the children. As few other people as possible were included in the conversations, although at times it was difficult to limit neighborhood children from participating. I brought toys to play with, books to talk about and other conversation pieces, and the sessions were usually conducted as free play time. I would at times try and guide the child to talk about actions and events (and hence use verbs), and sometimes towards using negation, but no formal experiments were conducted.

Transcription was done as soon after the recording as possible. Field notes from the recording sessions and follow-up questions with the parents were used in cases of unintelligible speech or when the reference of a particular utterance was unclear. Thus the number of utterances coded as unintelligible was kept to a minimum. I did all of the transcription myself, with another native speaker of Nairobi Swahili checking segments of the transcripts for accuracy[2]. Furthermore, sections that were unclear or problematic were checked by the both the additional native speaker as well as the parents of the children who were present during the recordings.

Transcription was done in CHAT format (MacWhinney, 2000). Transcription was done with particular attention to the production of verbal and nominal affixes. Transcription was in loose phonetic form, but when pronunciation was drastically different from adult speech, a full phonetic transcription was added in a phonetic tier (%pho). Each speaker was assigned a three letter code and their utterances were transcribed on separate lines. Additionally, a coding tier was used to code children's and parents' speech. The coding was performed as transcription occurred, and so there

[2] Due to financial limitations, I was not able to hire someone else to check the transcripts. My consultant was good enough to check the transcripts for me, but due to time limitations on his part, he was not able to check all the transcripts fully.

was no bias in the coding procedure[3]. Each child morpheme was coded for function and the number of syllables per word. Additionally, each verbal utterance was coded for transitivity (intransitive, transitive, ditransitive) and for the intended meaning. Intended meaning was determined on the basis of surrounding context, including the child's previous and following utterances, the adults' previous and following utterances, and field notes from the recording session. If the intended meaning was unclear, and if the parents who were in that recording session could not elucidate the meaning, then the utterance was coded as unclear and was not included in analyses that make use of intended meaning. Below is an example sentence with the accompanying code tier, and a full gloss and translation in (1b):

(1) a. FAU: mi namwona hii macho Fau04, line 618
%csc: Spro Ø T pr OA V IND dem N-5 1syll 3syll 1syll 2syll og
ALI: unamwona macho ?

b. mi na – mw – on – a hii ma–cho
I Ø pres.–OA_{3s}–see–IND these 5–eye
'I see these eyes'

The child utterance in this example is marked with the three letter code FAU identifying the child. The child's utterance is coded on the tier labeled %csc (Child Speech Code). See the table of codes in Appendix 3B for explanation of all the codes. Below is an explanation of the codes in this particular example:

Table 3.2 Codes used in example (1)

Code	Meaning
Spro	Subject Pronoun
Ø	Omitted prefix
T	Tense Prefix
Pr	Present tense
OA	Object Agreement
V	Verb root
IND	Indicative Mood final vowel
Dem	Demonstrative
N	Noun root
5	Class marker (in this case noun class 5)
1syll, etc	Monosyllabic word, etc.
Og	On-going present interpretation

In (1a), the child produces a [-SA] clause: the child omits SA in an indicative, matrix clause (see chapter 2 for contexts in which this occurs in adult Swahili). The child uses a reduced subject pronoun (the reduction is not represented in the coding scheme), omits SA, uses a present tense marker and a third person singular object agreement marker. The child uses an indicative mood vowel, and then a demonstrative and noun of class 5 as the object. The syllabic codes indicate the number of syllables in each word in this utterance in sequential order, and 'og' indicates that the intention of the child was to convey an ongoing, present tense meaning.

Every utterance produced by all the children was coded in this manner, and the parental utterances in some of the earlier files were coded in this way (see Appendices 3A and 3B). All calculations and statistics were done using CLAN programs (MacWhinney, 2000), making use of these codes. Random analyses were checked by hand to ensure accuracy.

[3] In some cases, when the function of a particular prefix is unclear or when the intended meaning is ambiguous, it is easy to be biased in assigning codes if a particular analysis is preferred. However, the fact that coding was performed before any analysis was formulated ensured that there was no bias involved.

3.3 Linguistic Measures

The children were of varying ages and at different stages in linguistic development. One measure of grammatical development that has been used extensively is Mean Length of Utterance (MLU). MLU can be calculated on the basis of words/utterance or morphemes/utterance. In Swahili, most utterances consist of a single verbal complex, and so words/utterance is a meaningless measure. I therefore used morphemes to calculate MLU. The specific procedure is outlined below:

(2) Procedure for calculating MLU

- Start on the second page of the transcript
- Identify the first 100 non-imitative, non-repetitive, non-formulaic utterances
- Count each morpheme in those 100 utterances
- Divide this by 100
- Morphemes that were counted include the inflectional prefixes (SA, T, OA), verb roots, mood final vowel, infinitive prefix, Grammatical function changing suffixes (applicative, stative, passive, causative, etc.), noun roots, noun class prefixes, adjectives, adverbs, affirmative answers (*ndio*, 'yes', as well as *ehh*, mm-hmm, etc.) negative answers (*hapana*, 'no', as well as ah-ah, etc.), demonstratives, locative suffix, complementizers, copulas, negative prefixes and suffixes, possessives, quantifiers, etc.
- Not included in the count were repetitions, imitations, formulaic utterances, and any other non-communicative speech.

Table 3.3 below shows the MLUs of the four children at the beginning and end of their recording periods.

Table 3.3 Starting and Ending MLUs for all 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

MLU is an effective (but gross) measure of linguistic maturity provided it is used to compare children within the same language. Children acquiring languages which are richly inflected such as Italian (and Swahili) have much higher MLUs (and thus tend to look much more mature) than children of comparable ages acquiring languages which are poor in inflectional affixes, e.g., English and Chinese. For this reason, Valian (1991) suggests using the ratio of verbs to total utterances (I call this measure the V ratio) as an additional measure of grammatical development for cross-linguistic comparison. V Ratio is calculated by dividing the total number of verbal utterances (excluding repetitions and imitations) by the total number of utterances[4]. Table 3.4 shows the V ratios for the four children.

Table 3.4 Starting and Ending V ratios for the four children

Child	Starting V ratio	Ending V ratio
Hawa	.07	.14
Mustafa	.05	.17
Fauzia	.20	.36
Hassan	.30	.40

3.4 Staging Criteria

The database contains data taken from four children of different ages. Furthermore, each child is recorded for different lengths of time. So for example, Mustafa's files span 11 months while Hassan's files span 2 months. For this reason, a staging or ranking criterion is needed in order to meaningfully compare data from all four children. I wish to stress that the results discussed in subsequent chapters are based on both the pooled data described in this chapter, as well as on individual children. I formulated conclusions on the basis of the pooled data because it is easier to observe generalizations using the pooled data, but I always verified my conclusions by comparing the pooled data to the individual children's data. For example, I claim in chapter 4 that bare stems are more frequent in stage 1 than in stage 4. I verify this by looking at the data in the relevant files from each child. The individual subject data are presented in appendix 4C.

I established three semi-independent measures of grammatical maturity and combined them to rank the children relative to each other. These three measures are given in (3):

(3) I. MLU (in morphemes)
II. V Ratio
III. % Mono-syllabic Place holders

We have already discussed MLU and V ratio, and on the basis of those measures we see that the relative ranking of the four children is Hawa<Mustafa<Fauzia<Hassan, i.e., Hawa is the least grammatically mature while Hassan is the most grammatically mature. One additional measure was used: the proportion of Monosyllabic Place Holders.

Bottari, Cipriani & Chilosi (1993) describe a phenomenon in early Italian that they call Monosyllabic Place Holders (MPH). This is a phenomenon that has been extensively discussed in the child language acquisition literature (see Peters & Menn, 1993, who call them 'filler syllables'; Peters, 2001; Veneziano & Sinclair, 2000, who call them 'additional elements'). Young children use monosyllabes at the beginnings of words. These syllables usually occur as reduced vowels from the middle region of phonological space, or nasal consonants. MPHs are found cross-linguistically (e.g.,.Italian, Bottari *et.al*, 1993; English, Peters, 2001), and are found cross-categorically (i.e., on nouns, verbs, etc.). Bottari *et al.* claim that MPHs are proto-syntactic markers that hold a place in a syntactic representation that the child (for whatever reason) cannot fill phonologically. Crucial for our purposes is the developmental path of MPHs: at the early stages (usually before age 1;8) MPHs are very rare. At some point around age 1;8 there is a spurt in the frequency of MPHs on all categories (verbs, nouns, adjectives and adverbs). For example, Veneziano & Sinclair (2000) in their analysis of one French girl's speech found that the rate of MPHs went from 1.6% at age 1;6.22 to 38.7% at age 1;7.18 (Veneziano & Sinclair, 2000; p.468). After that point, they gradually diminish (see table 3.5 and figure 1).

[4] An utterance is defined as anything with lexical material in it, including proper names. So a filler utterance such as 'Uhh' would not count, but something like 'Daddy' would.

Table 3.5 Development of MPHs across time

Age	Number of Lexical items	Lexical items preceded by MPH
1;3.2	8	0 (0%)
1;3.16	60	1 (1.7%)
1;4.26	118	2 (1.7%)
1;5.23	154	3 (1.9%)
1;6.22	213	3 (1.4%)
1;7.18	111	43 (38.7%)
1;8.15	190	72 (37.9%)
1;9.3	232	98 (42.2%)
1;10.12	493	103 (20.9%)
2;2.6	190	24 (12.6%)

(Adapted from Veneziano & Sinclair, 2000, p.469, table 1)

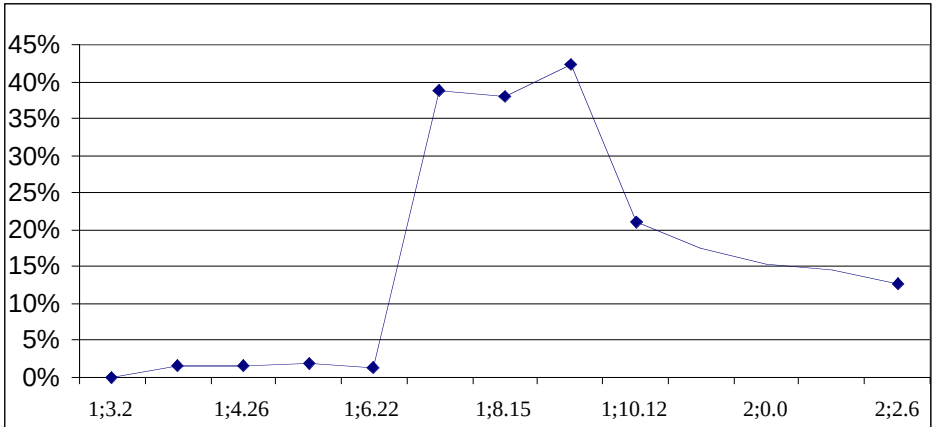

Figure 3.1. Development of MPHs by age
(developed from Veneziano & Sinclair, 2000)

From a peak of approximately 40% they slowly dwindle to 12% at the last data point (See Bottari, *et al.* 1993 and Vollman, 1993, for similar conclusions). This gradual drop-off is characteristic of all children who produce MPHs and thus can be used as a measure of linguistic maturity (see Peters, 2001 for a review). A high proportion of MPHs indicates that the mapping of morphological forms onto syntactic categories is not yet fully available – the child uses filler syllables as syntactic place holders (according to Bottari *et al*, 1993). Since MPHs gradually diminish as the child matures we expect that a child who uses fewer MPHs is grammatically more mature than a child who uses larger proportions of MPHs[5]. Swahili children also use MPHs, and I coded these separately from other clearly distinguishable prefixes. As is the case for other languages, Swahili MPHs are usually vowels from the middle area of phonological space (e.g., [↔] or [ɸ]), or nasals. Of the Swahili tense prefixes, all are CV syllables and hence are clearly distinguishable from MPHs. Similarly, most SA and OA prefixes are CV syllables. However, the following are either single vowels or nasal:

2nd singular SA [u]
3rd singular SA [a]
3rd singular OA [m]

The following procedure was used in order to distinguish MPHs from well-formed Swahili prefixes. If the prefix was fully adult-like in phonological quality (i.e., it was clearly a back rounded [u] , a low [a] or a bilabial nasal), it was classified as a well-formed prefix (i.e., not an MPH).

[5] Of course the limits of this measure are the initial spurt (approximately age 1;8) to the time they fade out entirely, which occurs at approximately age 3;6 (see Vollman, 1999; Peters & Menn, 1993). A further limit to using MPHs is the fact that not all children make use of these filler syllables (Peters, p.c.). So a child that does not use MPHs cannot be assumed to be linguistically mature because a prerequisite for using MPHs as a measure of linguistic maturity is that the child actually has used MPHs in the past. All of the children in this study use MPHs, but to varying degrees, therefore MPHs are an appropriate measure of their linguistic maturity.

If it was reduced or slurred in any manner or if it was unadult-like, it was classified as an MPH. If the prefix was a well-formed prefix but was inconsistent with the contextually-determined meaning, then it was classified as a well-formed prefix used incorrectly (i.e., an agreement error or an incorrect tense). Consider examples in (4a-d). In example (4a) the prefix [u] occurs alone on a verb. In this case the vowel is clearly back and rounded (adult-like), it is not reduced in any manner, and it was clear from context that the referent was 2nd person singular (where [u] is the adult 2nd person singular SA marker). Thus this token was classified as SA. In example (4b), the prefix was well formed (clearly an adult-like [a], which is a 3rd person singular SA marker, or a present tense marker) but did not match the contextually-determined meaning (which was 2st person negative *si*), and so this was classified as an incorrect prefix. If the prefix was a reduced vowel or a non-bilabial nasal (4c and 4d, respectively), because neither of these are adult-like prefixes, the prefix was classified as an MPH.

(4)

a.	u – tembe – a	coded as SA	Mus09, line 1408
target:	u – na – tembe – a 'You are walking'		
b.	a – tak – i	coded as	Mus19, line 878
target:	si – tak – i 'I don't want (it)'	incorrect prefix	
c.	_- tap – a	coded as MPH	Mus15, line 48
target:	ni – ta – ku – chap – a SA_{1s} – fut – OA_{2s} – slap – IND 'I will slap you.'		
d.	n – fany – a hivi	coded as MPH	Haw07, line 1642
target:	a – li– fany – a hivi SA_{3s}–past–do–IND this way 'He did it like this.'		

Generally MPHs were either [n], [N], [↔], or [℘]. I calculated the proportion of verbal MPHs in the speech of each child. The result of a FREQ count is presented in table 3.6 below.

Table 3.6 Proportion of MPHs on verbs, pooled across files for each child

Child	MPHs	Verbal Utterances	
Hawa	163	474	34%
Mustafa	153	1023	15%
Fauzia	41	653	6%
Hassan	26	512	5%

Notice that the proportion of MPHs is high for Hawa, and somewhat lower for Mustafa, with Fauzia and Hassan showing very few tokens of MPHs. If the proportion of MPHs is an indicator of grammatical maturity (as we propose), then Hassan is the most mature of the four children, with Fauzia, Mustafa and Hawa progressively less mature. Importantly, this is the same order that our MLU and V Ratio calculations suggest. As mentioned earlier, each of these three measures is subject to criticism. However, when a combination of these three measures result in the same order, the ranking procedure gains reliability. I formulated a staging process where each stage was defined in terms of the three measures. The stages were defined according to the following criteria[6]:

[6] These criteria are arbitrary. The cut-off points were designated so as to create roughly even-sized stages (in terms of number of utterances), but other than that the criteria are not intended to signal anything. They are simply incremental stages in development.

Table 3.7 Criteria for stages

	MLU	V Ratio	% MPHs
Stage 1	<2.5	<.15	>25%
Stage 2	2.5-3.0	.15-.20	15-24%
Stage 3	3.0-3.5	.20-.25	5-14%
Stage 4	>3.5	>.25	<5%

In order to assign children to a stage (or to various stages), I used a point system. I assigned points according to the above schema, so as to get a composite score for each child, and for sections of Mustafa's development. Table 3.8 shows the scoring system:

Table 3.8 Criteria for assigning scores for the purpose of staging children

	MLU	V Ratio	% MPHs
1 point	2.0-2.5	.01-.15	>25%
2 points	2.5-3.0	.15-.20	15-25%
3 points	3.0-3.5	.20-.25	5-15%
4 points	>3.5	>.25	<5%

The scores obtained for each child on each measure are given in table 3.9, with the composite score being the average of all three scores.

Table 3.9 Composite scores for the purpose of staging children

Child	MLU	V Ratio	% MPHs	Composite Score
Hawa	1	1	1	1
Mustafa	2	1	2	1.7
Fauzia	3	3	3	3
Hassan	4	4	4	4

Table 3.9 shows that the children fall into clear, discrete stages, based on the three language measures. Mustafa is the only child who shows inconsistency, in that the ratio of verbs to total utterances lags slightly behind the other two measures. However, recall that his data span a period of 11 months. If we do a more detailed breakdown of the corpus, we see that Mustafa goes through several stages. Mustafa's corpus is broken into three sections, based on the MLUs, V ratio and % MPHs, and the results are presented below.

Table 3.10 Composite scores for sections of Mustafa's corpus

Age	MLU	V ratio	% MPHs	Composite Score
2;0-2;3	2.24 (1)	.10 (1)	19% (2)	1.3
2;4-2;8	2.67 (2)	.11(2)	18% (2)	2.0
2;9-2;10	3.4 (3)	.20(3)	12%(3)	3.0

We see that Mustafa spans three clear stages. We can therefore say that based on these three measures, Mustafa is comparable to Hawa (who is in stage 1) during ages 2;0-2;3, and is comparable to Fauzia (who is in stage 3) during ages 2;9-2;10. The 5 months in between (2;4-2;8) represent a stage that is between the two. So we have the following breakdown of the corpus by stage:

Table 3.11 Division of the Swahili Corpus by stage

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

I have also included in appendix 4C the statistics for each child broken into monthly files for purposes of verification. Thus this staging process is simply a tool that makes the exposition of the facts clearer. In the next chapter we will see the patterns of omission that occur in early Swahili verbal utterances.