

Kenya Sign Language (KSL) Phonology: Articulatory Properties and Phonological Processes

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Abstract The study of phonology is concerned with the contrastive units of language whether these contrastive units are based on an audio language (like spoken languages) or a visual language (like signed languages). Spoken languages have as their smallest contrastive units' contrastive sounds while visual languages have articulatory properties as their contrastive units. The term phonology as a general scientific concept is used in sign language studies to refer to the study of those physical properties of signs whose contrasts lead to meaningful differences among signs Okombo et al [2]. The major distinguishing physical properties in KSL just like in other sign languages include: Hand shapes or hand forms (articulators), movement or motion (manner of articulation), location (place of articulation), and palm orientation (manner of articulation). These four articulatory properties of KSL together are referred to as manual signs where signs are physically produced by the hands and other parts of the body. However, often times manual signs have to combine with non-manual signs to make meaning. We can also add two more articulatory parameters to the ones above. That is, Non manual signs and the signing space. The above parameters can be viewed as the articulatory properties of a sign. According to Okombo et al, the actual nature of the sign depends on what the hand which performs the role of an active articulator does. It is also important to note that during the production of signs, they may influence each other and therefore determine sign order variation. This influence and subsequent variation in sign order is as a result of some phonological processes. A phonological process changes the appearance of an utterance by following well defined rules in phonology, but does not change the meaning of the utterance Vogler and Matexas [3]. In this paper we examine the articulatory properties of KSL or those physical properties of signs in KSL whose contrasts lead to meaningful differences among signs and also examine how signs in KSL influence each other and how this influence and subsequent variation in sign order is as a result of some phonological processes. We shall examine such phonological processes in KSL.

Keywords KSL Phonology, Phonological Processes, KSL

Visually perceivable and movable parts of the body – the hands, facial features, head, and upper body – are the articulators of sign language. It is through these articulators that words (sic) are formed, constrained, and contrasted with one another and that prosody is conveyed. Sandler. [1]

1. Introduction

Over the years phonology has been equated to sounds. It was not until the 1960's that attempts were made by Stokoe [4] to understand the place of phonology in a language system that is not sound based. Thus Stokoe coined the word cherology as synonym of phonology and cheremes, as the contrastive units of Sign Language. However, this coinage did not gain much currency in linguistics in general and sign linguistics in particular. What is clear though is that signs just like words have parts and these parts have a structure and organization. Phonology is primarily concerned with the structure and organization of the smallest contrastive units whether in spoken language or signed languages. These units act as the building blocks that help to produce signs. According to Brentari [5] sign language phonology – the concern of this paper – has a bearing on “the level of grammatical analysis where primitive structural units “without meaning” are combined to create an infinite number of meaningful utterances”. Thus sign language phonology revolves around those physical properties of signs (which on their own have no meaning) but can be combined to make an infinite number of meaningful utterances in Sign language and whose contrasts then lead to meaningful differences among signs.

In this paper therefore the term phonology will be used

as a general scientific principle to refer to the study of the smallest contrastive units in KSL that can lead to a change from one sign to another. In the articulation of a sign, if the articulatory properties (i.e. the hand shape, the movement, the location, orientation or even the non-manual sign) is altered, omitted or substituted with another, a different sign is formed. In this paper, we shall therefore examine the phonology of KSL by interrogating the parts of a signs in KSL, their occurrence and how these parts of signs motivate their interaction or how the different orders they may occur in can influence how they interact with each other – this is as a result of different phonological processes. In this paper we shall also examine the following phonological processes in KSL:

- i. Movement epenthesis
- ii. Hold deletion
- iii. Metathesis
- iv. Assimilation
- v. Coalescence
- vi. Neutralization

1.1. KSL Phonology

Phonology studies the smallest contrastive units of language their structure and organization, Valli and Lucas [6]. These contrastive units of language vary in terms of whether the language uses sound based or visual based symbols. In spoken language, which is audio based, the smallest contrastive units are contrastive sounds. Though the term phonology has been used to mean the study of how speech sounds contrast with one another in the formation of meaningful units in one particular language or in human language in general, as a general scientific concept it is also used in sign language studies to refer to the study of those physical properties of signs whose contrasts lead to meaningful differences among signs (Okombo et al 2006, p.86). There have been attempts to coin terminology that would fit into sign language linguistics in terms of phonology since phonology has over years been equated to sounds as Crystal [7] puts it:

“An important stage in the history of sign language analysis took place in the 1960s, when the term cherology was coined on analogy with phonology... to refer to the study of contrastive units (cheremes) that occur in sign language.” (p.223)

This coinage by Stokoe was important, however, it did not gain much support and usage and linguists generally adopted the term phonology to refer to how signs are structured and organized. In this paper I use the term phonology as a general scientific concept that as Okombo et al (2006) puts it “...refers to the study of those physical properties of signs whose contrasts lead to meaningful differences among signs.” In sign language, there are certain physical properties that evidentially point to its phonology for example hand shapes (articulators), movement (manner of articulation), Location (place of articulation) and palm orientation (manner of articulation),

signing space and minimal pairs. These KSL physical properties will be discussed below.

1.1.1. Main Distinguishing Physical Properties in KSL

According to Sandler (2013), visually perceivable and movable parts of the body – the hands, facial features, head, and upper body – are the articulators of sign language. It is through these articulators that words (sic) are formed, constrained, and contrasted with one another, and that prosody is conveyed. This is in contrast to spoken language where the tongue and other articulatory organs play a major part in articulation of speech sounds as Homer, in *The Iliad* asserts: “A persons tongue is a twisty thing, there are plenty of words there of every kind, and the range of words is wide, and their variation.” This quotation illustrates the place of the tongue in articulation of speech sounds. In sign language the counterpart of the tongue is the hand in conjunction with other parts of the body which are used in the articulation of signs. These are the major parameters that are used in the articulation of signs. While we acknowledge “the first step in an analysis of the phonology of a language is to establish which sounds in that language are in contrast with each other.” O’Grady et.al [8], we are aware that this can be effectively done through the establishment of minimal pairs. However, before discussing this very important first step in the analysis of phonology, in this paper I will start by examining the major distinguishing physical properties in the production of signs in KSL just like in other sign languages. These articulatory properties are also known as sub lexical features.

1.1.2. Hand Shapes/Hand Forms/Hand Configuration (Articulators)

The hand is to the deaf what the tongue is to hearing people in terms of articulation. Both are major articulators in sign language and spoken language respectively. Thus the importance of hand forms in sign language. Hand forms or shapes are based on the shape that the (active) hand or articulator takes when a manual sign is made. Thus for example a sign may have an index finger hand form or an S – hand form as illustrated below:

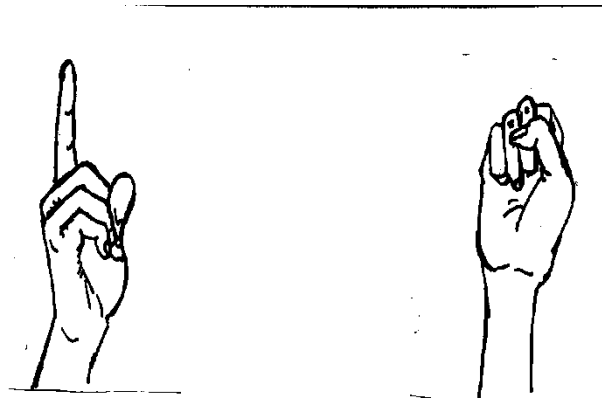


Figure 1. Index Finger Hand form & S – Hand form respectively

Most hand forms in KSL are made from the letters of the one handed manual alphabet that is used by people who are deaf in Kenya. However, there are a few hand forms like the index finger hand form, the claw hand form etc. which are not derived from the letters of the alphabet. The one handed manual alphabet is illustrated below:

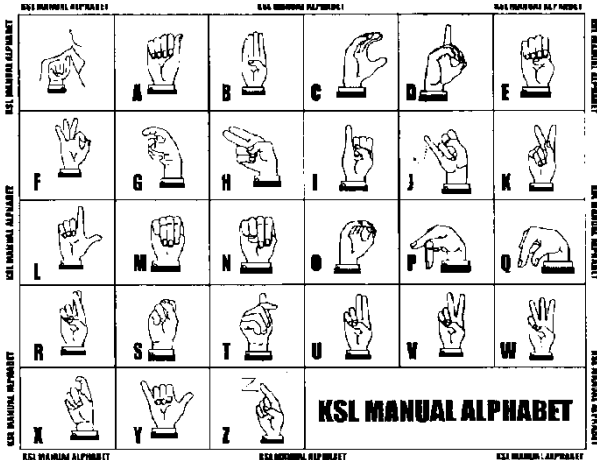


Figure 2. KSL Manual Alphabet

The use of these letters of the alphabet is called finger spelling which is basically a manual representation of letters of the English alphabets from A-Z. There are different types of manual alphabets adopted by people who are deaf in different countries. The manual alphabet used has a direct relationship with letters of the conventional orthographic English alphabet. KSL uses the one hand international manual alphabet presented in fig.2 above.

Using this manual alphabet, people who are deaf can fingerspell words of spoken language. This allows them to code mix by mixing signs with finger-spelled words of other spoken languages i.e. they change from SL to a variety of spoken language through finger spelling. Finger spelling is only possible for deaf people who can read and write.

1.1.3. Movement / Motion (Manner of Articulation)

Movement as a distinguishing physical property of KSL is based on the direction and speed of the active hand or active articulator i.e. movement of the signing hand or any other part of the signer's body e.g. the signing hand or active articulator may move fast towards the forehead or slowly away from the mouth etc.

1.1.4. Location (Place of Articulation)

Location is based on the position of the hand in relation to the body or place where one or two hands (both serving as active articulators) meet in relation to the rest of the signer's body or generally where a sign may be made, for instance, on the CHEST, FOREHEAD, EAR, TORSO, NECK CHIN, MOUTH, etc.

In KSL, the places below can act as locations or places where signs are articulated. Thus signs can be made at the:

- whole face or head
- upper face (forehead or brow)
- mid face (eyes or nose)
- lower face (chin or mouth)
- side face (cheek, temple, or ear)
- neck, the trunk (shoulders, chest, and belly)
- upper arm
- forearm (including the elbow)
- inside of the wrist,
- back of the wrist

1.1.5. Palm Orientation (Manner of Articulation)

Palm orientation is based mainly on the direction of the active hand's movement in relation to the signer's body. Thus the orientation of the sign maybe INWARD (towards the signer's body) or OUTWARDS (away from the signer's body) out wards movement may or may not be towards the listener's body. The important thing in orientation is the signer's body or (in some cases) the active hand itself (in relation to the space around it). Orientation can at times change the meaning of signs. Thus it is important to ensure the orientation of a sign is correct otherwise the meaning may change as illustrated in fig. 3 below. I is signed with index- finger hand form oriented towards the signer while in signing YOU, the index finger hand form is oriented away from the signers body. What this means is that if you want to sign I sign I and not YOU since the meaning will not be the same. So a slight change in orientation or manner of articulation of a sign can significantly change the meaning of the sign as exemplified in fig. 3 below:

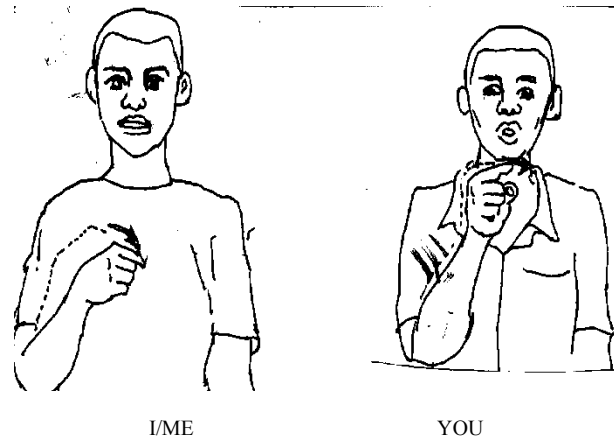


Figure 3. KSL for I/me and you.

1.1.6. Non Manual Signs (Facial Expressions)

A signer may add more meaning to a sign by movement and positioning of the eyes, eyebrows, mouth, face, head, shoulder and the body. These movements may give the same hand-sign different meanings with regards to asking, confirming or expression of doubt. They are particularly important in sentence meaning. (Cf. Klima and Bellugi [9]; Okombo et al 2006). Okombo et al (2006) added another parameter i.e. PROXIMITY: based on how close the hand

shape is to the location and the spatial relationship between the hand shape and the location. In KSL, non-manual signs show grammatical information such as question markers, negation or affirmation, and topicalization. Additionally, non-manual signs perform discourse functions like regulating the flow of conversation.

Non manual signs are normally used together with manual signs. It is however possible in limited number of instances in the KSL lexicon to make meaning by using only non-manual signs e.g. the KSL sign for DON'T KNOW exemplified in fig. 4 below:



Figure 4. KSL for I don't Know.

This sign is made by use of non-manual signs alone in KSL. This sign is also used as a synonym to the KNOW-NOTHING SIGN in KSL. Examples of other signs that make use of non-manual signs only include:

- (i). A head nod accompanied by interrogative facial expressions- wrinkled forehead, widened eyes, pouted lower lip to signify regulation of conversation or show acceptance or agreement.
- (ii). Interrogative facial expression with a slight forward stoop to mean TRUE? or REALLY?

However, the majority of signs use either manual or combination of both manual and non-manual signs. Baker [10] says:

... eye, face, head and body movement ... are part of the language itself and not merely a background behaviour or behaviours simply used to show emotions.

The non-manual grammatical markers are said to perform different syntactic functions e.g. asking questions, negating proposition, distinguishing between statement and questions. In other words, "the signer may add meaning to the sign by movements and positioning of the eyes, eyebrows, mouth, face, head, shoulder and the body. These movements may give the same hand-sign different meanings with regard to matters of asking, confirming or

expressing doubt about something." Okombo et al (2006: 24). An example of how NMGs distinguishing between a statement and a question is given below:

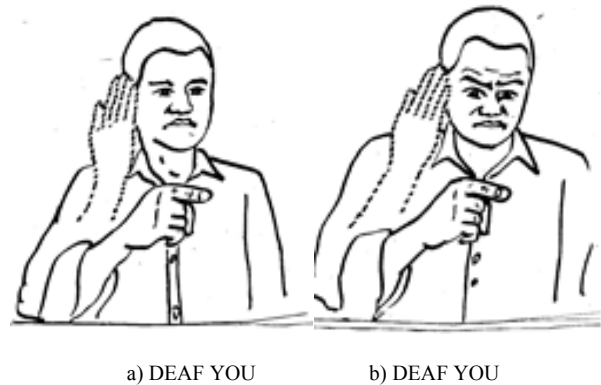


Figure 5. KSL for you are Deaf (statement and Are you deaf (question) respectively.

DEAF YOU// You are a deaf (statement) **Manual Signs only**

DEAF YOU// Are you deaf? (Question) **Manual+ non manual signs**

In the above example, fig. 5 (a) is statement while fig. 5 (b) is a (Yes- No) question. Both are made using manual signs DEAF YOU. The difference between the two examples above is that (a) is converted into a question by use of non-manual grammatical elements (through interrogative facial expression).

1.1.7. Signing Space (SS)

This is an imaginary space within which signs are made. Signs are rarely made above the head or below the waist or towards the back of head or body. However, the whole spatial area can be enlarged or confined to express "louder" signs when a person who is deaf is communicating or signing to another who is far. Here big signs are made equivalent to shouting in spoken language or "quieter" signs when a person who is deaf is communicating something secretly to another smaller signs are made equivalent to whispering in spoken language.

In KSL, through the Signing Space we can observe the following organizational principles:

- Location or placement
- Time relationships
- Use of Pronouns

The signing space is the space within which signs are made. In this space signs can be made with or without touching parts of the body. However, some signs can be made outside the signing space e.g. exaggerated signs, certain gestures and pantomime may exceed these limits, but most signs would be made in this restricted area (Valli and Lucas 1996:193).

The above parameters can be viewed as the articulatory properties of a sign. According to Okombo et al (2006), the actual nature of the sign depends on what the hand which

performs the role of an active articulator does. Each of these parameters work hand in hand to signal meaning in sign language. Hand shapes, location, orientation and non-manual signals are hold segments (or passive articulators) which combine with movement segments (active articulators). Hold segments denote static hands while movement segment denote dynamic hands. These are basically articulatory features that are linked to both hold and movement segments (Valli and Lucas 1996).

1.1.8. Minimal Pairs

According to O'Grady et al (2011), "since knowledge of segmental contrast is fundamental in knowing any language, the first step in an analysis of the phonology of a language is to establish which sounds in that language are in contrast with each other. In order to establish contrast, it is necessary to examine the distribution of sounds in words and to compare word meaning. The most straightforward way to accomplish this examination is by way of minimal pairs."

Minimal pairs occur when pairs of words or phrases in a language differ only in one phonological element and that difference can distinguish meaning. In spoken language the phonological element that makes the difference is sound. A pair of words may be same in all aspects but on one distinct sound which also contributes to their difference in meaning. For example, the following words in Kiswahili are minimal pairs:

Nani (who)	nyani (baboon)
Pika (cook)	piga (beat)
Kile (that)	kila(every)

The environment within which these words appear is the same but for one sound. Nani and Nyani are distinguished by /n/ and /ny/, Pika and Piga by /p/ and /k/ while Kile and Kila by /e/ and /a/. These sounds make meaningful contrast that is responsible for the differences in meaning of these words. Of importance here is the fact that the sound units themselves /n/, /ny/, /p/, /k/ and /e/, /a/ have no meaning but contrasting them with others within the same environment can lead to meaningful differences among signs.

While in spoken language the phonological element that makes the difference is sound, in sign language on the other hand the phonological element that distinguishes meaning in minimal pairs are its articulatory properties which include: hand shapes, movement, location, palm orientation and non-manual signs. In KSL minimal pairs can be created when some signs have the following articulatory properties:

i. Same hand shape but different movement.

Examples of this in KSL include: **SUNDAY, BUNGOMA**

SUNDAY: OPEN PALM HAND SHAPE IN THE MIDDLE OF THE FORHEAD MOVING AWAY FROM THE SIGNER – SINGLE MOVEMENT.

BUNGOMA (A town in Western Kenya): OPEN PALM HAND SHAPE IN THE MIDDLE OF THE FORHEAD MOVING AWAY FROM THE SIGNER – DOUBLE MOVEMENT.

The only distinguishing characteristic in the two signs and which then distinguishes meaning is the movement. Thus **SUNDAY (single movement)** and **BUNGOMA (double movement)** are minimal pairs in KSL.

ii. Same hand shape but different orientation.

Examples of this in KSL include: **YOU, ME; WAIT HEAVY**

I: INDEX- FINGER HAND FORM ORIENTED TOWARDS THE SIGNER BODY.

YOU: INDEX FINGER HAND FORM IS ORIENTED AWAY FROM THE SIGNERS BODY.

I and **You** are minimal pairs in KSL since they are two different forms with distinct meaning whose difference is in only one segment in this case – the sign orientation.

This is exemplified in fig.3 above repeated here as fig. 6 below:

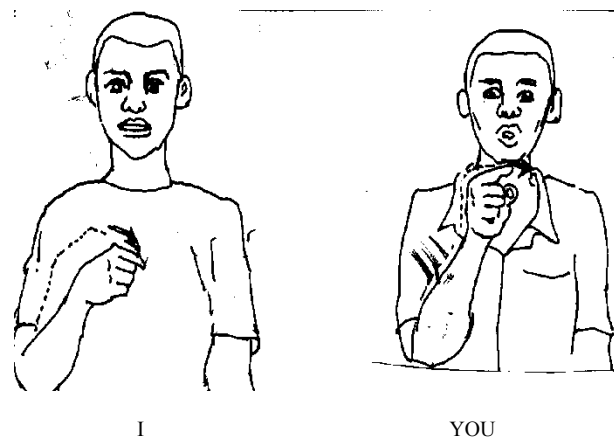


Figure 6. KSL for I and you.

Other examples as indicated earlier include: **WAIT** and **HEAVY** as illustrated in figure 7 below:

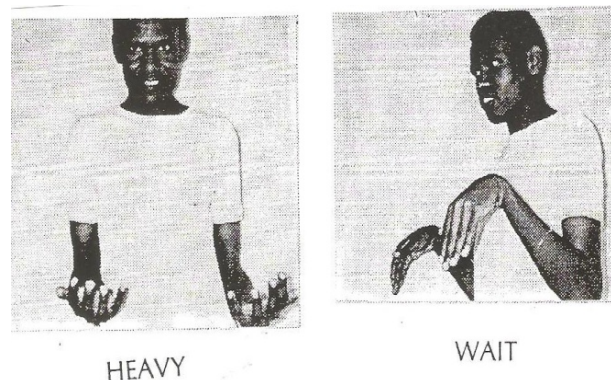


Figure 7. KSL for heavy and wait.

iii. Same hand shape but different location.

Examples of this in KSL include: CLEVER, NICE; ANGRY, COLLEGE

CLEVER: A- HAND SHAPE WITH THUMB TOUCHING FOREHEAD.

NICE: A- HAND SHAPE WITH THUMB TOUCHING CHEEK.

CLEVER and NICE; ANGRY AND COLLEGE are minimal pairs in KSL as exemplified below:

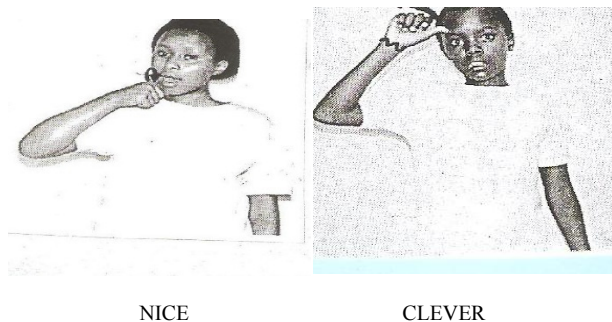


Figure 8. KSL for nice and clever.

iv. Same hand shape different non manual signs.

Examples of this in KSL include: RAIN, RAIN HEAVILY; SAD, VERY SAD.

RAIN: OPEN PALM WITH FINGERS APART FACING DOWN WITH UP AND DOWN MOVEMENT.

RAIN HEAVILY: OPEN PALM WITH FINGERS APART FACING DOWN WITH UP AND DOWN MOVEMENT +NON MANUAL SIGNS

SAD: CLAW HAND FORM ON THE CHEEK
 VERY SAD: CLAW HAND FORM ON THE CHEEK + NON MANUAL SIGNS

From the above examples, segments that are ordinarily distinct like CLEVER and NICE, I and YOU; HEAVY and WAIT, above change their meaning when we change their physical properties in KSL.

2. Phonological Processes

The manner of production (palm orientation) is a dimension of discourse that normally includes style and register. Signs may influence each other and therefore determine sign order variation. This influence and subsequent variation in sign order is as a result of some phonological processes. A phonological process changes the appearance of an utterance by following well defined rules in phonology, but does not change the meaning of the utterance. Vogler and Matexas (1999)

The following are phonological processes identified by Valli and Lucas (1996):

- Movement epenthesis
- Hold deletion
- Metathesis
- Assimilation
- Coalescence
- Neutralization

In the following section we shall examine each of these processes in KSL.

2.1. Movement Epenthesis

According to Richards et al [11] epenthesis “is the addition of a vowel or consonant sound at the beginning of a word or between sounds. “For example, Meru speakers of English in Kenya, add nasal sounds for words starting with consonants. This pre- nasalization is an example of epenthesis e.g. **mboy** for boy and **ngirl** for girl. In general therefore epenthesis is the addition of elements into already existing structures. Movement epenthesis which is found in KSL is thus an addition of a movement segment to the last segment of one sign and the first segment of the next sign. Movement epenthesis involves a sequence of signs that have a hold and internal movement (Valli and Lucas (1996)

Liddle and Johnson [12] in their auto segmental model asserts that signs consist of sequentially ordered units each unit being defined by the static nature of hands (hold segments) or their dynamic nature (movement segments). Put in a different way, signs are sequentially ordered units and are defined by a passive hand or the hold segment and an active hand or the movement segment. Since signs occur sequentially if you bring together two or more signs a movement may be added between the signs. These sequences (Hold – Movement) are mostly found in compound signs – that is signs made of a combination of two or more signs which function as one single sign e.g.

SWEDEN PEOPLE (SWEDES)

SWEDEN is made up of a hold segment, movement segment and then hold segment. PEOPLE is also made of hold, movement, hold as exemplified below following Valli and Lucas (1996)

BASIC SIGN	SWEDEN	PEOPLE
Movement	H M H	H M H
Epenthesis	H M H	M H M H

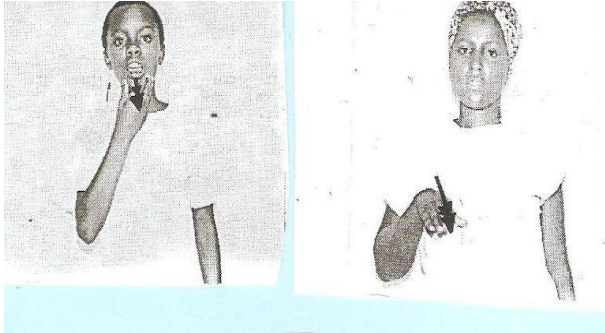
The two signs **SWEDEN** and **PEOPLE** come together to form (SWEDES) – people from Sweden – through the insertion of a movement between two holds.

In Kenyan Sign Language, there is more movement epenthesis found in compound signs as exemplified below:

DRIVE	PERSON (Driver)
H M H	M H M H

INDIA		PERSON (Indian)
H M H	M	HMH
FATHER		MOTHER (parents)
H M H	M	HMH
MAGIC		PERSON (magician)
H M H	M	HMH
MEDICINE		PERSON (doctor)
H M H	M	HMH

Examples below:



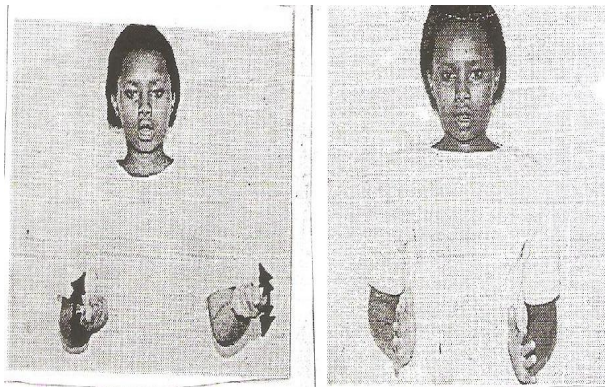
FATHER MOTHER (PARENTS)

Figure 9. KSL for Mother and father to give parents.

The sign FATHER MOTHER (PARENTS) has the following structure:

FATHER		MOTHER (parents)
HMH	M	HMH

The sign DRIVE PERSON (DRIVER) has the following structure:



DRIVE PERSON (DRIVER)

Figure 10. KSL for driver.

The sign DRIVE PERSON (DRIVER) has the following structure:

DRIVE		PERSON (Driver)
HMH	M	HMH

From the above examples, we can see that movement epenthesis consists of the insertion of extra movement normally not there in either of the two signs' lexicon form. Most compound signs used for epenthesis above are proper

nouns. There are however a few instance of verbs for example in the case of LEARN LEARN KEEP (MEMORIZE) and examples of some nouns and adjectives e.g. HEAD BIG (big headed) GIRL SHY (shy girl) etc. In all the cases, the signs are made starting with a Hold (H), Movement (M) and another Hold (H) segment. Before the second sign follows, there is a movement that is representing the epenthesis then the same pattern is repeated for the second sign (HMH).

More examples:

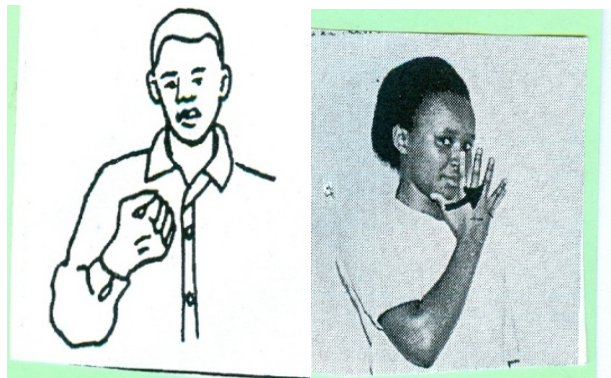


MEMORIZE

Figure 11. KSL for memorize

The sign MEMORIZE has the following structure:

LEARN	LEARN	KEEP (MEMORIZE)
HMH	M	HMH



GIRL SHY

Figure 12. KSL for shy girl.

The sign GIRL SHY which includes a noun and an adjective has the following structure:

GIRL	SHY
HMH	M HMH

2.2. Hold Deletion

Hold segments are characterized by static hand shape. Each segment is an articulatory bundle that has hand shape, location, palm orientation and non-manual signals facial expression. Lucas et al [14]. Hold deletion as a phonological process is closely related to movement epenthesis. Whereas in movement epenthesis we add a movement segment, in hold deletion we eliminate movements when signs occur in a sequence. Valli and

Lucas [14].

For example in JESUS FOLLOWER (Followers of Jesus) the sign JESUS is made of Hold, Movement and Hold (HMH) sequence. Similarly the sign FOLLOWER is made of the same sequence of Hold, Movement and Hold (HMH). When these signs are used in a sequence, there occurs epenthesis that is a movement segment is added between the first segment JESUS and the second segment FOLLOWER. There is also an occurrence of hold deletion where the last hold of JESUS and the first hold of FOLLOWER are eliminated. Following Valli and Lucas (1996) we can derive the following structure:

BASIC SIGN: JESUS FOLLOWER (Followers of Jesus)

Movement	HMH		HMH
Epenthesis	HMH	M	HMH
Hold deletion	HM	M	MH

BASIC SIGN: GIRL CHILD (daughter)

Movement	HMH		HMH
Epenthesis	HMH	M	HMH
Hold deletion	HM	M	MH

BASIC SIGN: INTERPRET PERSON (Interpreter)

Movement	HMH		HMH
Epenthesis	HMH	M	HMH
Hold deletion	HM	M	MH

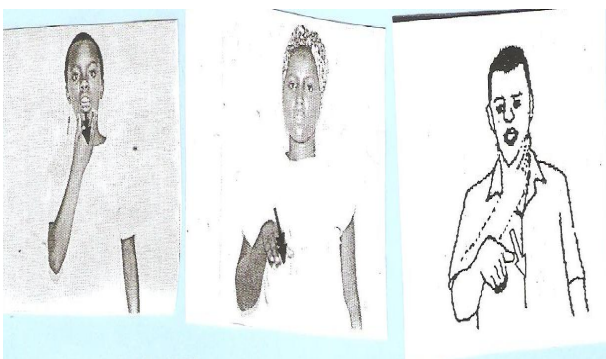
BASIC SIGN: UNDERSTAND NOTHING (I don't understand)

Movement	HMH		HMH
Epenthesis	HMH	M	HMH
Hold deletion	HM	M	MH

BASIC SIGN: FATHER MOTHER (parents)

Movement	HMH		HMH
Epenthesis	HMH	M	HMH
Hold deletion	HM	M	MH

Hold deletion is exemplified below:



FATHER MOTHER PARENTS

Movement	HMH		HMH	HM M MH
Epenthesis	HMH	M	HMH	
Hold deletion	HM	M	MH	

Figure 13. KSL for Father and Mother which gives us parents.

Another illustration of GIRL CHILD DAUGHTER in fig. 14 below:



GIRL CHILD DAUGHTER

Movement	HMH		HMH	M M HM
Epenthesis	HMH	M	HMH	
Holds deletion	HM	M	MH	

Figure 14. KSL for girl and child giving us daughter.

In the examples above, hold deletion occurs when the last hold in the first sign and the initial hold in the second sign are eliminated during the process of signing. Thus the non-contact holds between movements or "inter-M holds" (Liddle and Johnson 1984) are eliminated since there is a difference between the ending of the first sign in the compound in terms of articulation from the initial segment through the M-epenthesis rule, a segment bundle is inserted which is specified for M between the two signs. This changes the other articulatory specifications. This is further exemplified below:

BASIC SIGNS: FATHER MOTHER (PARENTS)

H MH H MH



Hold deletion **H M M MH**

BASIC SIGN: GIRL CHILD

H MH H MH



Hold deletion **H M M MH**

When the signs exemplified above are used in isolation, both end with substantial holds. However when juxtaposed as in a compound sign, the final hold of the first sign and the initial hold of the second sign are deleted. Other examples include:

BASIC SIGN: HEAD BIG

H MH H MH



Hold deletion **H M M MH**

BASIC SIGN: MAN MARRY (HUSBAND)
 H MH H M H



Hold deletion H M M M H

BASIC SIGN: WOMAN MARRY (WIFE)
 H MH H MH



Hold deletion H M M M H

Other examples of hold deletion in KSL include: HUSBAND, WIFE etc.



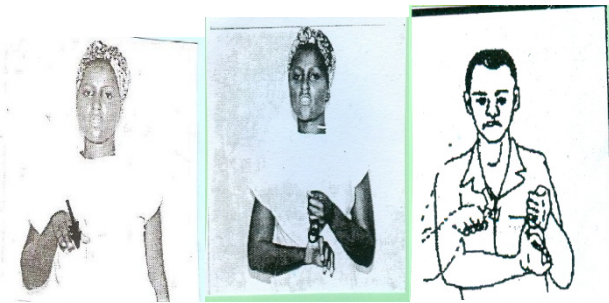
MAN MARRY HUSBAND

Figure 15. KSL for man and marry giving us Husband.

BASIC SIGN MAN MARRY (HUSBAND)
 H MH H MH



Hold deletion H M M M H



WOMAN MARRY WIFE

Figure 16. KSL for woman and marry giving us wife.

BASIC SIGN MAN MARRY (HUSBAND)
 H MH H MH



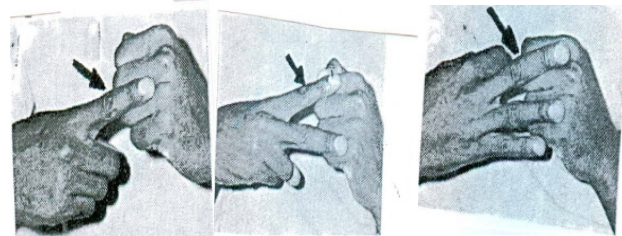
Hold deletion H M M M H

2.3. Deletions in Double Articulated Signs

The above examples (2.2) are of deletion of a hold segment (an item). However, in KSL, there are also

examples of deletion of a whole unit. For example in cases of double articulated signs – signs that require both hands to be articulated. In their articulation, both hands normally have a movement component – sometime one hand can be deleted. This can occur when a signer is holding something on one hand and wants to articulate a double articulated sign. In this case the articulator is not deleted but the place of articulation – the non-dominant hand can be deleted.

In this kind of scenario where the non-dominant hand is deleted because it is occupied, there is normally an addition of an unmarked place of articulation that is added. This added place of articulation could be a convenient surface such as table top, chair etc. the new surface used helps account for the deletion of the non – dominant hand.



SIX SEVEN EIGHT

Figure 17. KSL for numbers six, seven and eight.

In the examples fig. 17 above, the left non dominant hand that formed by an S- hand form can be deleted if that hand is occupied and signer cannot make use of it in a double articulation sign like number SIX, SEVEN, EIGHT above and the index figure hand form placed on an unmarked place of articulation say a table top and it would still mean number six. The same is true other several signs in KSL.

2.4. Metathesis

Metathesis as a phonological process involves signs exchanging an initial sequence of segments with a sequence of final segment in certain contexts. Richard et al (1987) asserts that metathesis refers to an alteration in the sequence of elements usually sounds but sometimes syllables, words or other units. In sign language this process would refer to a situation where parts of segments, whole segments or groups of segments can be variable rearranged i.e. where the order of segments or features of segments are rearranged.

Metathesis is mostly a product of fast speech or fast signing or the need to make pronunciation of certain words easy. Examples of metathesis in spoken languages include:

- ASK – AKS
- FILM – FLIM
- KIOSK – KIOKS

In KSL, Metathesis occurs when parts of a sign change places. Metathesis is more of a slip of the tongue in the case of KSL a slip of some aspect of the articulatory properties.

Examples of metathesis in KSL include:

- WIFE – WOMAN MARRY or
MARRY WOMAN (metathesis)
- HUSBAND – MAN MARRY or
MARRY MAN (metathesis)
- PARENTS – FATHER MOTHER
MOTHER FATHER (metathesis)
- INTERPRETER – INTERPRET PERSON
PERSON INTERPRETER
(metathesis)
- DAUGHTER – GIRL CHILD
CHILD GIRL (metathesis)

From the examples above, it is apparent that for metathesis to occur in KSL it must involve the same sign and thus gives us some variant of the same sign so that while the standard sign for WIFE is WOMAN MARRY, sometimes KSL users may reverse this order to MARRY WOMAN; HUSBAND can be changed from MAN MARRY to MARRY MAN; PARENTS – FATHER MOTHER to MOTHER FATHER, and INTERPRETER – INTERPRET PERSON to PERSON INTERPRETER. This mainly happens for ease of articulation or during fast signing.

In all the examples above, the standard sign is made up of one signs that is signed above the second one and thus it logically has to be signed first.



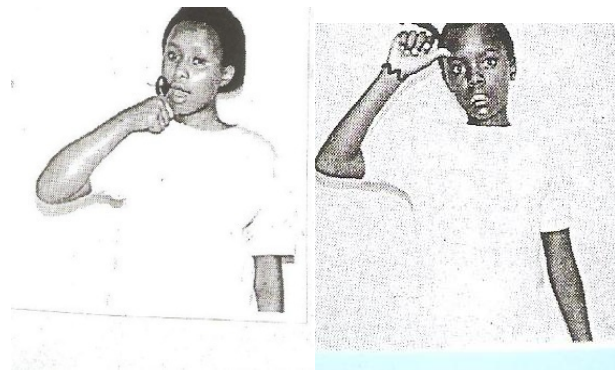
GIRL CHILD (DAUGHTER) WOMAN MARRY (WIFE)

Figure 18. KSL for daughter and wife.

In signing DAUGHTER in KSL, the first hand shape of GIRL in fig. 18 above is located higher than the second sign of CHILD and in signing WIFE the sign WOMAN is also signed higher than the sign MARRY. In which case if signers signs them the opposite way then they become metathesised signs. The change in movement from the standard sign to the metathesised one occurs mainly in informal situation or in casual talk. In formal situations, the standardized version is normally used.

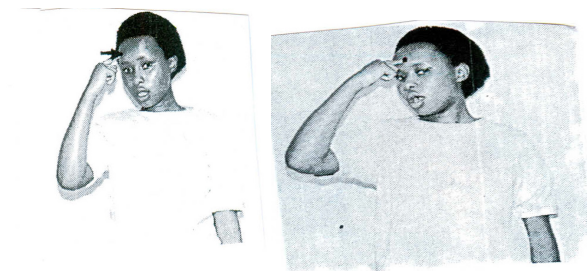
There are cases of the “slip of the tongue” in KSL where

during fast signing errors of production can occur. “Slip of the tongue” in spoken language is equivalent to "slip of the hand" in KSL as exemplified in fig. 19- 21 below.



NICE CLEVER

Figure 19. KSL for nice and clever.



THINK INDIA

Figure 20. KSL for think and India.



TRY NEW

Figure 21. KSL for try and new.

A signer may unintentionally and often times unconsciously reorder certain elements in the course of signing that can actually lead to a different sign and meaning. This can be viewed as production errors mostly occasioned by fast signing where for example instead of signing NICE they may sign CLEVER or vice versa since the only difference in the two signs is place of articulation. Similarly, a signer may sign INDIA for THINK or vice versa since they also differ only in place of articulation. INDIA is signed with index finger in the middle of the forehead while think slightly to the side. TRY and NEW

also provide room for slip of the hand since they only differ in manner of articulation or movement. TRY has inward movement while NEW is signed with outward movement. It is also common to find especially new learners of KSL slip when signing PLEASE and SORRY since they are both articulated on the chest and it is easy for an occurrence of the slip of the hand during signing.

2.5. Assimilation

Assimilation is a phonological process in which a speech sound changes and becomes like or identical to another sound that precedes or follows it, (Richard et al 1987). In sign language we can view assimilation as occurring when one sign takes the hand shape, location, movement or orientation of another sign. In other words, a sign can take the characteristics of another near it, one just before it or after it so as to be similar.

- SIGN LANGUAGE RESEARCH
- UNDERSTAND NOTHING
- UNDERSTAND ZERO
- FEAR NOTHING
- BIBLE TELL
- YOU GO
- WIFE SAME
- BELIEVE NOTHING
- FALL FINISH

In the above examples several signs are bounded into one through assimilation.

In SIGN LANGUAGE RESEARCH, the first sign, assimilates to the hand shape of the following sign i.e. LANGUAGE. The same is true of HOSPITAL RESEARCH. In the example UNDERSTAND NOTHING and UNDERSTAND ZERO, the assimilation is in terms of orientation. In UNDERSTAND NOTHING the first sign UNDERSTAND assimilates to the orientation of the second sign NOTHING. In KSL UNDERSTAND NOTHING is produced starting with an S- hand form that opens up to the index finger hand shape on the side of the forehead (no touching) and then it changes its orientation to that of a ZERO hand form before it ends up in a spread finger hand form in front of the trunk.



UNDERSTAND NOTHING

Figure 22. KSL for I don't understand.

In the production of the sign UNDERSTAND NOTHING in its assimilated form the sign UNDERSTAND assimilates to the orientation of the following sign that is NOTHING. Thus from the sign UNDERSTAND, the hand moves directly to the final orientation of the sign NOTHING that is a spread finger hand form in front of the trunk.



UNDERSTAND ZERO

Figure 23. KSL variant for I don't understand.

In UNDERSTAND ZERO on the other hand the signing also involves starting with an S-hand form, which opens up into an index finger hand form, and then it assimilates to the orientation of the sign ZERO.

In FEAR NOTHING – FEAR is signed on the side near the heart with a ZERO hand form opening and closing. NOTHING is a ZERO hand form that opens up to open finger hand forms. In this instance, the sign FEAR assimilates to the location of NOTHING, which is in front of the trunk.

In BIBLE TELL there is movement assimilation where after signing BIBLE, B-hand forms with palms facing each other in front of the trunk with the middle finger on each palm touching the center of the opposite palm then hold. To sign TELL the sign BIBLE must assimilate to the movement of TELL thus it moves to the lips and then moves away from the lips to stop in front of the trunk

In YOU GO, the sign YOU signed with an index finger hand form pointing at the listener assimilates to the movement and location of the sign GO.

Hand form assimilation can be exemplified by ARISE ZERO where ARISE is signed with an S- hand form moving from around the waist upwards, the S-hand form however assimilates to the hand form of the sign ZERO. Examples of other sign that fall under hand form assimilation include BELIEVE NOTHING and HIMSELF WITHDRAW.



In FALL FINISH we have movement assimilation.

The examples above are mainly of regressive

assimilation where a following sign retrogressively brings about a change in the sign that precede it. In the two handed signs, we also found out that anticipatory assimilation is more dominant. In anticipatory assimilation the base hand shape is in place before the dominant hand begins to make the sign. (Valli and Lucas 1995). Examples of anticipatory assimilation are given below:



MAN MARRY (HUSBAND) in this sign when the L-hand form facing up goes to the chin to form the sign MAN, the base hand shape is anticipatorily in place for the next sign which is MARRY where the last fingers meet in front of the trunk.



MAN MARRY HUSBAND

Figure 24. KSL for man and marry giving us husband.

As one signs MAN the non-dominant hand which is a protruding last finger hand form is already in place anticipatorily for the next sign MARRY.



In BELIEVE NOTHING the open palm hand shape is usually directly in place before the dominant hand form moves from the temple to make contact with it.



In FALL FINISH, the open palm hand shape that forms the base hand shape is also in place before the sign FALL.

In this case because the sign FALL is signed on the open palm hand shape. BELIEVE NOTHING and FALL FINISH above also exhibit what Little and Johnson (1985) call perseveration where “a non-dominant hand shape stays in place after the dominant hand shape has changed into a new sign.” In BELIEVE NOTHING the base hand shape remains in place even after the dominant hand has made contact with it and moved on to make the sign NOTHING. In FALL FINISH the open palm hand shape remains in place even after the dominant hand has come into contact with it to make the sign FALL and moved on to make the sign FINISH.

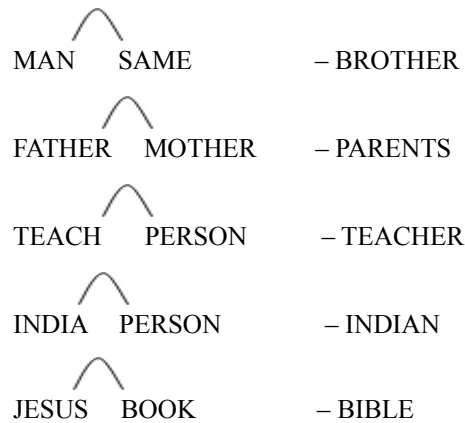
NOTHING is used in two ways IN KSL. It is used to mean “do not.” It is used together with UNDERSTAND. Used together, the compound sign UNDERSTAND

NOTHING means “I don’t understand.” In the second way it is used for purposes of comparison where the speaker looks at things as they were and compares them with what they are now when used this way the sign NOTHING is preceded by BEFORE or followed by the sign BUT both of which are able to bring out the comparison aspect.

FINISH which is a completive marker is used to state facts e.g. PERSON DEAD CROSS FINISH (Jesus died on the cross), JESUS HAVE POWER BEAT DEATH FINISH (Jesus has the power to beat death). ZERO can be used basically as a variant of NOTHING in that it can replace the sign NOTHING in terms of meaning in some contexts for example BIBLE TELL IF PEOPLE DEAD ARISE ZERO SAME PEOPLE THERE ARISE NOTHING (the Bible says if Jesus did not arise then there would have been no resurrection).

2.6. Coalescence

The process of coalescence is also known as fusion. Linguistic units that were distinct enough come together to create new linguistic segments. Coalescence can also be viewed as variation resulting from substitution in which new segments are born. In coalescence both units influence each other. Compound signs can exemplify this phonological process e.g.

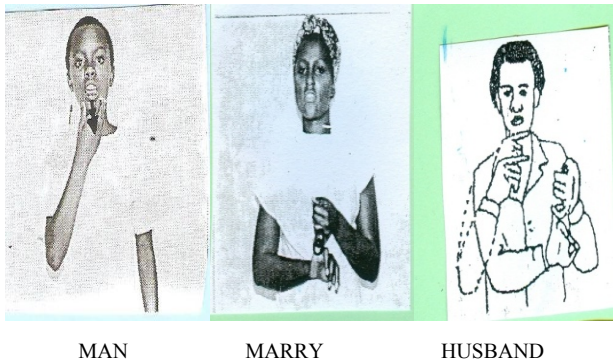


In the above examples signs that were distinct and distinguishable are coalesced to form new signs.

2.7. Neutralization

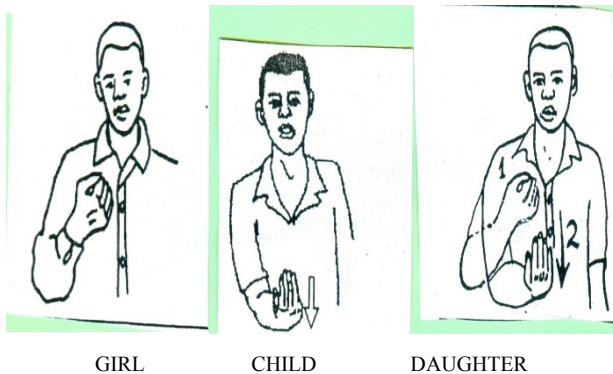
According to Friedman [15], neutralization in oral language entails the loss of distinction of two or more phones in a particular environment in a given language. In other words neutralization occurs when certain contrasts are merged in a certain environment or contexts. In sign language it would occur with the loss of distinction between the articulatory properties used in the production of signs in a given environment. In a situation where initially there was a phonemic distinction but it somehow disappears. It can be same hand shape different movement, or same hand shape different orientation, or same hand shape different location or same hand shape different non

manual signs. When such distinction disappeared in certain context then neutralization takes place. This is especially true in KSL in double contact signs or signs that are articulated at two different locations during their production. For example in the articulation of the sign HUSBAND, there is loss of distinction in the way the two signs MAN and MARRY are articulated to produce HUSBAND. There is thus loss of distinction in manner of articulation parameter as shown in Fig. 25 Below:



MAN MARRY HUSBAND

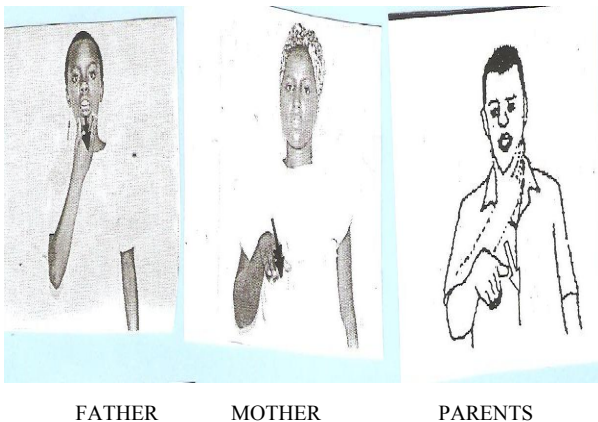
Figure 25. KSL for man and marry giving us husband.



GIRL CHILD DAUGHTER

Figure 26. KSL for girl and child giving us daughter.

In production of the sign DAUGHTER as illustrated in Fig. 26 above, the distinction in manner of articulation is also lost or neutralized since the sign daughter is produce simultaneously and thus merging the contrast in this context. In the production of the sign PARENTS, there is neutralization in the place of articulation parameter



FATHER MOTHER PARENTS

Figure 27. KSL for father and mother giving us parents.

3. Conclusions

From the above discussion, it is clear that KSL has a lexicon which is composed of form and meanings. Form equals the hand forms used - the manual aspects of signing together with the non-manual signs that sometimes accompany the manual signs. The form basically constitutes the physical properties that evidentially point to KSL phonology. Meaning is what the form signifies. We have also indicated following Klima and Bellugi (1975) that signs are mainly made up of four units that work in appropriate combination. These units we have called them the articulatory properties of KSL and they include:

- a) Hand forms / Hand shapes/ Hand configuration (articulators)
- b) Movement/Motion (Manner of articulation)
- c) Orientation (Manner of articulation)
- d) Location (place of articulation)

Okombo et al (2006) added another parameter i.e. PROXIMITY: based on how close the hand shape is to the location and the spatial relationship between the hand shape and the location. The above parameters together with non-manual signs and the signing space are the main distinguishing physical properties in KSL. For it is through them that "primitive structural units "without meaning" are combined to create an infinite number of meaningful utterances."

The discussion has also established that while in spoken language the phonological element that makes the difference is sound, in sign language on the other hand the phonological element that distinguishes meaning in minimal pairs are its articulatory properties which include: hand shapes, movement, location, palm orientation and non-manual signs.

It is also clear from the discussions above that signs may influence each other and therefore determine sign order variation. This influence and subsequent variation in sign order is as a result of some phonological processes. We have discussed in this paper various phonological processes that occur in KSL. The ones discussed include:

- Movement epenthesis
- Hold deletion
- Metathesis
- Assimilation
- Coalescence
- Neutralization

In conclusion, therefore, we can say that the study of phonology is concerned with the contrastive units of language whether these contrastive units are based on an audio language (like spoken language) whose smallest contrastive units are contrastive sounds or visual language like sign language (like Kenya Sign Language) whose smallest contrastive units are its articulatory properties. The term phonology as a general scientific concept is used in sign language studies to refer to the study of those physical properties of signs whose contrasts lead to

meaningful differences among signs (Okombo et al 2006).

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