



## IGBO SIGN LANGUAGE PHONOLOGY: ARTICULATORY ELEMENTS

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### Abstract

Primarily, phonology is the study of the sound system of a language. The term phonology as a general scientific concept is used in sign language studies to refer to the study of those physical elements of signs whose contrast lead to meaningful differences among signs, Okombo, et al (2006). This paper examines the major distinguishing physical elements in Igbo sign language phonology which include: hand shapes (articulators), movement (manner of articulation), location (place of articulation), palm orientation (manner of articulation) and non-manual signals which have to combine with the manual signs to make meaning. The researchers adopted a descriptive method and collected the data through video coverage/ snapshots of the basic lexical signs from selected Igbo home signers. The Phonological Model that outlines the parameters for sign description, which builds on the fundamental works done by Stokoe (1960), Klima and Bellugi, et al (1975) forms the framework used in the analysis of the data. The work discovers that most hand shapes in the Igbo Sign Language (ISL) are the same as those found in the American Sign Language (ASL), and that there are evidences of some phonological realizations and processes like minimal pairs, free variation, assimilation, deletion etc, in the signing patterns of Igbo home signers. It then concludes that the study of phonology is concerned with the distinctive units of language whether they are based on an audio language whose smallest contrastive units are sounds or visual language whose smallest distinctive units are its articulatory elements. It therefore establishes that these articulatory elements of sign language phonology can equally be applied to the study of Igbo sign language phonology, and suggests further linguistics research on the Igbo sign language structure to see how other phonological realizations/processes apply to the language.

**Keywords:** Igbo sign language, Sign language phonology, minimal pairs, free variation

### 1. Introduction

Phonology is the study of speech sounds of a language. Sounds combine to form words in spoken languages. The basic unit of phonology is phoneme, which is the individual speech sound that makes meaningful contrast in a language. In sign



linguistics, unit of signs that are equivalent to units of sounds in spoken languages also combine to form meaningful signs. The term 'phonology' is also used for sign language descriptions, although some scholars dispute the fact saying that sign languages are not vocal. The first researcher to demonstrate that signs used in the American Sign Language(ASL) could be considered to have an internal sub lexical structure similar to what is found in the words of spoken languages was William Stokoe, with the publication of *Sign Language Structure* in 1960. Initially, Stokoe's signs had been commonly seen as unanalyzable iconic gestures with little or no internal organization Woll (1990). McNeill (1992) says signs are like suchsed in the gesticulation that accompanies speech. The above indicate that signs were thought to be different from words because they could not be further broken down into smaller meaningful recurring segments.

The term phonology in this work will be used as a general scientific principle to refer to the study of the smallest contrastive units in the Igbo Sign Language (ISL) that can cause a change from one sign to another. In the articulation of a sign, if the articulatory properties (that is; the hand shape, the movement, the location, palm orientation or even the non-manual signs) are altered, omitted or substituted with another, a different sign is formed.

This study will focus on the articulatory elements in Igbo sign language phonology, and is informed by a strong desire borne by the researchers to see in existence a standard Igbo sign language that can be studied by everyone that wishes to study it in higher schools of learning, both the hearing and non-hearing persons. The researchers were also spurred by constant controversies among scholars, most disheartening, the linguistics scholars that something like Igbo sign language cannot exist. The above form the bedrock on which this work hinges. The work therefore aims at setting a pace and beckoning to well-meaning linguistics scholars to commence further researches on Igbo sign language development.

## 2. Review of Related Literature

### 2.1. Theoretical Framework

Stokoe (1960) reveals that the lexical signs of ASL seemed to be produced using a limited number of gestural features. Stokoe maintains that the action of a sign had three main aspects: **A designator:** used to refer to the specific combination of hand configuration and hand orientation. It is abbreviated to *dez*. A particular **tabulation (tab):** used to refer to the location of the hands. A specific **Signation (Sig):** used to refer to the movement of the hands. *Dez*, *tab* and *sig* were what Stokoe called chremes, the sign equivalent of phonemes. These chremes later came to be widely known as *handshape*, *location and movement* respectively, Lucas (1995) and Sulton-Spence & Woll (1999). Since Stokoe's original study, further research has shown that other features of sign formation should be taken into consideration. Battison (1978) sees *orientation*, which is referred to as the direction of the palm and fingers, as an important component of sign formation. According to him, a particular handshape can be oriented in a number of ways in relation to the signer's body. The palms and fingers may be oriented left, right, up, down, towards or away from the signer's body. Edward (2015) identifies two forms of signing in the articulatory parameter of sign language phonology. These two forms are the manual and nonmanual forms of signing which when combined produce meaningful utterances. The manual form she says relies on the hands while the nonmanual lies on facial expression, mouthing, click etc. The manual and nonmanual parameters, elements or properties of sign language

description which have been successfully used in every known sign language and will be employed by the researchers in the analysis of the linguistic data in this study are illustrated in pictorial forms below:

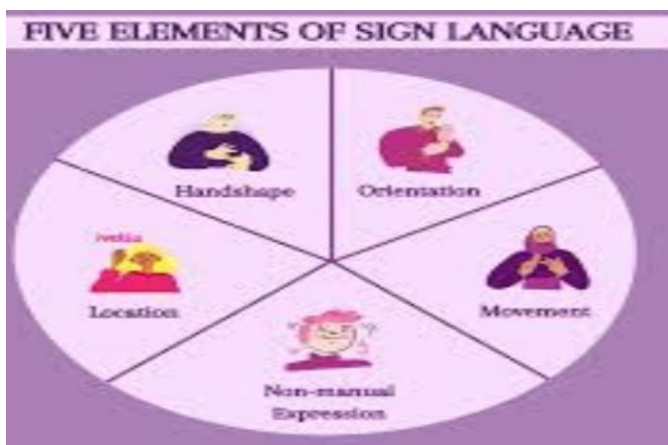


Fig. 1. Starthk Educational Trust-Sign Language Series

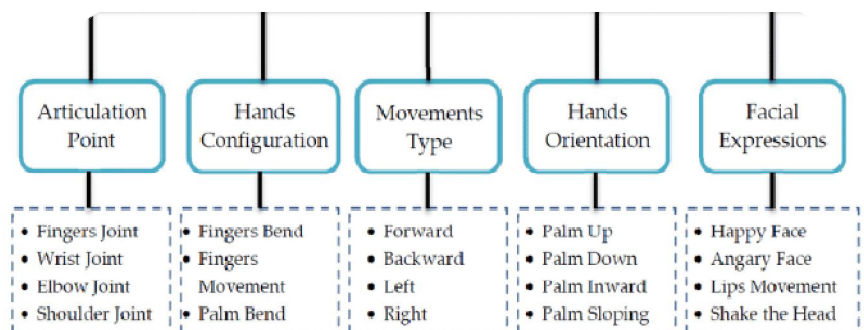
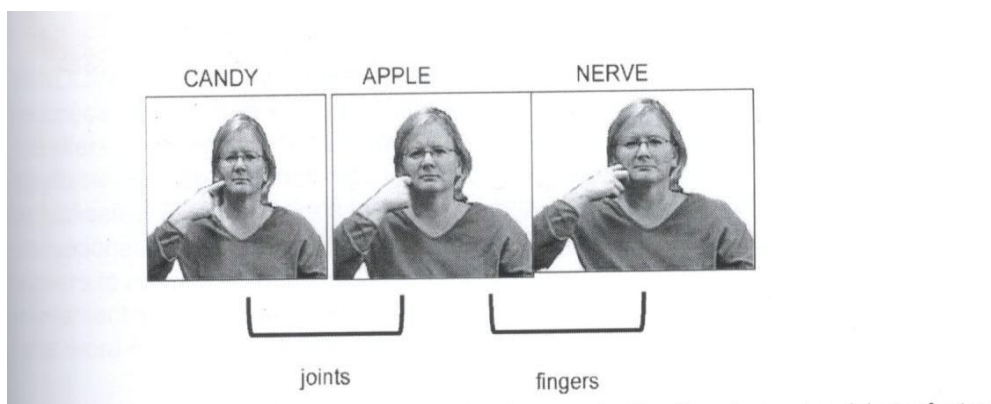


Fig. 2. Essential Elements for Sign Formation (Researchgate.net/figure/Sign-language-recognition-approaches\_fig2\_32628773)

## 2.2. Theoretical Studies

Phonology studies the smallest contrastive units of language their structure and organization, Valli and Lucas (1995). These contrastive units of language vary in terms of whether the language uses sound based or visual based symbols. In spoken languages, which are sound 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). There have been attempts to create terminology that would fit into sign language linguistics in terms of phonology since phonology has over years been associated to sounds. Describing the phonological organization of sign language, Sandler (2012) has it that sign language signal is known to be shaped by the hands, face and body. The speech signal is shaped by articulators inside a tube extending between the lips and the vocal cords. Iconicity according to Fishberg (1975) is often argued to play a big role in the production and perception of gesture. For him iconicity can be achieved through the following ways: hands that act, embody, model and draw.

Goldin-Meadow and Brentari (2015) speak about signed language phonology saying that hand shapes can be placed along a similar scale as segments found in spoken languages. According to them, the same way spoken language segments can be placed on a scale from fully closed (i.e., stops /p, t, k, b, d, g/, which have a point of full closure), to fully open (i.e., vowels /a, i, u/), with fricatives /s, z/ approximants /l, r/ and glides /w, j/ falling in between, that is how hand shapes in sign languages can be placed along a similar scale, from fully closed (the closed fist hand shape) to fully open (the open palm hand shape), with flat, bent, and curved hand shapes in between. In spoken languages, there are phonotactics (phonological rules) that regulate the sequence of open and closed sounds; similarly, in ASL, phonological rules regulate the alternations between open and closed hand shapes, Sandler, (1989); Brentari, (1998). Speaking about sub-lexical phonological features, Goldin-Meadow and Brentari (2015) put it that these sub-lexical phonological features are used in signed languages to identify minimal pairs or minimal triple-sets of words that differ in only one feature, just as in spoken languages. They cite the following examples in both spoken and signed language; (**pat** vs. **bat** vs. **fat** in English; **APPLE**, **CANDY**, and **NERVE** in ASL, see the diagram below.



**Fig. 3. Example of Minimal Set in ASL (Goldin-Meadow and Bentari, 2015:9).**

The three sounds in bold in English are all bilabial and all obstruent, but /b/ differs from /p/ in that it is [+voice] and /f/ differs from /p/ in that it is [+continuant]; [voice] and [continuant] can vary independently. The three signs in ASL differ in hand shape features (the number of fingers that are ‘selected’ and whether the fingers are straight or bent): the hand shape in **CANDY B** differs from the hand shape in **APPLE D** in that the index finger is straight instead of bent (a feature of joint configuration, in this case aperture, as just described), and the hand shape in **NERVE B** differs from the hand shape in **APPLE D** in that there are two fingers bent instead of one (a feature of selected finger group). These features, like their spoken language counterparts, can also vary independently. Concerning syllables in sign languages, Brentari (1998) says that they are based on number of movements, just as syllables in spoken languages are based on number of vowels.

“The words of a sign language lexicon are comprised of a finite number of discrete, meaningless, contrastive units” (Stokoe 1960). Meaningful morphemes and words he says are made up to such units, which can be recombined or substituted for one another to create new words. This kind of structuring therefore makes it possible to amass a vast vocabulary, and no other species has it he maintains.



Crystal (1997) recognizes an important stage in the history of sign language analysis that 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. This coinage by Stokoe was important, though it did not gain much support and usage, but linguists generally adopted the term phonology to refer to how signs are structured and organized. In sign language, the physical properties that evidentially point to its phonology are: hand shapes (articulators), movement (manner of articulation), location (place of articulation) and palm orientation (manner of articulation). These four articulatory elements 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. About articulatory parameters, Edward (2015) says they are the aspects that come into play in the production of the signs. She identifies two forms of signing: manual and non-manual in her study of Adamorobe sign language of Ghana. According to her, the manual form includes the handshape or hand form, place or location, the orientation and movement, which relies on the hand. On the other hand, non-manual form she says relies on facial expression like mouthing, click etc.

In his study on Kenya Sign Language (KSL) Phonology, Jefwa (2018) added a sixth articulatory element; the signing space, which he defines as an imaginary space within which signs are made. He further explains that in as much as signs are rarely made above the head or below the waist or towards the back of head or body, the whole spatial area can however be enlarged or confined to express “louder” signs when a person who is deaf is communicating or signing to another who is far. Here, according to him, 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. He identifies the following organizational principles in KSL: location or placement, time relationships and use of pronouns.

### 3. Methodology

The area where this research work was carried out is the Igbo region of Nigeria. There is no known resource or research done on the already endangered language of the deaf group of people in Igbo. This is part of stigmatization and negligence as no one cares to know much about them. There is little or no trace of a well-researched work done on their language of communication to ascertain their exact population.

The Igbo deaf individuals who reside in their various homes and their relatives who understand them better were used as informants for this study. Data elicitation for this study were from among these deaf individuals found in Igbo locality. The informants hail from the five core Igbo states. Five informants were chosen, and the researchers also preferred to reach out to the relatives of the chosen individuals at their homes or places of work. The pictures and sign videos of the lexical signs administered to these informants were taken for analysis and proper documentation purposes. The linguistic data needed for this study did not include the ASL but strictly the home signs and gestures used by the local signers (Igbo home signs). They include deaf individuals that probably have not undergone any formal education in signing, or who have received some formal education in signing but have Igbo language as their L1, and their respective relatives. These relatives of the deaf were useful in the interpretation of signs. Using the basic wordlist, our corpus targeted up to 250 words and the 36 alphabet for the Igbo orthography (to create an interim Igbo Sign Language manual

alphabet) were collected. There was no age or sex specification. The lexical and numerical signs (wordlist) that were administered to the deaf were under the following headings: objects (nouns), pronouns, verbs, home/family, time, numbers, animals, parts of the body, food and relationship in other to cover a reasonable area of human activities.

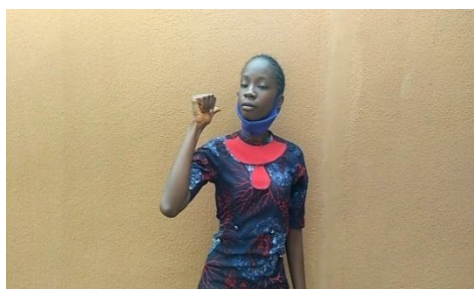
#### 4. Igbo Sign language Phonology

In a sign language, there are certain physical elements that evidentially point to its phonology. These elements are: hand shapes (articulators), movement (manner of articulation), Location (place of articulation), palm orientation (manner of articulation) and non-manual expressions. These are the major elements used in the articulation of signs and they are also known as lexical features. In the Igbo sign language (ISL), these physical elements are seen in the signing patterns of the home signers and are discussed as followings:

**4.1. 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. In sign languages, hand forms or shapes are based on the shape that the (active) hand or articulator takes when a manual sign is made. Most handshapes in ISL are discovered to be the same as what is found in the ASL manual alphabets. For instance, signs for ‘eat and yesterday’ have the active hands taking the shapes of ‘O’ and ‘A’ respectively.



Ri/rí/ (eat)



Ụnyaahụ/ụpàáhù/ (yesterday)

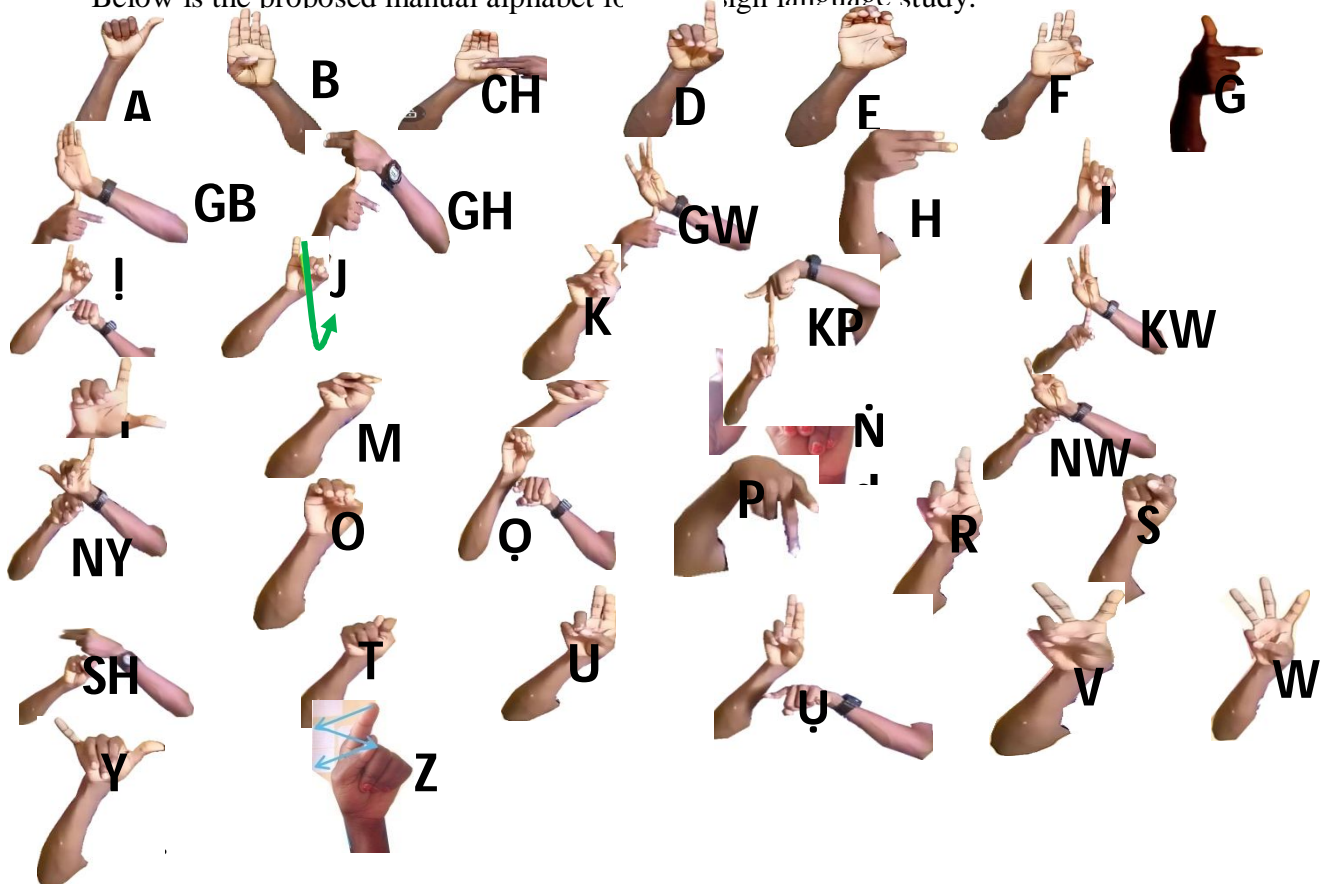
Fig. 5. Signs for ‘eat’ and ‘yesterday’ in Igbo sign language

This interesting observations spurred the researchers to think in the direction of creating a manual alphabet for the study of Igbo sign language adopting the already existing handshapes in the American sign language. The orthography of English has 26 alphabets while that of Igbo contains 36 alphabets (9 digraphs and 27 single alphabets). In creating the manual alphabet for the study of the Igbo sign language, the researchers represent the 27 single alphabets in Igbo with the same hand shapes as the American manual alphabet (making use of one hand in signing), and then represent the 9 digraphs by combining the two hand shapes for the two letters involved (making use of two hands in signing). Example is seen below:



Fig. 6. How digraphs are got in Igbo Sign Language Manual Alphabet

Below is the proposed manual alphabet for Igbo sign language study:

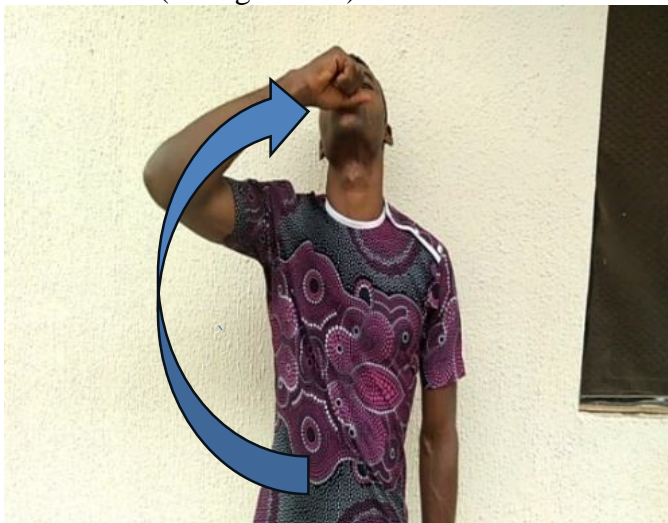


### Igbo Sign Language Manual Alphabet

The use of these letters of the alphabet is called finger spelling which is a manual representation of the 36 letters of the Igbo alphabet from A-Z. There are different types of manual alphabets adopted by signers in different countries. This manual alphabet has a direct relationship with letters of the conventional orthographic English alphabet. It combines the one hand American sign language manual alphabet and the British two-handed manual alphabet, but has American sign language as a base for its formation. Using this manual alphabet, people who have interest in learning the Igbo sign language (both deaf and hearing individuals) can fingerspell words of spoken Igbo language and or other languages as well. This allows them to code mix by mixing signs with finger-spelled words of other spoken languages, that is, they change from SL to a variety of spoken language through finger spelling.

**4.2. Movement (Manner of Articulation):** As a distinguishing physical element of the Igbo sign language (ISL), movement is based on the direction and speed of the active hand or active articulator, that is, movement of the signing hand or any other part of the signer's body example, the signing hand or active articulator may move fast

towards the forehead or slowly away from the mouth or any other part of the body. In signing 'drink' in Igbo sign language for instance, a swift movement is made with the active hand (the right hand) as to fetch water from a basin and up to the mouth.



Ñụ/ηó/ (drink)

**Fig. 8. Sign for 'drink' in Igbo sign language showing a swift movement from down to up**

**4.3. Location (Place of Articulation):** Location is the position of the hand on the body or in the space around the signer. It 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 head, chest, breast, ear, mouth, forehead, chin etc. In the Igbo sign language (ISL), the places that can act as locations or places where signs are articulated are enumerated as follows: whole face or head, upper face (forehead or brow), mid face (eyes or nose), lower face (chin, jaw or mouth), side face (cheek, temple, or ear), neck, the trunk (shoulders, breast, chest, or belly), upper arm, forearm (including the elbow), the wrist, etc. Below is a sign for 'sister' showing the location or position of the hand on the body of the signer (i.e. the breast).

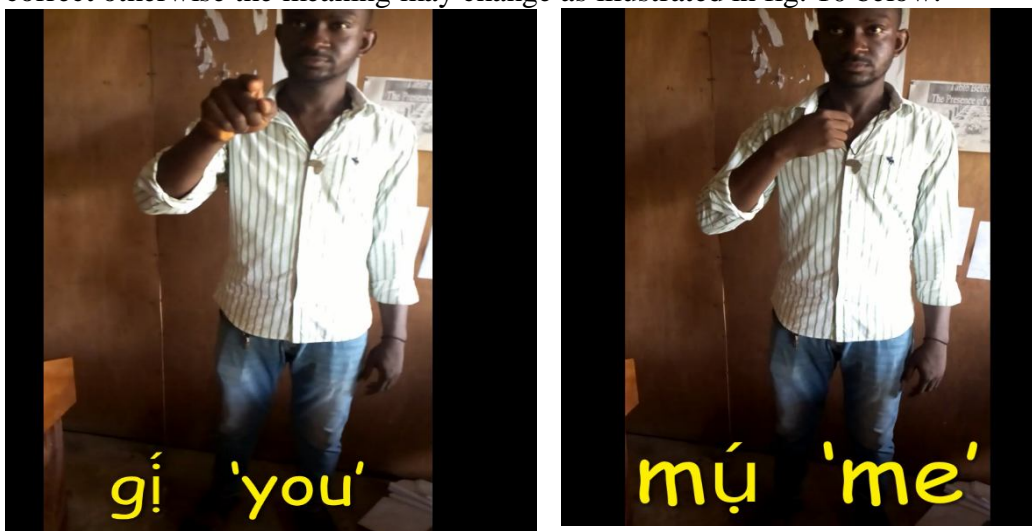


**Fig. 9. Sign for 'sister' in Igbo sign language**

**4.4. Palm Orientation (Manner of Articulation):** This is based mainly on the direction of the active hand's movement in relation to the signer's body. The orientation of the sign maybe inwards (towards the signer's body) or outwards (away



from the signer's body). Outwards 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 make sure that the orientation of a sign is correct otherwise the meaning may change as illustrated in fig. 10 below.



**Fig. 10. Illustration of Palm Orientation Signs for 'I/me' and 'you' in Igbo Sign Language**

'I/me' 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 signer's body. So, a slight change in orientation or manner of articulation of a sign can significantly change the meaning of the sign.

**4.5. Expressions/Non-Manual Signals:** 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-signs different meanings with regards to asking, confirming or expression of doubt or joy, anger, dislike, rejection etc. Every part of the human face is necessary in signing and sign language has a grammar of the face, Sandler (2010). Expressions/non-manual markers in sign languages include tilting of the head, shrugging of the shoulder, eye brow raising, head nod etc. In phonological terms according to Edward (2015), the above can be related to the concept of prosody. These non-manual markers were also observed in the Igbo sign language like in the example below:



**Ụgbọala /ó gbó àlǎ (car)**

**Fig. 11. Sign for 'car' in Igbo Sign Language**



In the above example of sign for 'car', an Igbo home signer added a non-manual signal of puffing out the chin and the mouth to hand shape, movement, location and palm orientation, to show ignition of an engine.

## 5. Conclusion

From the above discussion, it is obvious that the Igbo sign language (ISL) has a lexicon which is made up of form and meanings. Form refers to the hand forms used (the manual and non-manual aspects of signing). Basically, the form constitutes the physical elements that evidentially point to the Igbo sign language (ISL) phonology. The form signifies the meaning and we have also demonstrated that signs are mainly made up of four units that work in appropriate combinations, following Klima and Bellugi (1975). These units we have called the articulatory of the Igbo sign language (ISL) and they include: the hand forms or Hand shapes (articulators), Movement (manner of articulation), Location (place of articulation) and Palm Orientation (manner of articulation).

The above elements in addition to the non-manual signals are the main distinguishing physical properties in the Igbo sign language (ISL), because it is through them that the 'primitive structural units without meaning' are combined to create an infinite number of meaningful utterances (signs). The study 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 are the articulatory properties which include the manual and non-manual forms.

Finally, we can say that the study of phonology is concerned with the distinctive units of language whether they are based on an audio language (like spoken language) whose smallest contrastive units are sounds or visual language (like sign language) whose smallest contrastive units are its articulatory elements. These physical elements can be seen successfully applied to the study of the Igbo sign language phonology in this work.

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