Mary Edward
ORCID 0000-0001-5721-8535
University of Brighton, UK

Lexical iconicity in Adamorobe Sign Language (AdaSL) and Ghanaian Sign Language (GSL*)*

Abstract

The visual modality of sign languages offers a high potential for iconicity, i.e. resemblance relationships between form and meaning. Of particular interest is the understanding that iconicity is not monolithic but demonstrated through different devices and strategies that may be influenced by cultural factors and specific communicative contexts. This chapter discusses signers and gesturers preference for specific iconic strategies to name handheld tools. Signers of Ghanaian Sign Language (GSL) and Adamorobe Sign Language (AdaSL) were compared with rural gesturers (Adamorobe) and urban gesturers. Working within the cognitive linguistic framework, the chapter discusses signers and gesturers preference for instrument and handling strategies and the consistent use of iconic strategies across signers in each group. Signers and gesturers exhibited systematic preference for iconic representation of tools, choosing an action-based sign depicting how the object is held (handling) or depicting features of the object (instrument). Interesting finding of this chapter is the language contact situation in Adamorobe, and its influence on the rural gesturers' preference for iconic representation although all the gesturers confirmed no prior knowledge of AdaSL.

Keywords: sign language, gesture, patterned iconicity, handheld tools, cognitive linguistics, Ghana, Adamorobe

Introduction[1]

Sign languages are the natural languages used by deaf communities all over the world and fulfil all the requirements for full-fledged human language. Sign languages rely on the visual-gestural mode of communication, that is, the signs are perceived by the eyes and delivered by the hands and other parts of the body including the head and face. Even though the signs are produced with the hands, the modality does not determine a universal sign language that is used by all deaf groups and communities all over the world. Different societies, nations and communities have sign languages that are distinct from each other. American Sign Language (ASL) for instance, is different from British Sign Language (BSL) in lexicon and grammar, as well as in the fingerspelling alphabet. Also, within a particular country, there are differences in the sign languages used by deaf communities. In Ghana, for

---

[1] Portions of this paper are adapted from my ongoing PhD research on Iconicity in Ghanaian Sign Language and Adamorobe Sign Language (Edward forthcoming).

instance, Adamorobe Sign Language (AdaSL), which is an example of a rural sign language, is totally distinct from Ghanaian Sign Language (GSL), which is an urban sign language.

The term "urban sign languages" refer to national sign languages and few other sign languages that are used for deaf education[2]. Urban sign languages are used predominantly by deaf people beside teachers, interpreters (De Vos & Pfau 2015), child of Deaf adults (CODAs), sibling of Deaf adult (SODA) and other hearing members of Deaf families. The term "rural sign languages" refers to sign languages that are used in particular communities with a high incidence of deafness for communication between deaf people and also between deaf and hearing people.

Notwithstanding the difference in modality, sign and spoken languages exhibit similar properties of language structure: i.e. both have phonology, morphology, semantics, syntax etc. (Pfau et al. 2012; Sandler & Lillo-Martin 2006). In recent literature on both spoken and signed languages, *iconicity* (the resemblance relationship between form-meaning) has been noted as a fundamental property of human language (Perniss et al. 2010; Simone 1995). Different frameworks have been used to discuss the notion of iconicity and the most used framework for iconicity in spoken language is the cognitive linguistics framework (Langacker 2008). Other signed linguists have adopted the cognitive linguistics approach to iconicity to discuss iconicity in sign languages (Wilcox 2004; Occhino 2016).

There is a restriction on how much we can represent iconically with sound[3] as compared with signs, and this restriction is modality-specific. Gestures and sign languages use the same manual modality for linguistic encoding. The use of co-speech gestures relies on the medium of the hands, face and the body. Similarly, sign language also typically involves the use of articulators other than the hands, notably movements of the mouth. Research on gestures have revealed that gestures share iconic features of visual-spatial modality and exhibit use of similar strategies of iconic representation used by signers (Padden et al. 2015; Padden et al. 2013; Brentari et al. 2015; Ortega & Özyürek 2016). Gesture has the same visual-spatial modality and the expression of information by the hands and other parts of the human body.

1. Patterned iconicity in sign language

Recent linguistic investigations have demonstrated that the ubiquitous influence of iconicity is present in both spoken and sign modality but more productive in sign languages (Occhino 2016; Perniss et al. 2010; Wilcox 2004; Taub 2001; Dingemanse et al. 2015). Iconicity is defined simply as the resemblance relationship between the form and the meaning of a linguistic expression. Valli et al. (2011) state that in linguistic iconicity, the form of the symbol is an icon or picture of some aspect of the thing or activity being symbolized and that the way of representing this iconicity is sign language specific. For example, the sign HOUSE[4] in GSL is a picture of the roof of a building and the sign WOMAN in AdaSL

---

[2] In most parts of the world sign languages have only quite recently been used in education.

[3] Occhino states that the "mismatch in our ability to iconically represent our interactions in space and time, through sound, is compounded by the fact that the oral channel is much more restricted in terms of articulatory degree of freedom and visual saliency" (Occhino 2016:193).

[4] The glossing convention for sign language use capital letters for signs.

is iconic of a woman's breast. The resemblance relationship here is the mapping of the mental representation of the articulatory forms represented as for HOUSE and (touching a meaningful location, i.e. the chest) for WOMAN. The linguistic representation of the articulatory form according to P. Wilcox (2000) has a resemblance relationship with the mental depiction of the concept in an individual's experience. Different types of iconicity exist in different sign languages and these include handling (holding or manipulating), object (hand as object), instrument (hand as object in use), etc. Signers employ the diverse possibilities afforded by the hands and the body to represent iconic structures in sign languages (Meir et al. 2013).

The recurrent use of an iconic strategy across signs in a particular semantic category has been called Patterned Iconicity (Padden et al. 2013; 2015). Different sign languages exhibit different patterns of iconicity within a category (Kimmelman et al. 2018). For example, Padden and her colleagues found differential patterns with respect to the use of *handling* or *instrument* strategies for the semantic category of handheld tools by signers and gesturers[5] (American Sign Language (ASL), New Zealand Sign Language (NZSL), Al-Sayyid Bedouin Sign Language (ABSL), American gesturers and Israeli Bedouin gesturers) (Padden et al. 2013). They identified a preference for handling strategy by the gesturers: i.e. the hand holding or grasping an object. For signers, ASL and ABSL signers favoured instrument strategy: i.e. the hand depicts features of the object and performs canonical actions of the object. NZSL signers favoured the handling strategy to name handheld tools (Padden et al. 2013).

Kimmelman et al. (2018) identified iconicity patterns for different semantic categories in their Iconicity Patterns in Sign Languages (IPSL) database. They identified different iconic strategies for the semantic category named Instrument. They identified British Sign Language (BSL), French Sign Language (LSF), German Sign Language (DGS) among others as *handling* in relation to the semantic category of instrument. American Sign Language (ASL), Estonian Sign Language and Brazilian Sign Language preferred the *object* strategy according to Kimmelman et al.'s analysis. On the other hand, Russian Sign language and Italian Sign Language used both *object and handling* strategies to the same degree.

2. Cognitive Linguistic Approach to Sign Languages

In the Cognitive Linguistics (CL) framework language is assumed to reflect fundamental properties and design features of the human mind (Evans & Green 2006). In CL, linguistic symbols (linguistic units) have both phonological and semantic poles and the relationship between the poles could be that of resemblance or arbitrary (Langacker 2008; Wilcox 2004). For example, in GSL and AdaSL, there is a resemblance relation between the form and meaning of TABLE. The resemblance is the flatness that is represented by both sign languages. This iconic relationship between the form and the meaning is represented by the phonological pole (handshape- palm facing down or palms tracing the flat surface) and

---

[5] Gesturers in this chapter refers to hearing people who used hand and body gestures to name the handheld tools.

the semantic pole (meaning- a piece of furniture with a flat top). However, when there is no resemblance relation between the phonological and semantic poles, there is no iconicity.

A model of iconicity formulated for sign language and relevant for the chapter is *Cognitive Iconicity* developed by Sherman Wilcox (Wilcox 2002; 2004). Wilcox defines cognitive iconicity as "a distance relation between the phonological and semantic poles of symbolic structures" (Wilcox 2004:122). In the cognitive iconicity perspective, arbitrariness is reduced because "the phonological and semantic poles of signs reside in the same region of conceptual space" (Wilcox 2004:122). The phonological pole refers to the linguistic form and the semantic pole refers to the actual meaning given to the word (see figure 1). The form entails the phonological realisation of the sign[6]; Handshape (HS), Movement (M), Location (L) and Orientation (O) and these phonological parameters are relevant for the meaning of the sign. The Handshape is the acceptable hand form in signing; Movement refers to how the dominant or the non-dominant hand or both are moved to create a sign; Location is the place the dominant hand or the non-dominant hand is placed in the formation of a sign and Orientation is direction of the palm of the dominant hand.
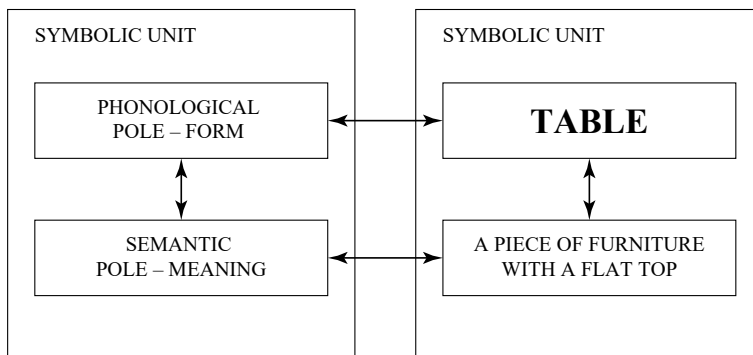

Figure 1. Phonological and semantic poles

The phonological pole, which consists of the articulatory parameters, represents the *construals* of form and the semantic pole (which can have arbitrary or iconic relationship with the phonological pole) represents the construals of meaning. Langacker (2008:43) defines construal as "our manifest ability to conceive and portray the same situation in alternate ways", and as such TABLE can be construed as *flat object* or *four-legged* entity depending on what is profiled by signers.

---

[6] The phonology is primarily made up of the articulatory parameters and the non-manual makers. The articulatory parameters refer to the aspects that come to play in the formation of the sign. These include the Handshape, Movement, Location and Orientation. The non-manual markers in sign languages rely on facial expression and the position of the body and these act as prosodic cues to the sign.

The phonological parameters are morphological in other parts of the lexicon, such as classifier constructions, that is a signed word that represent a group of objects and is sometimes incorporated with movement (Occhino 2016).

3. Language Information

Ghanaian Sign Language (GSL) is the sign language of the urban deaf community in Ghana. There are 110,625 deaf people in Ghana[7] that is 0.4% of the population and out of these number, some people use GSL as either a first or second language. GSL developed from the sign language introduced by Andrew Foster[8] in 1957 and it is representative of Ghanaian society and Ghanaian culture. Most urban deaf people are educated in GSL. It is used by the state television to interpret news items and special national events to deaf people and other users of GSL. The first dictionary for GSL is believed to have been produced in the early 2000s and a new dictionary edited by Deutsch & McGuire was published in 2015 (McGuire & Deutsch 2015)[9].

Adamorobe Sign Language (AdaSL) is an indigenous village sign language used in Adamorobe in the south eastern part of Ghana. AdaSL is believed to have existed as far back as 1733 as a language used by both hearing and deaf people in Adamorobe (Okyere & Addo 1994). The community is noted for its unusually high incidence of hereditary deafness of an estimated 40 deaf people in the village (1.3% of current population of about 3000)[10]. Miles (2004) reported that deaf Adamorobeans were the first substantial historical group of African people known to have used a formal sign language and the record dated as far back as the 18th century. The sign language in Adamorobe is older than GSL and has a long tradition of usage by both deaf and hearing people. Earlier research done in Adamorobe discovered that almost everybody in the village could communicate in the sign language (Frishberg 1987). However, current visits to the community reveal a decline in the numbers of hearing and deaf signers. Linguistically, AdaSL is distinct from GSL and other home signs used in Ghana.

4. Methods

4.1. Participants

Four groups of signers and gesturers were recruited for this study. For the sign languages, 10 signers of GSL were recruited from Medie and Nsawam (Greater Accra and Eastern Regions) and 10 signers of AdaSL were recruited from Adamorobe in the Eastern region of Ghana. The groups of gesturers or non-signers were recruited from Adamorobe (n=4) and Sekondi (n=6) representing rural and urban locations respectively.

All deaf signers were deaf adults between the ages of 24 and 65 years and they were recruited based on willingness to join the study[11]. Gesturers were all confirmed by

---

[7] Accessed from Ghana National Association for Deaf (GNAD) website 31/08/2018. GSL is mostly used by educated deaf people.

[8] Andrew Forster was a deaf African American who contributed immensely to Deaf education in Sub-Saharan Africa (Kiyaga & Moores 2003).

[9] A free online mobile application for GSL has recently been launched by Leiden University's Lab for Sign languages and Deaf studies (2020).

[10] Nyst cites 2% of population of 2400 in a research done in 2001 (Nyst 2007).

[11] All deaf participants were given detailed explanation of the research work and they all consented by signing a consent form. They were also paid for taking part in the research. All non-signers consented to

friends and family as having no sign language knowledge and were between the ages of 19-57 years. Gesturers from Adamorobe were specifically scrutinized to ensure that they had no knowledge in AdaSL[12].

4.2. Data collection process

All data collection involved picture elicitation task. Pictures of 20 handheld tools were displayed on a laptop screen and signers and non-signers were tasked to name the object in their sign language or with a gesture. The stimulus materials were displayed on white background and stayed on the screen until the signer or gesturer had finished producing the sign or gesture for it.

Figure 2. Examples of handheld tools used for elicitation

Signers and gesturers were first shown the materials and were given the opportunity to look through the pictures before the elicitation task. All AdaSL signers signed in the presence of the researcher and the camera at different times. 40% of GSL signers signed before the researcher and the camera. 60% signed in the presence of the researcher and a research assistant (non-signing). All urban non-signers gestured in the presence of the researcher and they all signed on different days and different times. Rural non-signers gestured in the presence of the researcher and two hearing signers of AdaSL. The presence of the AdaSL signers was to ensure that no non-signer had knowledge of AdaSL.

4.3 Coding

The coded handheld tools are *bottle, broom, bucket, comb, cup, fork, hammer, iron, key, knife, lipstick, long broom, mobile phone, paintbrush, pen, saw, scissors, spoon, toothbrush,* and *umbrella*. The 20 handheld tools resulted in 251 tokens from the 10 GSL signers, 241 tokens from the 10 AdaSL signers, 187 tokens from the 6 urban signers and 103 tokens

---

take part in the research work, their participation was voluntary and they were not paid for taking part in the research.

[12] Although earlier research in Adamorobe concluded that almost everyone (deaf/hearing) could sign (Frishberg 1987), recent research has revealed the gradual decline in the number of hearing signers (Edward 2015). There are more non-signing hearing people in Adamorobe than hearing signers.

from the rural gesturers. The responses by deaf signers consisted of individual signs and a few multipart signs. Rural gesturers mostly responded with single tokens and very few two-part signs. Items that elicited more than one sign mostly used different strategies for each sign. For example, BOTTLE (figure 3) elicited handling and entity strategies for two-parts signs (AdaSL), and elicited strategies like tracing 3D (GSL) and handling (gesturer).

a. two-parts sign (AdaSL)   *one-part (GSL)*   *one-part (urban gesturer)*

Figure 3. BOTTLE by signers and gesturers

Coding was done with the language annotation software ELAN (version 5.4, 2018) (Wittenburg et al. 2006) developed at the Max Planck Institute for Psycholinguistics. The videos were coded for use of iconic strategies listed below:

(a) *Handling* (Padden et al. 2013; 2015). In this strategy, the hand(s) represents human hand holding or grasping object. The hand holding or grasping the object can also perform canonical actions related to the object. With the *hand as hand* schema, "the entire hand is profiled, and is construed as a hand" (Occhino 2016:144).

(b) *Instrument* (Padden et al. 2013; 2015). In this strategy, the hand(s) depicts features of object and performs canonical actions related to the object. The Handshape (HS) has some or all the features of the depicted object. Instrument schematised the handshape as *object-shape schema* (Occhino 2016) where the hand is an entity (or object) performing a canonical action related to the object (instrument) as in mobile phone. When the hand only shows features of the object and does not perform any action, we get the entity strategy.

(c) *Entity*- This strategy is referred as the *object* strategy by other researchers (Padden et al. 2013; Kimmelman et al. 2018; Hou 2018). The hand only shows features of object and does not perform any action with this strategy. Another type of entity strategy that has been identified in this work is *Entity at body Location*. The entity handshape located at a meaningful location shows features of the object but in addition has a meaningful location. The hand at the location does not perform any action.

(d) *Measuring* (Mandel 1977; Ebling et al. 2015; Nyst 2016). Hand(s) indicates size or the height of entity, or the size of the object is shown by delimiting relevant part of the finger, hand or arm. Nyst refers to this strategy as measure stick.

(e) *Tracing (2D)* – For this strategy, the hand(s) are drawing tool and the movement creates virtual shape in space or on body. This result is 2D shapes. It is referred to as sketching in other literature (Mandel 1977; Ebling et al. 2015).

(f) *Tracing (3D)*- The hands and movement represent shape of entity by tracing outline or surface of entity. This results in 3D shapes (Ebling et al. 2015; Padden et al. 2013; Kimmelman et al. 2018).

(g) *Indexing*- Signers' hand points to objects at present or point (or hold on) to part of signer's body that is related to the object.

(h) *Body strategy*- Parts of the body perform canonical actions related to it. The body strategy is distinct from the handling strategy. Body strategy includes shrugging shoulder, a leg kicking, body reclining, arms moving up and down among others.

(h) *Presentable Action*- This refers to embodied conceptual gestures in a source culture that are used to code experiences (both abstract and tangible) or to name items that are related to the experiences generated by an object. For example, the gesture of smelling roses- FLOWER; the gesture of putting head down on pillow- SLEEP.

A few of the signs and gestures were also coded as *not clear* in their iconicity strategies used. These signs on the surface were perceived as having some form of iconic form-meaning mapping. However, the mapping between the form of the sign and the referent was not clearly marked as one of the above listed strategies. For example, initialized[13] signs (used by GSL signers) that had meaningful locations and (or) meaningful movement but did not have a specific iconic strategy were marked as *not clear*. The responses marked as *not clear* did not clearly fit with the iconic strategies listed above. There were few non-iconic signs from the signers (no form-meaning resemblance relationship).

Below are a few examples of the strategies as used by signers and gesturers to name handheld tools.

Iconicity Type	Examples		
Handling	KEY (AdaSL)	LONG BROOM (AdaSL)	COMB (GSL)
Instrument	TOOTHBRUSH (AdaSL)	MOBILE PHONE (GSL)	SAW[14] (AdaSL)

---

[13] Initialization in sign language is the process of using the fingerspelled letter of the alphabet that represents the first letter of the English word as the handshape for a sign. The initialized handshapes did not have iconic mappings as described above.

[14] This sign has figure-ground relationship which will be discussed in section 7.

Entity	
	MOBILE PHONE (GSL) FORK (AdaSL) MIRROR (GSL)
Measure[15]	
	BOTTLE (AdaSL) CUP (AdaSL)
Tracing 2D[16]	
	BOTTLE (rural gesturer) BUCKET (urban gesturer) CUP (urban gesturer)
Tracing 3D	
	BOTTLE (GSL) CUP (GSL) BUCKET (urban gesturer)

Table 1. Iconic strategies with examples

[15] In these examples, the upright hand is the entity handshape and the index finger is the measure stick that delimit the relevant part of the hand to depict BOTTLE and CUP.

[16] In tracing 2D, the hand is a drawing tool that traces the shape of the object. It is mostly depicted with the index finger. On the other hand, tracing 3D is mostly depicted with the open palm.

Not clear & Not iconic	Examples		
Not clear	 KEY with K HS	In this sign, the movement is meaningful, but the HS is initialised from KEY.	
Not iconic			
	SAW (fingerspelling) (GSL)		

Table 2. Examples of signs marked not clear and not iconic

The responses from the signers (not the gesturers) were also coded for consistency and agreement in the use of iconic strategies across signers in each group.

5. Results

The main iconic strategies that emerged were the handling and instrument strategies for naming handheld tools by both signers and by the gesturers. Overall, GSL and AdaSL signers used more instrument strategy as compared to the gesturers. Although handling strategy was preferred by gesturers (rural/urban), rural gesturers showed higher preference for instrument as compared to urban gesturers. Other strategies were used minimally by both signers and gesturers.

5.1. Iconicity patterns among signers

Among GSL signers, an average of 53% used an instrument strategy and 30% used a handling strategy. Other strategies used were the tracing (3D) strategy (8%) and entity strategy (4%), and 9% of the GSL signs for handheld tools were coded as *not iconic* (see Table 2 for example).

AdaSL signers, just like their urban counterparts, demonstrated a higher preference for an instrument strategy in naming handheld tools and objects. 58% of the AdaSL responses reflected an instrument strategy, 26% of responses were a handling strategy and 8% of the responses used entity strategy. There was no response in the AdaSL data that used tracing (2D & 3D) and the body strategy was not used by GSL signers. Only 3 tokens from AdaSL were coded as non-iconic; one was a borrowed sign from GSL (WATER).

Comparing the iconic strategies used by GSL and AdaSL signers to name handheld tools, the overall pattern is the use of instrument and handling strategies by signers (figure 4) as demonstrated in previous studies (Padden et al. 2013; Padden et al. 2015; Kimmelman et al. 2018).
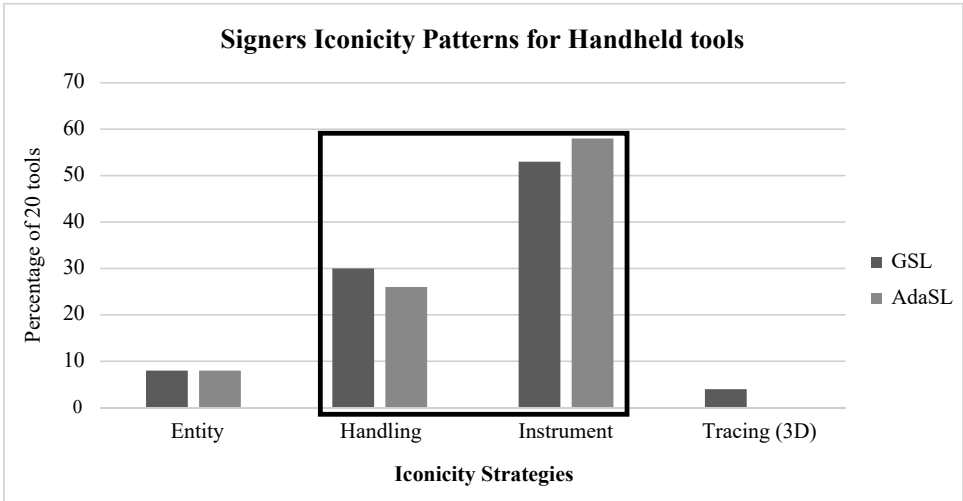
Figure 4. GSL and AdaSL iconicity patterns for handheld tools[17]

In both sign languages, there were items that elicited more *instrument forms* and these included broom (100% GSL, 100% AdaSL), comb (80% GSL, 100% AdaSL), fork (100% GSL, 100% AdaSL), mobile phone (100% GSL, 100% AdaSL), paintbrush (100% GSL, 100% AdaSL), saw (90% GSL, 100% AdaSL), scissors (100% GSL, 100% AdaSL), spoon (100% GSL, 100% AdaSL) and toothbrush (80% GSL, 100% AdaSL). Some tools elicited more *instrument forms* in one sign language as compared to the other. Examples include knife (10% GSL, 100% AdaSL) and pen (70% GSL, 0 AdaSL). There were few items that elicited more *handling forms* in both sign languages. These include the following: bucket (100 GSL, 90% AdaSL), hammer (80% GSL, 100% AdaSL), iron (90% GSL, 80% AdaSL), key (80% GSL, 100% AdaSL), long broom (70% GSL, 60% AdaSL) and

---

[17] The differences in the preference for either instrument or handling among GSL and AdaSL signers did not show significance. GSL and AdaSL signers used instrument and handling forms almost to the same degree. For example, the preferences for instrument forms; AdaSL (58% mean) signers over GSL signers (53% mean) in relation to 20 handheld tools did not show statistical significance (Two-sided Wilcoxon Rank W = 32, p-value = 0.1807). The few numbers of participants made statistical inferences difficult to run for the gesturers.

umbrella (70% GSL, 70% AdaSL). Other tools elicited more *handling forms* in one sign language as compared to the other: lipstick (80% GSL, 20% AdaSL), pen (10% GSL, 100% AdaSL). Few items had high responses for using other iconic strategies in one or both sign languages and these include bottle (tracing (3D)-100% GSL); bottle (entity, 70% AdaSL) and umbrella (entity 50% GSL, 40% AdaSL).

5.2 Iconicity patterns among gesturers

Gesturers from urban and rural locations also made predominant use of handling and instrument strategies for the category of handheld tools (figure 5). Although most of the responses from the gesturers used handling strategy as seen on other studies (Brentari et al. 2015; Ortega & Özyürek 2016; Padden et al. 2013), gesturers from Adamorobe (rural) showed a higher preference for instrument strategy in comparison with their urban counterparts and similar to what was demonstrated by the AdaSL signers. 62% of the average responses of the urban gesturers used handling strategy and 51% of the average responses from rural gesturers were in the handling strategy. However, rural gesturers used instrument strategy to a higher degree (42%) as compared with urban gesturers (23%).

There were varied responses by gesturers. For instance, although all rural gesturers responded with an instrument strategy for *knife*, only three out of the six urban signers responded with an instrument strategy. All rural gesturers responded with instrument strategy for *broom* whereas urban gesturers responded with a handling strategy. Further, *toothbrush* had varied responses from both gesture groups; rural (3 handling, 1 instrument) and urban (4 handling, 2 instrument).
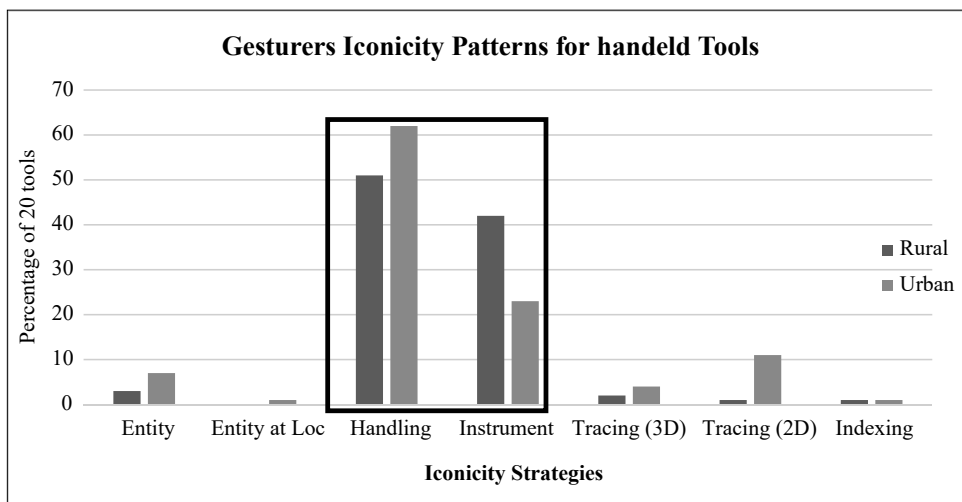

Figure 5. Rural and Urban gesturers iconicity patterns for handheld tools
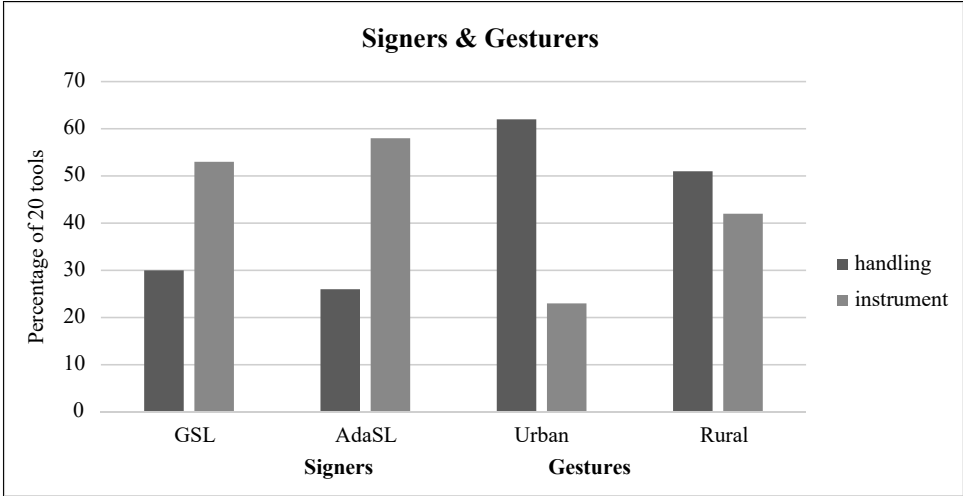
Figure 6. Signers and non-signers compared[18]

5.3 Consistency and full agreement among signers

Consistent use of strategy is defined as >70% of signers use the same strategy (Padden et al. 2013) and full agreement is defined as 100% of signers use the same strategy (see figure 7). AdaSL signers had 90% consistent use of strategies and GSL had 85% of consistent use of strategies. AdaSL signers had 65% full agreement of strategy and GSL signers had 45%. Consistency and agreement in use of same strategy for individual items is higher in AdaSL than in GSL
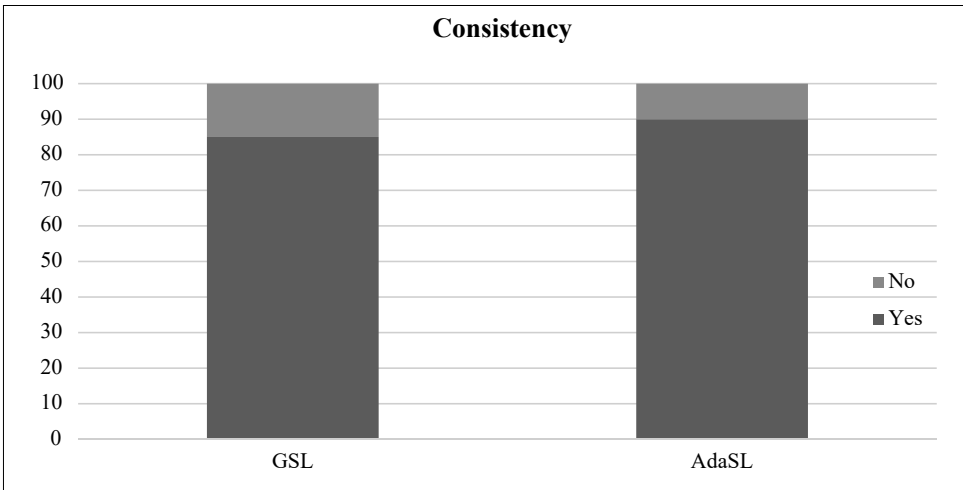

Figure 7. Consistent use of strategy by GSL and AdaSL signers

---

[18] In this chart, black depicts handling strategy and grey depicts instrument strategy (across signers and gesturers)
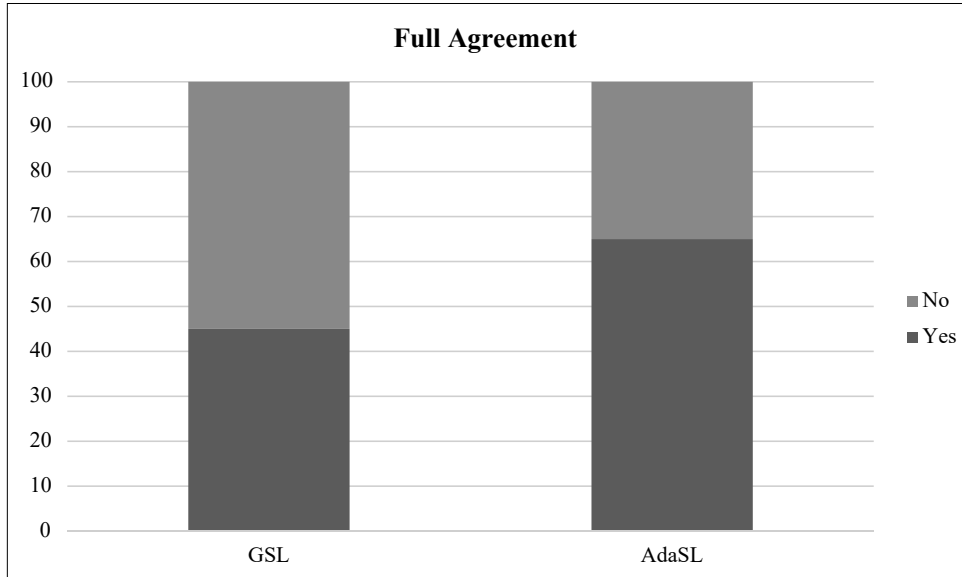
Figure 8. Full agreement in use of strategy

Figure 9. BROOM – consistent use of strategy by AdaSL signers; 100% instrument

6. Discussion

Signers and gesturers make predominant use of handling and instrument strategies for the category of handheld tools. Both GSL and AdaSL signers prefer the instrument strategy. Urban gesturers prefer the handling strategy. The preference for handling forms by gesturers could indicate that gesturers prefer to name instrument forms according to how they are handled whereas signers present extra information that depicts features of

the object. Therefore, in agreement with Padden et al. (2013) preference for instrument forms seems to emerge quickly in a new sign language like ABSL. GSL, which emerged in the 1950s, demonstrated a high preference for instrument forms. Padden et al. (2013) also links the preference for the use of handling strategy to be associated with the use of mouthing as a way of marking nouns as exemplified with the prevalent mouthing in New Zealand Sign Language (NZSL). Mouthing in sign language refers to the oral production of the syllables in the word i.e. signers say the word as used in the equivalent spoken language at the same time of sign production. German Sign Language (DGS) and British Sign Language (BSL) (Kimmelman et al. 2018) prefer the handling strategy as compared to instrument and this could also be linked to the prevalence of mouthing in both sign languages. Both GSL and AdaSL signers used little mouthing.

Whereas instrument strategy permits diverse construed variants, handling strategy has little allowance for profiling the hand-as-hand with construed variants. For example, construed variants of the *mobile phone* profiled different handshapes but used the same iconic strategy. The similarity between the linguistic form of *mobile phone* and the meaning is the representation by the construals of handshape[19] represented by signers. In representing *mobile phone*, the iconic relationship between the form and the meaning is represented by the phonological pole (i.e. representing *mobile phone* with different handshapes depending on the how signers profiled the depicted image). On the other hand, when we cannot match the relation between the phonological and semantic poles, there is no iconicity. From the example of *mobile phone* given in figure 10, we can see that the meanings of the lexical signs are construed based on signers' perception of the real world and profile of the object.

Iconic strategy	Construed variants using the same iconic strategy
Instrument	GSL(Y-HS) MOBILE PHONE GSL(G-HS) AdaSL (A-HS) AdaSL (B-HS)

Figure 10. Variants of mobile phone

Although the instrument strategy uses an entity handshape[20], the entity strategy resulted in 8% of the responses from both GSL and AdaSL signers. Even gesturers from Adamorobe showed higher preference for instrument in comparison to urban gesturers. For example, all rural gesturers responded with instrument strategy for *broom* (just like rural signers, see Figure 9) whereas urban gesturers responded with a handling strategy. The high proportion

---

[19] The handshapes are named according to their closeness with the alphabets (GSL alphabets). See the examples in fig.10. See Appendix for the GSL alphabet.

[20] In the instrument strategy, the hand(s) depicts features of the object (entity) but in addition, the entity handshape performs canonical actions related to the object. On the other hand, the entity strategy only shows the features of the object and does not perform any action.

of use of instrument strategy by gesturers in rural Adamorobe community may be the result of language contact situation with AdaSL[21]. However, because the number of gesturers was lower than the signers (urban=6, rural=4), we need to treat this result with caution because the differences could be a matter of chance.

In cognitive linguistics, the relationship between the linguistic form and the meaning is inseparable and language reflects the properties of the mind. Therefore, the linguistic form has a psychological reality drawn from the experiences of a language user. In the analysis of lexical items from signers (and gesturers), the phonological forms of the signs are emergent units of constant use and that reflects the properties of the mind. The handshape of the sign bears semantic features of the object based on association. Different handshapes profile different semantic features of the object: profiling the whole object or profiling part for the whole (metonymy). The same object (such as *broom* and *mobile phone*) can be construed in alternate ways and each alternate way will profile particular semantic information.

Language users perceive linguistic content in relation to their understanding. The relationship between the form and the meaning is representative of how we represent conceptual structures with linguistic forms and how the forms resemble the structures they represent. Based on the above data, signers of GSL and AdaSL mostly construed handheld tools with instrument or handling strategies. Hwang et al. (2017:10) refers to these two strategies jointly referred as the *manipulation strategy* because they involve "the body representing the body of a human agent and an arm representing the arm of a human agent as it acts upon the referent". Instrument strategy has entity handshapes with action-associated movement and the movement of the hand/arm represents the action of the agent on the referent.

Also identified in the data is that construal of the same strategy could also have different phonological profiling depending on signers' perception of objects. For example, the same strategy can have change in HS, location, movement or orientation depending on how signers conceptualize the articulators. From the data, all the 10 GSL signers profiled *mobile phone* as an instrument, 8 of the signers used the Y-HS focusing on the shape of telephone and 2 others (marked with a black box) used the G-HS focusing on the *mobile phone* with a pole (see figure 11). All AdaSL signers also profiled *mobile phone* as an instrument, 9 of the signers used the A-HS and one signer profiled it with both a B and G handshapes. That is, both GSL and AdaSL signers construed mobile phone as an object and focused on different shapes of the mobile phone. Whereas the Y-HS depicted the older version of telephone and the G-HS depicted a phone that has a pole, the A-HS & B-HS depicted a little handheld or portable device. In other words, the different handshapes refer to different types of phones as profiled by the signers.

In cognitive iconicity (Wilcox 2004) the phonological and semantic poles reside in the same region of conceptual space. In other words, the linguistic form of the lexical signs and the meaning are embedded in the same mental concepts. The iconic strategies used by signers and gesturers encompassed the phonological and semantic poles through profiling of the object. The phonological parameters (Handshape, Movement, Location and Orientation) and the semantics (meaning) contribute to iconic structures. The phonological

---

[21] The rural gesturers live together in the same community with AdaSL signers and the imperatives of day to day conversations might trigger the visibility of some AdaSL signs to these nonsigners.

and semantic poles of *mobile phone* in GSL and AdaSL have a resemblance relationship[22]; that is, all handshapes profile *mobile phone* depending on how signers construe the object with the iconic strategies. The iconic handshapes share form-meaning mappings with the construals of the linguistic form and the construals of real-world objects. AdaSL signers demonstrated greater consistency of strategy because >70% of the tools were profiled with the same iconic strategies by the signers and there was 65% full agreement of strategies used (see Figures 7 & 8). AdaSL as village sign language with long history shows higher consistency and agreement in use of strategy compared to younger GSL. GSL is relatively new sign language (that emerged in 1957).


Figure 11. MOBILE PHONE, GSL

The phonology of *mobile phone* and most of the lexical signs discussed above have meaning and this meaning is associated with the semantic pole (see figure 12). In consideration, the phonological pole is submerged in the semantic pole of a symbolic unit (Langacker 2008; Wilcox 2004; Occhino 2016). In this sense, the different representations of the phonological pole by signers (and gesturers) are the result of different usage-events that are triggered by the object.

Signers handshape "exists on a continuum of form-meaning mappings ranging from near one-to-one mappings to many-to-one mappings" (Occhino 2016:4). One-to-one mappings deal mostly with the phonology and many-to-one mappings present morphological information (Occhino 2016). Unlike the one-to-one mapping that elicited single forms, the hands profiled different information (different forms) based on many-to-one mappings. There were some handshapes that were higher in the number of times used than others. For instance, the B-HS resulted in 50 responses out of the 252 tokens of GSL signers and the A-HS resulted in 36 tokens. In AdaSL, the B-HS resulted in 77 responses of the 242 tokens of AdaSL signers and the A-HS resulted in 42 responses. The higher usage of B-HS and A-HS by both GSL and AdaSL signers predict a higher number of associations with the handshapes, that is many of the lexical items were profiled with B and A handshapes. On the other hand, F-HS elicited 10 (out of 252 tokens) responses from GSL and 7 (out of 242 tokens) from AdaSL signers; lower associations and frequency show that there were fewer items that profiled the F-HS.

---

[22] There is resemblance relationship when the phonological and semantic poles are close together.
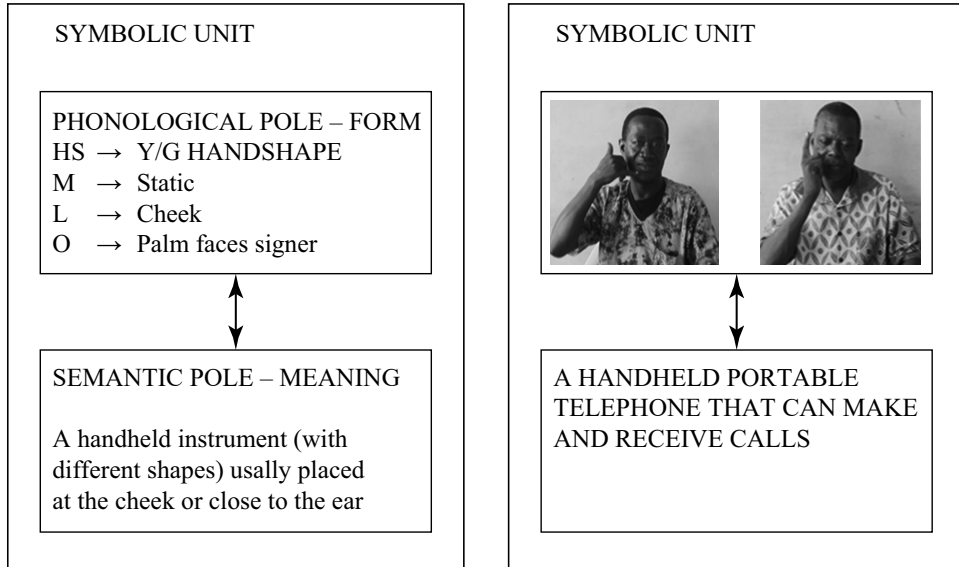
Figure 12. Phonological and semantic poles

Finally, few of the responses had figure-ground relationships in individual signs. For these responses, each hand – the dominant hand and the non-dominant hand – conveyed different aspects of the object. For most of the signers, the dominant hand profiled the figure whereas the non-dominant hand profiled the ground (or the entity being acted on). the dominant hand for all signers shown in figure 13 is the right hand.
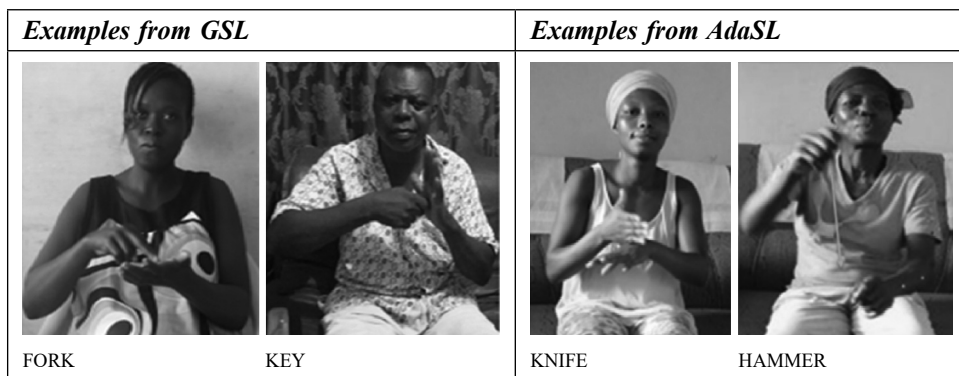
Figure 13. Examples of signs with multiple schemas

Lexical items that elicited multiple forms had thematic roles like agent, instrument and patient (see table 3). The dominant hand (for most of the signers the right hand) acted upon the non-dominant hand in agent-patient relationship. For example, in figure 13 the dominant hands were fork (instrument), key (handling), knife (instrument) and hammer (handling). The non-dominant hands elicited entity strategy.

Articulatory unit	KNIFE	HAMMER	FORK	KEY	Thematic role
Dominant hand	B	F-closed	H	A	Agent
Non-dominant hand	B	A	B	B	Patient
Iconic strategy (dominant)	Instrument	Handling	Instrument	Handling	Agent/instrument
Iconic strategy (non-dominant)	Entity	Entity	Entity	Entity	Patient

Table 3. Multiple schemas in individual signs.

7. Conclusion

This chapter presented the results of iconic strategies used by signers and gesturers in Ghana. It discussed the preference for either instrument or handling by both signer and gesturers. Although both signers and gesturers used instrument and handling strategies, signers had a greater preference for instrument and gesturers a greater preference for handling except rural gesturers who demonstrated a high preference for instrument almost comparable to their preference for handling. Both signers and gesturers demonstrated a recurrent use of either instrument or handling iconic strategies across the semantic category of tools. The comparison between signers and gesturers demonstrate one facet of the emergence of a new sign language. The preference for handling forms becomes lexicalised as instrument when the language develops. Another finding of this research is the high use of instrument by rural gesturers (of Adamorobe), which seems to be related to AdaSL in the community. A study on the iconic patterns used by signers will further lead "to uncover mechanisms of representation and symbolic organization in gesture and language" (Padden et al. 2015:93).

The data from the signers were analysed for consistency and agreement, and AdaSL, a rural sign language had higher consistency and agreement in use of the same strategy for individual items than GSL, an urban sign language. It is also worth noting that lexical variants exist in GSL. Although lexical variants were not thoroughly investigated (because all the signers recruited for the study lived in proximity), when other lexical items in other semantic domains in three different dictionaries of GSL (published at different times) were compared, few lexical variants were identified. Further investigations with some native signers of GSL confirmed that some dictionaries have older versions of the signs and few variants are new entrants. For example, *mobile phone* signed with focus on the pole was used by 2 signers (deaf couple) who confirmed that the sign *mobile phone* with the Y-HS refers to TELEPHONE. Two recent dictionaries of GSL published in 2020 (online) and 2015 do not have the sign MOBILE PHONE but rather TELEPHONE depicted with the Y-HS as seen in figure 11. Irrespective of the existence of variants in GSL, there existed similarities between GSL and AdaSL (sharing the same preferences) and their preference for instrument strategy reiterate the fact that preference for instrument forms seems to emerge quickly in a new sign language (e.g. GSL).

The responses from the signers showed that the relationship between the linguistic form (phonology) and the meaning (semantics) involves series of associations that are

mapped from the phonological parameters and the meanings. The preference for a particular handshape is triggered by signers' profile and the construals of the object. Finally, there were handshapes that elicited fewer responses and others that elicited more responses in one-to-one mapping and many-to-one mappings respectively. The handshapes with higher numbers of association and frequency had lower semantic correlations because of the different associations linked to the handshapes. On the other hand, the handshapes with lower associations and frequency had stronger semantic associations for the handshapes. Iconic patterns among signers and gesturers reveals a mechanism for the emergence and development of sign languages and gestures.

APPENDIX. GSL manual alphabet (McGuire & Deutsch 2015)
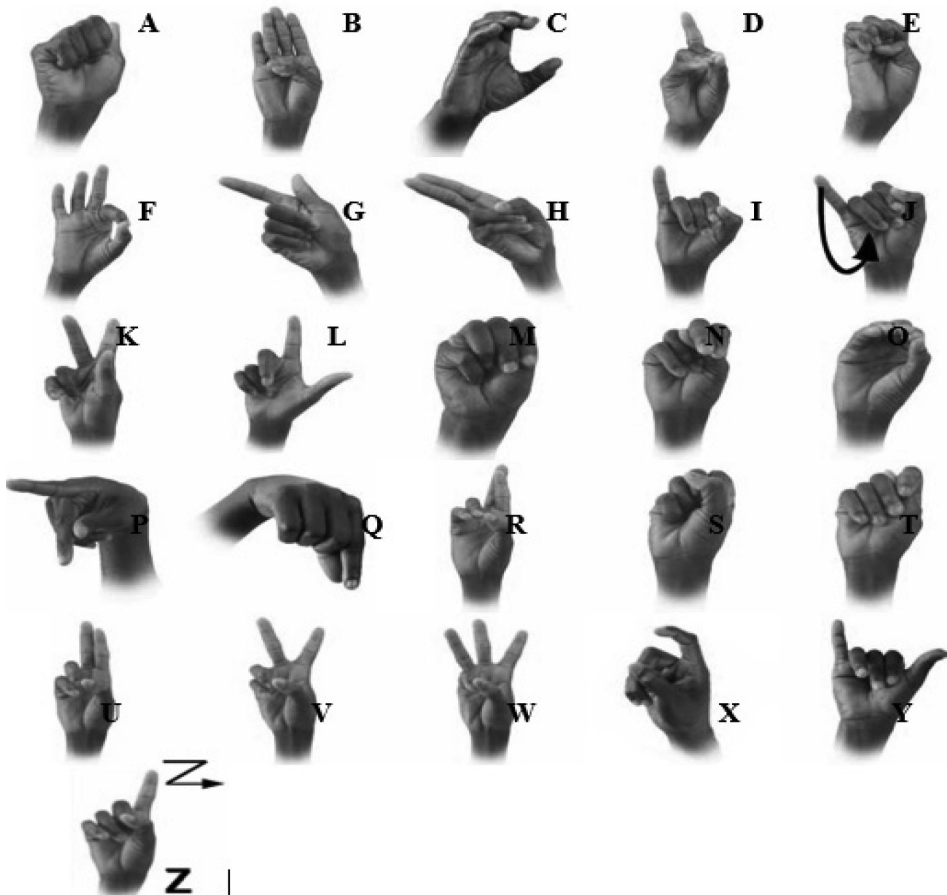
References

Brentari, Diane, Alessio Renzo, Jonathan Keane & Virginia Volterra. 2015. "Cognitive, cultural, and linguistic sources of a handshape distinction expressing agentivity". *Topics in cognitive science* 7(1), 95-123.

De Vos, Roland Pau. 2015. "Sign language typology: the contribution of rural sign languages". *Annual Review Linguist* 1(1), 265-288.

Dingemanse, Mark, Damián Blasi, Gary Lupyan, Morten Christiansen & Padraic Monaghan. 2015. "Arbitrariness, iconicity, and systematicity in language". *Trends in cognitive sciences* 19(10), 603-615.

Ebling, Sarah, Konrad Reiner, Penny Braem Boyes & Gabriele Langer. 2015. "Factors to Consider When Making Lexical Comparisons of Sign Languages: Notes from an Ongoing Comparison of German Sign Language and Swiss German Sign Language". *Sign Language Studies* 16(1), 30-56.

Edward, Mary. 2015. *Signing out: Linguistic contact and possible endangerment of the Adamorobe Sign Language*. Paper presented at the BAAL language in Africa SIG annual meeting on 22nd May 2015 at Aston University, Birmingham.

Edward, Mary. forthcoming. *Iconicity as a pervasive force in language: Evidence from Ghanaian Sign Language and Adamorobe Sign Language.* Brighton: University of Brighton, Doctoral College.

Evans, Vyvyan & Melanie Green. 2006. *Cognitive linguistics: An introduction*. Edinburgh: Edinburgh University Press.

Frishberg, Nancy. 1987. "Ghanaian sign language". *Gallaudet encyclopedia of deaf people and deafness*, 778-779.

Hou, Lina. 2018. "Iconic Patterns in San Juan Quiahije Chatino Sign Language". *Sign Language Studies* 18 (4), 570-611.

Hwang, So-One et al. 2017. "Of the body and the hands: patterned iconicity for semantic categories". *Language and Cognition* 9(4), 573-602.

Kimmelman, Vadim, Anna Klezovich & George Moroz. 2018. "IPSL: A database of iconicity patterns in sign languages. Creation and use". In: *Proceedings of the Eleventh International Conference on Language Resources and Evaluation* (LREC-2018). Miyazaki, Japan: ELRA.

Kiyaga, Nassozi & Donald Moores. 2003. "Deafness in Sub-Saharan Africa". *American annals of the deaf* 148(1), 18-24.

Langacker, Roland. 2008. *Cognitive grammar: A basic introduction*. Oxford: Oxford University Press.

Mandel, Mark. 1977. "Iconic devices in American sign language". In: Lynn A. Friedman (ed.). *On the other hand: New perspectives on American Sign Language*. New York: Academic Press, 57-107.

McGuire, Caithlin & Casey Deutsch. 2015. *Ghanaian Sign Language Dictionary*. Morrisville: Lulu.com.

Meir, Irit, Carol Padden, Mark Aronoff & Wendy Sandler. 2013. "Competing iconicities in the structure of languages". *Cognitive Linguitics* 24(2), 302-343.

Miles, Mark. 2004. "Locating deaf people, gesture and sign in African histories, 1450s–1950s". *Disability & Society* 19(5), 531-545.

Nyst, Victoria. 2007. *A Descriptive analysis of the Adamorobe Sign Language (Ghana).* Amsterdam: Doctoral Dissertation, University of Amsterdam, Faculty of Humanities.

Nyst, Victoria. 2016. "Size and shape depictions in the manual modality: A taxonomy of iconic devices in Adamorobe Sign Language". *Semiotica* 210, 75-104.

Occhino, Corrine. 2016. *A cognitive approach to phonology: Evidence from signed languages.* Doctoral dissertation, The University of New Mexico, USA.

Okyere, Alexander & Mary Addo. 1994. "Deaf Culture in Ghana". In: Carol J. Erting, Robert C. Johnson, Dorothy L. Smith & Bruce D. Snider (eds.). *The Deaf Way. Perspectives from the International Conference on the Deaf Culture.* Washington: Gallaudet University Press.

Ortega, Gerardo & Asli Özyürek. 2016. *Generalisable patterns of gesture distinguish semantic categories in communication without language: Evidence from pantomime.* Talk presented at the 7th Conference of the International Society for Gesture Studies (ISGS7).

Padden, Carol, Irit Meir, So-One Hwang, Ryan Lepic, Sharon Seegers & Tory Sampson. 2013. "Patterned iconicity in sign language lexicons". *Gesture* 13(3), 287-308.

Padden, Carol, So-One Hwang, Ryan Lepic & Sharon Seegers. 2015. "Tools for language: Patterned iconicity in sign language nouns and verbs". *Topics in cognitive science* 7(1), 81-94.

Perniss, Pamela. 2007. *Space and iconicity in German sign language (DGS).* Nijmegen: Doctoral dissertation, Radboud University Nijmegen Nijmegen.

Perniss, Pamela, Robin Thompson & Gabriella Vigliocco. 2010. "Iconicity as a general property of language: evidence from spoken and signed languages". *Frontiers in psychology* 1, 227.

Sandler, Wendy & Diane Lillo-Martin. 2006. *Sign language and linguistic universals*. Cambridge: Cambridge University Press.

Simone, Raffaele (ed.). 1995. *Iconicity in language.* Amsterdam: John Benjamins Publishing.

Taub, Sarah. 2001. *Language from the body: Iconicity and metaphor in American Sign Language.* Cambridge: Cambridge University Press.

Valli, Clayton, Ciel Lucas, Kristin Mulrooney & Miako Villanueva. 2011. *Linguistics of American sign language: An introduction*. Washington: Gallaudet University Press.

Wilcox, Phyllis Perrin. 2000. *Metaphor in American sign language*. Washington: Gallaudet University Press.

Wilcox, Sherman. 2002. "The iconic mapping of space and time in signed languages". *Advances in consciousness research* 41, 255-282.

Wilcox, Sherman. 2004. "Cognitive iconicity: Conceptual spaces, meaning, and gesture in signed language". *Cognitive Linguistics* 15(2), 119-148.

Wittenburg, Peter, Hennie Brugman, Albert Russel, Alex Klassmann & Han Sloetjes. 2006. "ELAN: a Professional Framework for Multimodality Research". *Proceedings of LREC 2006, Fifth International Conference on Language Resources and Evaluation.*