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수어논문 3

Handshape Complexity in Initialized Signs: A Cross-linguistic Study*

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Hwangbo, Hyun Jin & Choi, Youngju. (2023). Handshape complexity in initialized signs: a cross-linguistic study. *The Linguistic Association of Korea Journal*, *31*(4), 241-264. This paper presents a comprehensive phonological analysis of handshapes undergoing initialization in Korean Sign Language (KSL) and extends its findings to comparisons with other sign languages. The study investigates the complexity of these handshapes in terms of finger and joint configurations, aiming to discern universal tendencies in signs undergoing the initialization process. Results indicate that initialized handshapes in KSL and other sign languages typically exhibit low to medium complexity, suggesting the potential representation of unmarked handshapes within the language. This research lays the groundwork for future investigations, offering valuable insights into the phonological intricacies of initialized handshapes in KSL and contributing to broader cross-linguistic comparisons.

Key Words: Korean Sign Language (KSL), initialization, handshape, complexity, phonology, sign language

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1. Introduction

Fingerspelling adds new words in sign languages through fingerspelled loans, abbreviations, and initialization (Sandler & Lillo-Martin, 2006). Fingerspelled loans spell out words using fingerspelled signs, and these are frequently used in American Sign Language (ASL) to introduce a concept like place names and technical terms in academic disciplines (Bellugi & Newkirk, 1981; Brentari, 1998). Abbreviations consist of the initial letter of an English word, produced with an arbitrary combination of location and movement. For instance, in ASL, some of the color terms are represented by fingerspelled handshape 'Y,' 'P,' and 'G' for 'yellow,' 'purple,' and 'green,' respectively, with an arbitrary location and movement. In contrast, initialization, unlike the former two methods which generate new signs, involves replacing a handshape of an existing native sign with the initial letter of an English word. For example, when the native ASL sign 'group' substitutes its handshape with the fingerspelled handshape 'F', it means 'family'. That is, the initialized signs distinguish detailed meanings and disambiguate the existing words (Sandler & Lillo-Martin, 2006).

The linguistic analysis of the initialized signs assumes an interesting position concerning the handshapes of native signs since not all native signs undergo the substitution of their handshapes with fingerspelled signs. Initialized signs exhibit a selective replacement of handshape while preserving the original locations and movements. The question arises as to whether the initialized signs share common properties in relation to their native handshape, particularly with respect to their complexity. Handshape complexity is measured by selected fingers and joint configurations (Brentari, 2011; Brentari et al., 2017). This paper explores the complexity levels inherent in the configurations of the handshapes of native signs that undergo initialization.

The purpose of this paper is to examine the handshapes of native signs in Korean Sign Language (KSL) that replace their handshape with fingerspelled signs. The analysis focuses on assessing handshape complexity through the examination of selected fingers and joint configurations. Furthermore, this study seeks to compare the handshape complexity observed in KSL to that of other sign languages, aiming to identify universal features of native signs undergoing initialization. The findings of this paper show that handshapes incorporating initialization predominantly exhibit low to medium complexity in terms of selected fingers and joint configurations. This analysis suggests that these handshapes are highly likely to overlap with the unmarked ones in KSL and other sign languages.

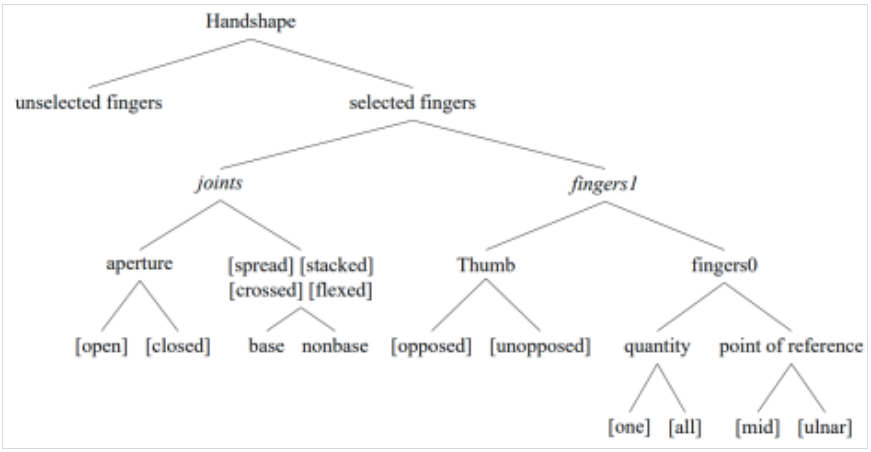
The structure of this paper is as follows. Section 2 provides the background of handshape complexity, elaborating on the features of selected fingers and joint configurations. Section 3 briefly describes what the initialization process is and analyzes handshape complexity in KSL and other sign languages, and Section 4 presents a comprehensive discussion and conclusion with suggestions for future studies.

2. Handshape Complexity

Handshape is one of the fundamental elements within the phonological parameters of sign languages, alongside movement and location, since the seminal work of Stokoe (1960/2005). Later, orientation has been added to the parameters (Battison, 1978). Among these parameters, handshape is highly related to initialization. Initialization involves the integration of the fingerspelled alphabet signs into a native sign, while the other three parameters, movement, location, and orientation, remain unaltered. This section provides explanation regarding the handshape complexity with examples.

Phonological models of sign languages, such as the Hand Tier Model (Sandler & Lillo-Martin, 2006) and the Prosody Model (Brentari, 1998, 2019), show very similar subcategories of handshape which include 'fingers' and 'joint.' The structure of Prosody Model as in (1) shows that the handshape is composed of selected and unselected fingers.

(1) Prosody Model



The former refers to the ones that are actively used and the latter to the ones that are not in use. In this paper, our main focus is on the selected fingers and their features. In Eccarius and Brentari (2008), the selected fingers are further categorized into primary and secondary selected fingers and we will mainly focus on the primary selected fingers.

The selected fingers are further specified separate ones. Thumb is specified as [opposed] or [unopposed]. Fingers are distinguished as ulnar and nonulnar side. The ulnar side indicates pinky-finger side and the nonulnar side indicates the opposite. And how many fingers are active one is also marked as a feature. The [one] and [all] characterize the quantity of fingers that are active.

Joints show whether the hand is fully opened, bent (closed), flat opened, flat closed, curved opened, curved closed, or fully closed. Fully opened handshape refer to the handshape where all joints are extended while fully closed handshape refer to the handshape where all joints are fully flexed and have a fist handshape. These handshapes are described by the joints features with aperture features, [open] and [close], and joint selection features, [spread], [stacked], [crossed], and [flexed]. Base joints refer to knuckles and nonbase joints refer to finger joints or interphalangeal joints. With the combination of the [flex] feature with base and nonbase joints, one can describe the various joint configuration described above.

The complexity of a handshape can be measured by "the number of branches and the features" in joints and fingers (Brentari, 2011; Brentari et al., 2017, p.287), which are the italicized nodes in (1). According to Brentari et al. (2017), the joint configuration complexity is categorized into low, medium, and high. Low complexity joint configurations are fully extended or fully closed handshapes. Figure 1a shows some low joint complexity handshapes. These low complexity handshapes are known to be the most frequent handshapes and acquired early in ASL (Boyes Braem, 1990) and British Sign Language (BSL) (Morgan et al., 2007). Medium complexity joint configurations are the ones where joints are flexed either in base or nonbase, or joints are spread as shown in Figure 1b. Also, the curved-open joint configurations show medium complexity. The most complex joint configurations are "the most infrequent and acquired very late cross linguistically" (Geraci et al., 2015 as cited in Brentari et al., 2017) and these are the stacked and crossed joint configurations. The examples of these joint configuration handshapes are in Figure 1c.

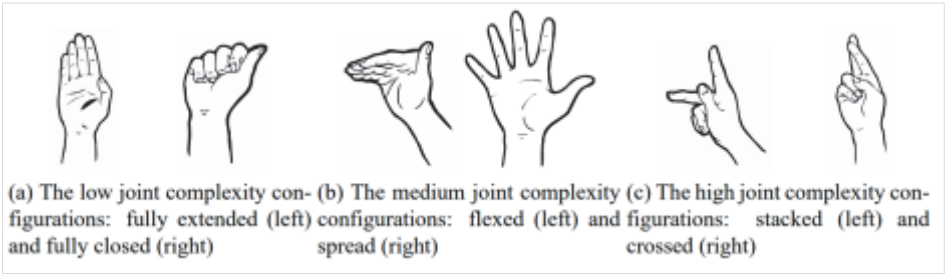


Figure 1. Examples of joint complexity configuration

The phonological representation of the fully extended handshape has an empty joint node, in other words, there is no joint branch. Therefore, the representation only shows fingers node as in Figure 2a. For the fully closed handshapes, joints are specified only with the [flex] feature (Brentari, 1998). The phonological representation of the flexed handshape is in Figure 2b. The base of the joints is flexed, therefore the joints are specified with 'base' in addition to the [flex] feature as shown in the figure. For the spread handshapes, joints are specified with the [spread] feature. For stacked and crossed joint configurations, the joint features are selected with the fingers feature as in Figure 2c.

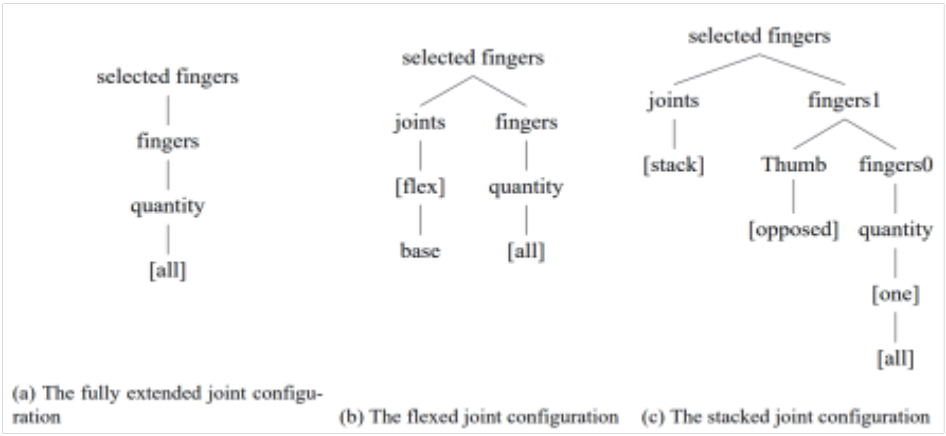


Figure 2. The phonological representations of low, medium, and high complexity joint configurations of Figure 1. Note that the representations only show left handshapes in Figure 1.

The fingers features are categorized into two: thumbs and the remaining four fingers, denoted as the 'Thumb' node and the 'fingers0' node, respectively. The attributes of the thumb are illustrated by the joint configuration of the thumb, specifically whether it is opposed or unopposed. The two features are [opposed] and [unopposed]. The former feature, [opposed], indicates the thumb positioned closely to the palm, while the latter, [unopposed], indicates the thumb positioned apart from the hand or palm. For example, curved, flat, and closed handshapes are represented with the [opposed] feature, while open and flexed handshapes are represented with the [unopposed] feature. Note that the thumb is a "semi-independent articulator" (Brentari, 1998, p.113), thus, specified differently from other selected fingers.

Under the 'fingers0' node, two categorized features are quantity and point of reference. As mentioned above, the quantity features specify the number of fingers involved, while point of reference features specifies which side of the hand the fingers are selected. To be more specific, the quantity feature [one] and [all] represents one finger and all four fingers, respectively. When these features are in a dominance relationship, such as [one] dominating [all] or [all] dominating [one], it indicates two or three fingers, respectively.

The handshapes in Figure 3 show examples of handshapes of different level of complexities. Figure 3a is one of the least complex finger group handshapes. The selected finger of the left handshape is the index finger which is fully extended. The quantity feature [one] under the fingers node represents the number of fingers within the selected fingers. There is no point of reference features because the index finger is neither the middle nor the pinky fingers. The phonological structure is represented in Figure 4a. Here, joints are not specified because the selected finger, the index finger, is fully extended. The selected fingers of the fully extended handshape are all fingers. Therefore, the quantity feature is represented with [all] which is represented in Figure 2a. The handshapes depicted in Figure 3b are examples of medium complexity selected fingers group. In the left side Figure 3a, the selected fingers are the index and the middle fingers, both of which are fully extended. The increased number of selected fingers requires the feature [all], dominated by [one], as shown in Figure 4b. Turning to the right handshape, it is noteworthy that selecting the pinky finger brings additional complexity compared to selecting the index finger alone. While both handshapes are represented with the feature [one] for quantity, the pinky finger requires a specific point of reference with the [ulnar] feature. Given that the pinky finger introduces another branch under the fingers node, the

pinky finger handshape is inherently more complex than the index finger handshape. Examples of the most complex selected fingers group are shown in Figure 3c. The selected fingers of the left handshape are the index, the pinky, and the thumb. The thumb is unopposed and the index and pinky fingers are extended. Therefore, there is no joint node, while the thumb is represented with the [unopposed] feature. The other selected fingers, index and pinky, are represented by the quantity features [one] dominating [all]. In addition, since pinky finger requires point of reference, the feature [ulnar] is also represented. The selected fingers of the handshape are all fully extended, hence, there is no joint node as in Figure 4c. The other handshape in Figure 3c, shows that the selected fingers are the middle, pinky fingers, and the thumb. The thumb is represented with the [unopposed] feature. The quantity feature [one] dominates the feature [all], and the [mid] feature dominates the [ulnar] feature under the point of reference. These phonological representations show more complex phonological structure, that is, there are more branches and features under the 'fingers' node.

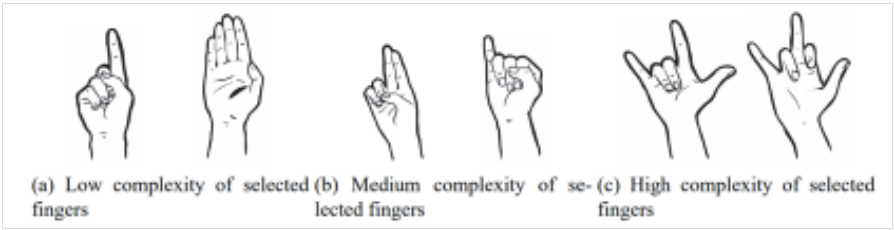


Figure 3. Handshapes of low, medium, and high complexity selected fingers group

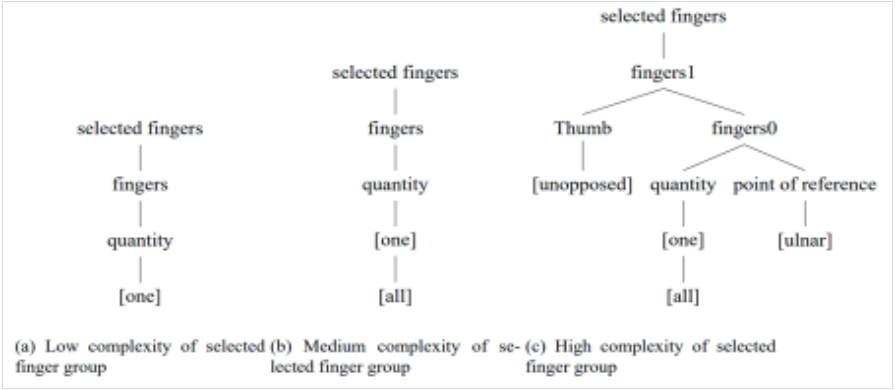


Figure 4. The phonological representations of the left side handshapes in Figure 3

As mentioned above, the handshape complexity is measured by joint configuration and selected fingers. The complexity of handshapes, either in joint configuration or selected fingers, are easily recognizable. Low complexity of joint configuration includes fully extended and fully closed handshapes. The fully closed handshape is represented by the joint feature [flex], but the full extended handshape does not create a joint node. Medium complexity in joint configuration is represented by the [flex] feature along with the specification of [base] and [nonbase]. The most complex joint configurations are the stacked and crossed handshapes, which are specified as [stack] and [crossed], respectively.

The complexity of joints and fingers configuration is straightforward. The low complexity is denoted by the quantity features [one] or [all] along with fully extended or fully flexed joints. In other words, the quantity feature, in the absence of the point of reference node and joint node, results in the selection of the extended index finger or all fingers. The joint feature [flex] combined with the quantity feature [all] results in a fully closed handshape. The medium complexity of the fingers configuration shows both quantity features [one] and [all], resulting in two fingers. These fingers may or may not have [mid] or [ulnar] for a point of reference, resulting in the selection of the pinky finger. The medium complexity of joint configurations shows the [spread] feature or [flex] feature with the specification of 'base' and 'nonbase.' The most complex fingers configuration is the one where all the features occur together, that is, [one] and [all] for quantity and [mid] and [ulnar] for a point of reference. The most complex joint configuration shows [stack] or [crossed]. Utilizing the complexity measurements, the subsequent section provides a brief overview of initialization. Additionally, handshapes of native signs in KSL and other sign languages will be examined in terms of their handshape complexity.

3. Initialization and Handshape Complexity in KSL and Other Sign Languages

3.1. Initialization

Initialization is one of the ways to create new words in sign languages, which is a sub-type of blends. According to Meir (2012), blends combine certain phonological parameters from two different sources and create a single sign. That is, blends take the

handshape from one sign while incorporating the location and movement from the other sign. This has been observed in many sign languages such as ASL, BSL, Israeli Sign Language (ISL), German Sign Language (DGS), Australia Sign Language (Auslan) and Indo-Pakistani Sign Language (IPSL) (Meir, 2012).

There are several types of blends: blending two sign words, numeral incorporation, and initialization. Blending two sign words is common in sign languages. For example,in Turkish Sign Language the sign for 'neighbor' blends the handshape from 'home' and the location and movement from 'close' (Makaroğlu, 2021). In KSL, 'son' and 'daughter' blends the handshape from 'man' or 'woman' and the location and movement from 'to be born,' respectively (Lee, 2008). Another sub-type of blends is numeral incorporation, which involves combining a numeral handshape with a sign to express concepts such as weeks, years, ages, etc. (Liddell, 1996; Meir, 2012, and many others). In Israeli Sign Language, 'one day' is composed of a sign 'day' and the number handshape for 'one', while 'two days' is consists of the sign 'day' and the number handshape for 'two', and so forth. Similarly, in ASL, 'one week' is produced using the sign for 'week' with the handshape for 'one', and 'two weeks' is produced using a sign for 'two', and so on. KSL exhibits a parallel pattern, where 'two days' incorporates the signs for 'two' and 'day,' 'three days' combines 'three' and 'day,' and so forth.

Initialization replaces the handshape of a native sign with the initial letter of a spoken word (Sandler & Lillo-Martin, 2006).[1] As previously mentioned, this is one of the way to add a new word in sign languages. Through initialization, a language can convey nuanced meanings and disambiguate existing words (Sandler & Lillo-Martin, 2006). Initialization is particularly employed when there is no established sign for certain concepts, such as place names, academic terms, and technical terms (Bellugi & Newkirk, 1981; Brentari, 1998). Initialization is utilized in various sign languages including ASL, Quebec Sign Language (LSQ), Irish Sign Language (Ó'Baoill & Matthews, 2000), and Israeli Sign Language (Meir & Sandler, 2008).

Many of the initialized signs are semantically related to the native sign, thereby specifies the word meanings. Several of the ASL examples are provided in (2) (Brentari,

1) In Bellugi and Newkirk (1981), an initialized sign is referred to a sign incorporating a manual alphabet handshape corresponding to the first letter of the word with an arbitrary movement and location. This description of initialized signs is termed as an 'abbreviation' in Sandler and Lillo-Martin (2006). In this paper, the definition of initialized signs, as in Sandler and Lillo-Martin (2006), is adopted, wherein initialized signs consist of a existing sign and a manual alphabet handshape.

1998; Brentari & Padden, 2001; Meir, 2012; Sandler & Lillo-Martin, 2006), with additional instances to be explored in Section 3.3.

(2) a. GROUP: FAMILY, ASSOCIATION, SOCIAL, DEPARTMENT, TEAM
b. SCIENCE: BIOLOGY, CHEMISTRY, EXPERIMENT
c. COMPUTATION: STATISTICS, ALGEBRA, CALCULUS, GEOMETRY, TRIGONOMETRY
d. SOUND: PHONOLOGY

By changing the handshape of the sign 'group' to incorporate the fingerspelled alphabet 'F', the meaning is specified to 'family'. That is, location and movement persist from the native sign 'group,' while the handshape undergoes a replacement to fingerspelled alphabets such as 'F', 'A', 'S', 'D', and 'T,' meaning 'family', 'association', 'social', 'department', and 'team', respectively. Additionally, initialized signs are productively used in scientific and academic domains to refine the meaning as 'biology', 'chemistry', 'phonology', 'statistics', 'algebra', and so forth.

Analogous patterns are observed in LSQ as well. LSQ incorporates the handshape of fingerspelled alphabets in French alongside existing signs as exemplified in (3) (Machabée, 1995). Based on the existing native sign 'corps', the sign for 'organism' is articulated by adopting the handshape of the French fingerspelled alphabet 'o', while retaining the location and movement of the sign 'corps'. Similarly, the sign for 'human' incorporates the French fingerspelled alphabet 'h' as its handshape, and the sign for 'physical' utilizes the French fingerspelled alphabet 'p'.

(3) CORPS: ORGANISME (organism), HUMAIN (human), PHYSIQUE (physical)

KSL also incorporates initialization by replacing the handshape of the native sign to Korean fingerspelled alphabets as illustrated in (4). The examples of initialization are from Lee (2008); Weon et al. (2021) and Korean Sign Language Dictionary (National Institute of Korean Language, 2023). Through out this paper, the translation of KSL words is provided alongside the Korean alphabet 'Hangul,' presented in the Yale Romanization system. The fingerspelled alphabet and the native sign is concatenated using the symbol '/'. For example, by substituting the handshape of the native sign 'surrounding' to the Korean fingerspelled alphabets 'p' and 'h', the word specifies its meaning to 'mood' and

'environment', respectively. Again, the location and movement of the native sign 'surroundings' remain unchanged. Additional examples of initialized signs will be elaborated in Section 3.2.

(4) a. PWUNWIKI 'mood': 'p'/SURROUNDINGS
b. HWANKYENG 'environment': 'h'/SURROUNDINGS

Interestingly, KSL incorporates fingerspelled English alphabet with native KSL signs as well. For example, the sign for 'design' is composed of the fingerspelled English alphabet 'I' and the KSL word 'plan', and 'taxi' is composed of the fingerspelled English alphabet 'T' and the KSL word SEDAN, as illustrated in (5). In this context, the handshape of KSL native signs are replaced with fingerspelled English alphabets. In other words, the native KSL signs 'plan' and 'sedan' undergo a handshape substitution, incorporating the fingerspelled English alphabet 'I' and 'T,' respectively, to convey the meanings of 'design' and 'taxi.'

(5) a. DESIGN: 'I'/PLAN
b. TAXI: 'T'/SEDAN
c. TEAM: 'T'/CLUB
d. LEMON: 'L'/SOUR
e. WINDOWS: 'W'/SYSTEM

As previously discussed, initialization adopts the handshape of the fingerspelled alphabet in the spoken language, and replaces the handshape of native signs while preserving the movement and location. In the following sections, initialized signs in both KSL and other sign languages will be analyzed phonologically focusing on handshape complexity.

3.2. Initialization in KSL and Handshape Complexity

Initialized signs in KSL combine fingerspelled Korean alphabet with a native KSL word, resulting in a replacement only in the handshape. As exemplified in (6), the native KSL signs incorporate fingerspelled Korean alphabets to specify meanings. The words in (6) are visually represented in Figure 5. As depicted in the images, the sign for

'magazine' consists of the location and movement of the native KSL word 'book' while adopting the handshape of fingerspelled Korean alphabet 'c'. It is noteworthy that the word 'magazine' maintains the same movement and location as the sign 'book', while the word replaces the handshape with the fingerspelled Korean alphabet 'c'.

(6) a. CAPCI 'magazine': 'c'/BOOK
b. CHELHAK 'philosophy': 'ch'/KNOWLEDGE
c. CIKUM 'now': 'c'/PRESENT
d. KALILEE HOSWU 'lake of kalilee': 'k'/LAKE

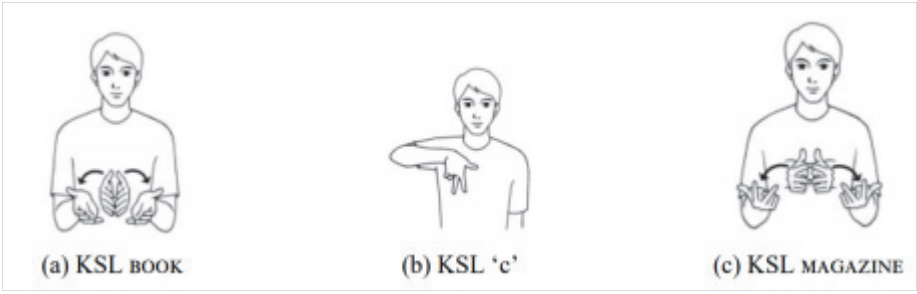


Figure 5. KSL MAGAZINE and its components

The handshape characterizing native KSL signs for 'book,' 'knowledge,' 'present,' and 'lake' is defined by a fully extended hand with an unopposed thumb, as visually depicted in Figure 6a. This selected finger configuration similar to the previously discussed pattern, featuring a lack of joint nodes due to the extension of all fingers. The only distinction is the inclusion of the unopposed thumb, which is one of the selected finger. The phonological representation of the fully extended handshape with an unopposed thumb is illustrated in Figure 6b. Notably, the distinguishing factor from Figure 2a lies in the inclusion of the 'Thumb' node, reflecting the fact that the thumb is one of the selected fingers in this specific handshape, as depicted in Figure 6a.

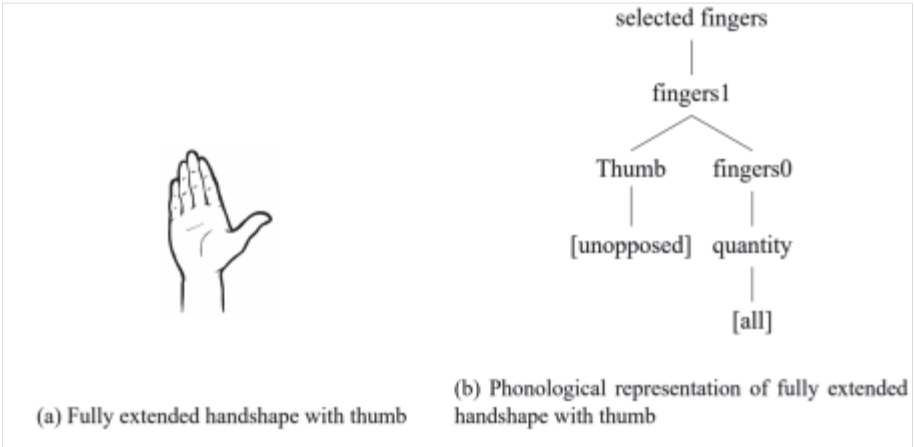


Figure 6. Fully extended handshape with thumb and its phonological representation

The handshape shared by the native signs 'surroundings', 'language', and 'mental' listed in (7) is delineated in Figure 3a. The selected finger is the fully extended index finger. Therefore, phonological representation aligns with the pattern depicted in Figure 4, and for brevity, it is not repeated here.

(7) a. PWUNWIKI 'mood': 'p'/SURROUNDINGS
b. HWANKYENG 'environment': 'h'/SURROUNDINGS
c. YEY-EN 'prophet': 'yey'/LANGUAGE
d. CENGSINCICHEY 'mental retardation': 'c'/MENTAL

A note is included regarding two-handed signs featuring distinct handshapes on each hand. As illustrated in Figure 7, the images depict two compounds (7a) and (7b), distinguished by the incorporation of different fingerspelled alphabets. To be more specific, the fingerspelled alphabets differentiate and specify the respective meanings. In particular, the word 'surrounding' incorporates the fingerspelled alphabet 'p', indicating 'mood', while 'h' indicates 'environment'. Figure 7a and 7b show the fingerspell alphabets of 'p' and 'h', respectively.

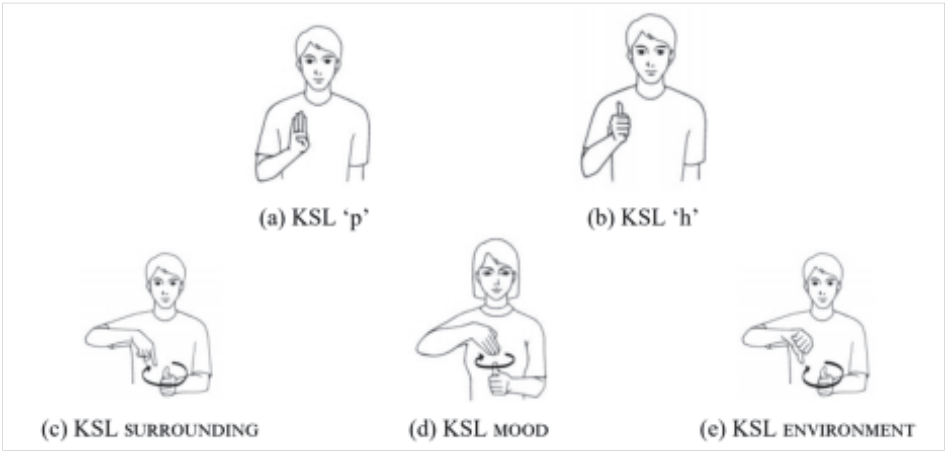


Figure 7. KSL signs incorporating different fingerspelled alphabets specifying the meanings

The lexical word 'surrounding' is a two-handed sign, where each hand exhibits distinct handshapes, as exemplified in Figure 7c. Within two-handed signs, the actively moving hand is the dominant hand. In this specific sign, the hand with an extended index finger (Figure 3a) serves as the dominant hand, therefore, incorporates the fingerspelled alphabets. As illustrated in Figure 7d and 7e, the handshape of the dominant hand undergoes a substitution into the fingerspelled alphabets, specifying the meanings of the signs as 'mood' and 'environment'.

The handshape shared by the native signs 'fun' and 'world' listed in (8) is described as a curved-open handshape with all fingers curved slightly, as shown in Figure 9a. The handshape undergoes a replacement with the fingerspelled Korean alphabets 'k', 'c', and 'n', respectively. For instance, Figure 8a displays the native sign 'fun', and the one incorporates the fingerspelled Korean alphabet 'k' as represented in Figure 8b. The phonological representation of the curved-open handshape is delineated in Figure 9b.

(8) a. KIPPUM 'joy': 'k'/FUN
b. CULKITA 'enjoy': 'c'/FUN
c. NWURI 'world': 'n'/WORLD[2)]

2) 'Nwuri' is a native Korean word for 'seygey' which is a sino-Korean word and both means 'the world'.

Figure 8. FUN and JOY in KSL

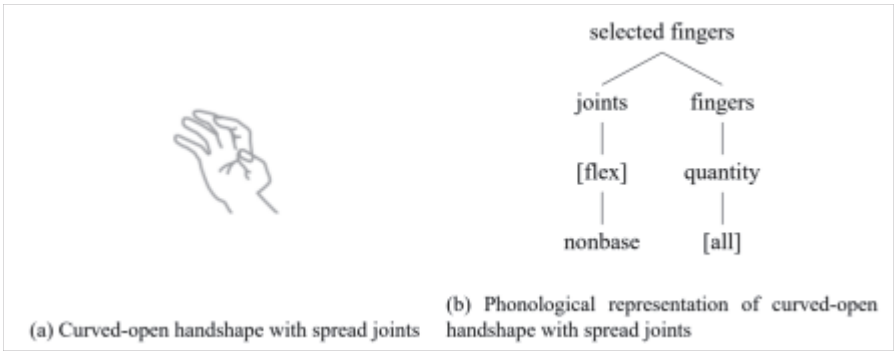


Figure 9. Curved-open handshape with spread joints and its phonological representation

The handshape common to the native words 'plan' and 'culture' as in (9) is the flexed handshape which is illustrated in Figure 1b. The base of selected fingers is flexed, thus, the joint node is specified with the 'base' feature. With all fingers selected, the quantity of selected fingers is denoted as [all]. The phonological representation is exactly mirrors the one in Figure 2b, and it is not repeated here for brevity.

(9) a. SELKYEY 'planning': 's'/PLAN
b. CONGKYO 'RELIGION': 'c'/CULTURE

The handshapes of the native signs listed in (10) can be observed with only one

instance for each. The handshape of each word is visually represented in Figure 10. Specifically, the handshape of 'movie' is fully extended with spread joints as in Figure 10a, while the handshape of 'armband' is a curved-open handshape with the index finger and thumb, as shown in Figure 10b. The handshape of the sign 'rights' features a lax, extended handshape where the joints are relaxed. The handshape is illustrated in Figure 10c, where a laxness is denoted in parentheses. Lastly, the handshape of 'human' is characterized by an extended pinky and thumb, the latter being unopposed, as shown in Figure 10d.

(10) a. TONGYENGSANG 'video': 't'/MOVIE
b. CIPSA 'deacon': 'c'/ARMBAND
c. CAKYEK 'qualification': 'c'/RIGHTS
d. PAYKSENG 'the people': 'p'/HUMAN

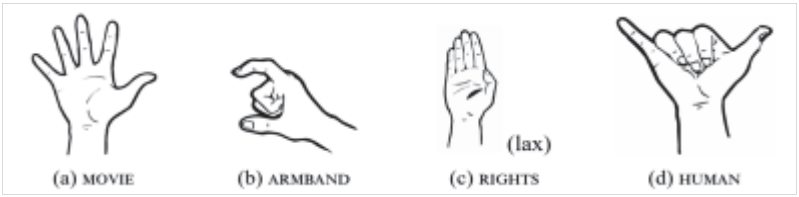


Figure 10. Handshapes of each native sign in KSL

The selected fingers in Figure 10a are four fingers which are fully extended and spread including thumb. The quantity feature of the finger is [all], and the joint feature is [spread] while the joint feature of thumb is [unopposed] as represented in Figure 11a. The handshape in Figure 10b has a curved-open handshape of the selected fingers, the index finger and thumb. Therefore, the quantity feature of the handshape is [one], while the joints are widely curved-open in [base] and [nonbase]. Thumb is in a opposed position thus has [opposed] feature which is represented in Figure 11b. The handshape of the word 'rights' is fully extended lax handshape, which is also known as "sloppy" handshape (Eccarius & Brentari, 2008, p.86). Regardless of the laxness, the quantity feature of the selected fingers are all four fingers, thus, has a phonological representation as Figure 11c. Lastly, the selected fingers of the handshape in Figure 10d are the pinky finger and thumb. To represent the pinky finger point of reference is required. The [ulnar] feature in addition to the quantity feature represents the pinky finger. Again, thumb is

unopposed as Figure 11d shows.

The data suggests that the handshapes incorporating fingerspelled alphabets of Korean show low or medium handshape complexity. To be more specific, the majority of the selected fingers display either low complexity or medium complexity. In detail, the low complexity handshapes show one of the quantity features, while the medium complexity handshapes include either both quantity features or one quantity feature along with the point of reference features. Moreover, the joint configuration also manifest either low or medium complexity. For extended handshapes, the absence of joint nodes represents the simplest form. Some handshapes show medium joint complexity involving flexed and spread joints. Based on the presented data, it can be concluded that handshapes incorporating fingerspelled Korean alphabets in KSL predominantly demonstrate low and medium complexity in terms of fingers and joints configurations.

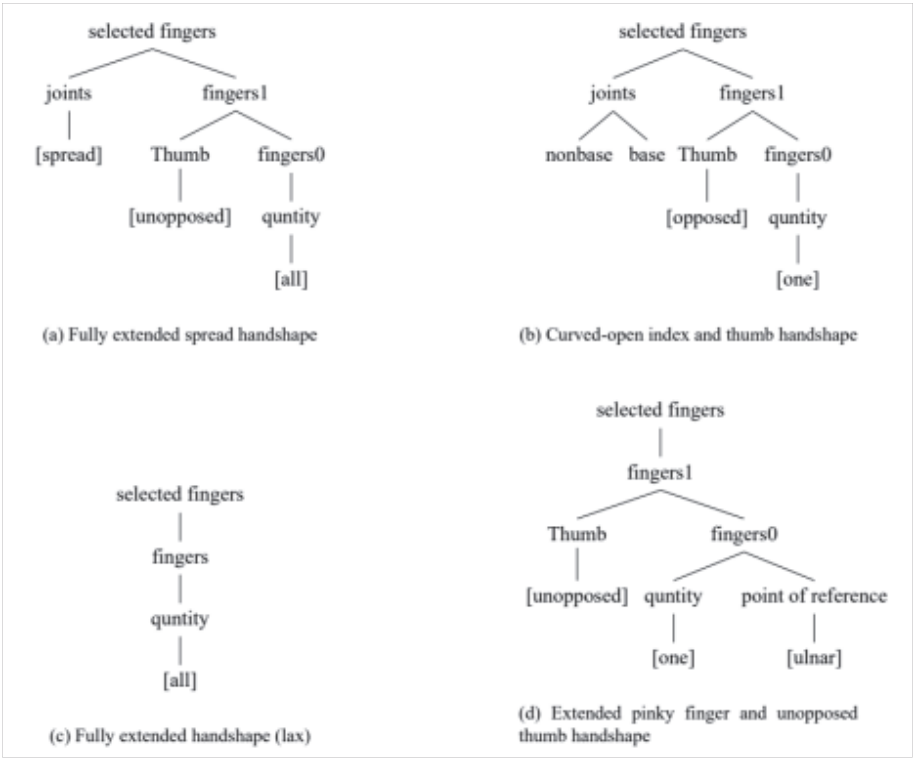


Figure 11. Phonological representations of the handshapes in Figure 10

3.3 Initialization in Other Sign Languages and Handshape Complexity

Initialization is a common method to add new words into a lexicon and is observed in various sign languages. Meir (2012) provided examples of initialized signs in Israeli Sign Language (ISL). For instance, the Hebrew word 'preferable' is incorporated into the native sign 'better' resulting in the initialized sign with the meaning 'preferable.' Another example is the initialized sign 'experience.' This sign is composed of the native sign 'feeling' and the Hebrew word 'experience'. Additionally, the initialized sign 'flat-area' combines the native sign 'land' and the Hebrew word. Figure 12a shows the handshape of the native sign 'better'. The handshape depicted in Figure 12a shows that the index and the thumb has a curved-closed joint configuration. It is noteworthy that the other fingers, middle, ring, and pinky, are unselected. In the phonological representation, the selected fingers, index and thumb, are represented with the thumb node and the quantity feature [one]. Both the base and non-base joints are flexed to make a curved-closed joints. Therefore, the joint configuration is represented with the feature [flex] along with specifications of the joints. These are represented in Figure 12b.

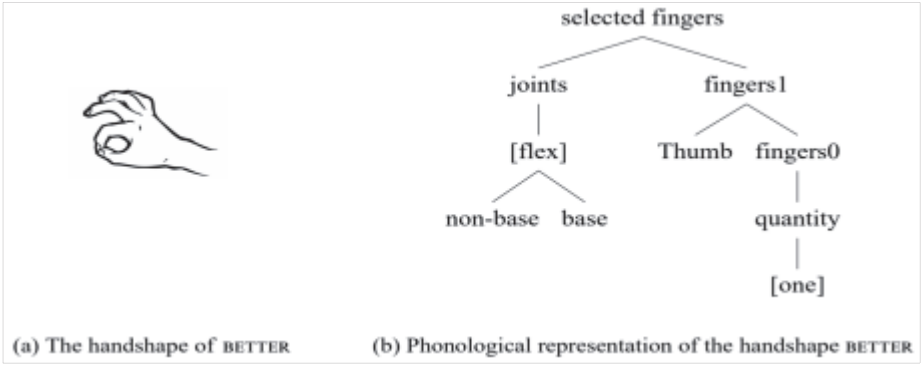


Figure 12. The handshape and phonological representation of BEttER in Israeli Sign Language (ISL)

Quebec Sign Language (LSQ) incorporates French fingerspelled alphabets. Machabée (1995) analyzed video corpus of LSQ and there were fifty-seven signs that showed initialization in LSQ. One of the examples is based on the native sign 'body', previously presented in (3). The handshape of the native sign 'body' is replaced with French fingerspelled alphabets, resulting in various meanings. For example, the handshape with

the fingerspelled alphabet 'O' conveys the meaning of 'organism,' 'H' means 'human,' and 'P' represents 'physical.' The handshape of the native sign 'body' is the curved-open handshape. The handshape and the phonological representation is same as the ones represented in Figure 9.

More examples come from American Sign Language (ASL), as in (11), in addition to the examples previously presented in (2). For example, the signs 'room' and 'office' are distinguished by the fingerspelled handshape 'R' and 'O'. That is, both signs are based on the native ASL sign BOX and change the handshape to manual alphabet 'R' to indicate 'room' and 'O' to indicate 'office'.

(11) a. GOVERNMENT: POLITICAL/POLITICS
b. CHANGE: MODULATION
c. FIELD-OF-ENDEAVOR: PROFESSION
d. THOUGHT: THEORY, REASON, LOGIC, MEDITATE
e. SUSPICIOUS: PARANOIA
f. PERSON: PERSON, INDIVIDUAL, CLIENT, HUMAN, SUBJECT
g. BOX: ROOM, OFFICE

Figure 13 shows the handshapes of the native signs 'box,' 'person,' 'science,' and 'change'. The handshape for 'group' is fully extended and spread as in Figure 10a. The signs 'government,' 'thought,' and 'suspicious' share the handshape of extended index finger as in Figure 3a.

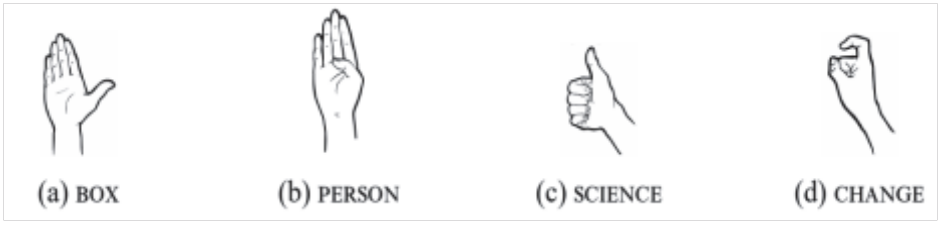


Figure 13 Handshapes of BOX, GROUP, PERSON, SCIENCE, and CHANGE in American Sign Language (ASL)

The handshapes in Figure 13a and 13b are the same except for the thumb position. All fingers are selected and fully extended in both handshapes, the thumb is unopposed

in the handshape for 'box' whereas it is opposed in the handshape for 'person'. Therefore, the phonological representations are the same except the thumb position feature as represented in Figures 14a and 14b. The selected finger of the handshape for 'science' is the thumb which shows unopposed joint configuration. The phonological representation of the handshape is illustrated in Figure 14c. The handshape for the sign 'change' is the curved index finger, thus, the joint configuration is represented with flexed nonbase as in Figure 14d. The phonological representations for the handshapes 'group' and 'government' are already presented in Figures 11a and 4a.

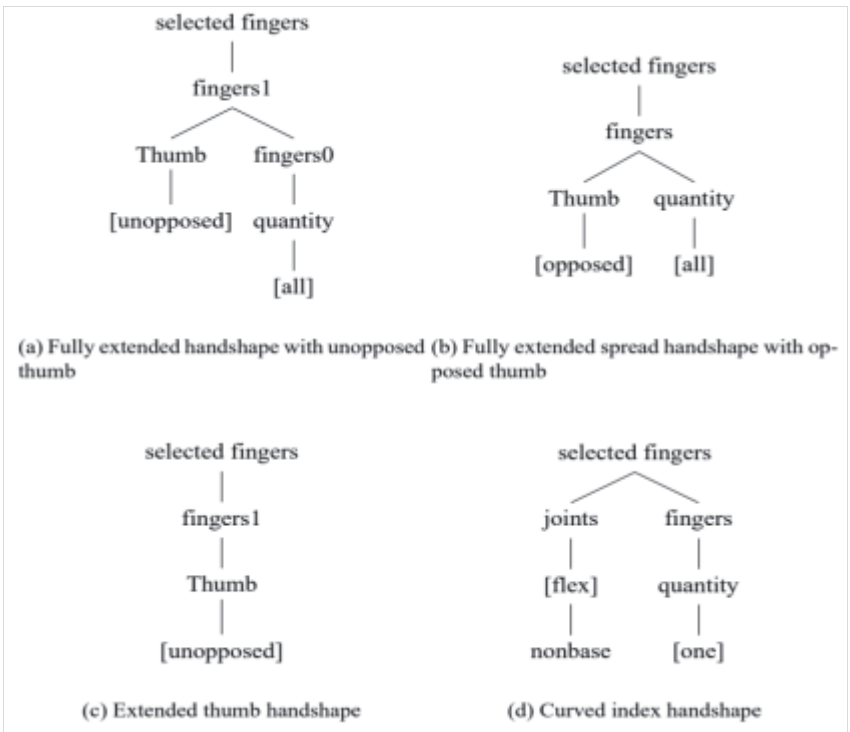


Figure 14. Phonological representations of the handshapes in Figure 13

The data from other sign languages also suggests that native sign handshapes incorporating fingerspelled alphabets from spoken languages exhibit low to medium complexity as well. The selected fingers typically include all fingers with the thumb or one finger, usually the index, either with or without the thumb. Joint configurations

involve extended, flexed, or spread joints. The phonological analyses of handshapes incorporating initialization suggest a strong tendency for low to medium complexity handshapes to be initialized with fingerspelled alphabets from spoken languages.

4. Discussion and Conclusion

The primary objective of this paper was to analyze the handshape complexity of the signs incorporating initialization in KSL and compare this complexity with other sign languages. The phonological analyses of handshapes in KSL and other sign languages suggest that native signs undergoing initialization share the characteristic of low to medium complexity in terms of fingers and joints configurations. There appears to be a universal tendency in the handshapes that undergo the initialization process. This paper offers a comprehensive phonological analysis of KSL handshapes, comparing them with other sign languages, and identifies a universal tendency in handshapes undergoing initialization.

However, there are several limitations to this study. Regarding joint configuration, representing joints with phonological features poses challenges. While it is intuitive that stacked and crossed joints are more complex, the features [stacked] and [crossed] themselves might necessitate further theoretical exploration. Additionally, studying the openness of joints in conjunction with lax handshapes requires detailed investigation, as these aspects are continuous rather than categorical. The representation of openness and laxness warrants more in-depth examination. Another limitation pertains to thumb position. As highlighted by Eccarius and Brentari (2008), the thumb behaves differently from other fingers, although some systematicity exists. The phonological structure of handshapes in KSL, in particular, requires detailed examination, given the limited research in this area. Lastly, especially in the case of KSL, handshapes, in general, have not been extensively studied. Consequently, the proportions of low complexity, medium complexity, and high complexity handshapes remain unknown. While the handshapes of native signs undergoing initialization exhibit low to medium complexity, the prevalence of high complexity handshapes in KSL is unclear. Therefore, comprehensive research on handshapes is essential to confirm the tendency observed in initialization.

As previously noted, low complexity handshapes are typically acquired early and are likely to represent unmarked forms. However, the acquisition and unmarked handshapes

in KSL have not been thoroughly examined to date. This study aims to lay the foundation for future research in this field. To further substantiate the identification of unmarked handshapes, KSL acquisition studies are essential to enrich the research area. This paper conducted a phonological analysis of initialized handshapes in KSL. We posit that this work serves as a foundational contribution to future research endeavors, offering insights into the underlying representations of KSL, unmarked forms, and facilitating more detailed phonological analyses.

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