

# Chapter 11

## Phonology

Els van der Kooij & Onno Crasborn

### 11.1 Introduction

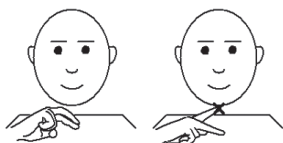
Phonology studies those elements used to form words and their possible combinations. In the phonology of spoken languages, the sounds of a specific language are analyzed and how these sounds are combined into syllables and words. Not all languages use the same set of sounds, and not every combination is possible. The word *tlaak*, for instance, is not a possible English word. However, there is at least one language, Tlingit (spoken in southeast Alaska) in which the word *tlaak* is well-formed and part of the lexicon – it means ‘being wet’.

It is important to distinguish well-formedness from the property of having meaning. Any English speaker knows that *tlaak* cannot be an English word: the combination of /t/ followed by /l/ cannot occur at the beginning of an English word. On the other hand, the nonsense word *blim* could well be an English word: the combination of /b/ followed by /l/ is possible in English (e.g. *blue*). Both nonsense forms do not exist in English, but, in contrast to *tlaak*, *blim* could in principle be an English word.

In sign languages, the same distinction applies. It is not possible to do just anything with your hands and for that to be a possible sign in a given sign language. A sign with a handshape in which only the ring finger is extended (see (5b) in Chapter 10) could never be part of the vocabulary of, for instance, Sign Language of the Netherlands (NGT), as this handshape is not part of the handshape inventory of NGT. In (1), we see a sign that does not exist in BSL and that would be considered as ‘foreign’ by British signers. As it happens, this sign does exist in a different sign language: it is the sign for SHOULD in Chinese Sign Language (CSL).

#### Chinese Sign Language

(1)



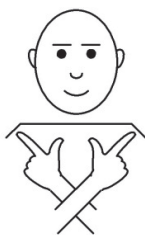
SHOULD (X-hand → e-hand)

Generally speaking, this impression of a sign being ‘foreign’ either results from a form being used that does not exist in that sign language, such as the extended ring finger in NGT, or from a combination of forms that is not possible. Taking the CSL sign in (1), both the initial handshape (☞-hand) and the final handshape (☜-hand) do exist in BSL, but they cannot be used in sequence within one sign.

The CSL sign for IMPERIALISM (2a) is a possible sign in French Sign Language (LSF), but it does not happen to have a meaning. It is a well-formed sign, since all the form elements can be used in LSF: the two ☞-handshapes, the crossing of the arms on the chest, and the position of the hands with the palms oriented towards the body. Actually, it resembles a form that does happen to have a meaning in LSF: the LSF sign AUSTRIA (2b).

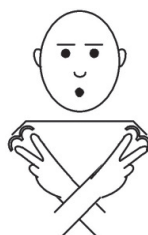
*Chinese Sign Language (a) and French Sign Language (b)*

(2) a.



CSL: IMPERIALISM

b.



LSF: AUSTRIA

In order to find out which form elements occur in a language and which do not, we need to carry out a phonological analysis. In spoken languages, we distinguish vowels and consonants. In sign languages, handshapes, locations, and movements are contrasted; these building blocks are often referred to as **parameters** (see Section 1.2).

The distinctive sounds of a language are called **phonemes**. The size of the phoneme inventory can differ between spoken languages: the number of **distinctive** sounds used in a specific spoken language can be quite small but also very large. A phonological analysis is required to establish which of the attested sounds actually are phonemes. The sounds *m* and *b*, for example, distinguish the English words *make* and *bake*. Those two words have different meanings in English. They form a **minimal pair**, as they are identical except for their initial sound. Therefore, we can conclude that the sounds /*m*/ and /*b*/ are phonemes of English. We can understand the distinctiveness of these sounds at different levels. When looking more closely at the properties of the sounds /*m*/ and /*b*/, they are in fact alike: they are both bilabials and voiced. The sole difference is that the exhalation of air passes through the nose when articulating /*m*/ but through the mouth when articulating /*b*/. It is thus the feature [nasal] which is responsible for

the difference in meaning between the words *make* and *bake*. Such a feature is called a **distinctive feature**. Distinctiveness can be a property of the phonemes (the succession of sounds) as well as of the features that make up those phonemes. In order to determine the distinctive features of a sign language, an analysis of the language's entire system of form elements is required. We need to know which form elements are capable of distinguishing meaning. Moreover, we need to find out how the form elements are articulated. As we saw in Section 10.4, signs, just like words, can be articulated slightly differently depending on the context in which they appear. Predictable variants of phonemes (i.e. form elements that distinguish meaning) are called **allophones**. For instance, in English, plosive consonants are articulated with aspiration [p<sup>h</sup>], but after /s/, there is no aspiration. The sounds [p<sup>h</sup>] and [p] are then allophones of the phoneme /p/ in English.

Minimal pairs occur in all sign languages. In British Sign Language (BSL), the two signs in (3) form a minimal pair: (3a) means *CRUEL*, (3b) means *SWEET*. All parameters of the two signs are the same except for the location. Both signs are articulated with a 1-handshape which makes a turning movement. However, the location of the sign *CRUEL* is the throat while *SWEET* is articulated at the side of the mouth. In other words, these two locations are distinctive, they are part of the phonological inventory of BSL.

### British Sign Language

(3) a.



CRUEL


b.



SWEET

In the following sections, we will discuss the various parameters in turn: the handshape (Section 11.2), location (Section 11.4), and movement (Section 11.5) of the hand(s). In a more restricted set of signs, the orientation of the hand (Section 11.3) and certain non-manual aspects (Section 11.6) also play a role in distinguishing meaning. As already discussed in Section 10.2, an important property of signs is whether they are articulated by one or by two hands; this property will be further explored in Section 11.7. Section 11.8 focuses on the adjustments of form in phonological processes, and Section 11.9 discusses the role of iconicity within phonology. While Sections 11.2–11.9 focus on the phonological structure of signs, in Section 11.10, we broaden our perspective by addressing phonology at the sentential level, that is, aspects of sign language prosody.

## 11.2 Handshape

Of the different parameters, the **handshape** seems to have the largest number of distinctive possibilities. We still know relatively little about the phonology of many sign languages but in those that have been studied, the number of distinctive handshapes appears to be larger than the number of distinctive locations and movements. The size of the handshape inventory may differ from one sign language to another, but there does not seem to be as much variation as in the sound inventories of spoken languages. The study of many sign languages has resulted in lists of those handshapes that frequently occur, but a systematic analysis of allophones has not been conducted yet. This makes it hard to compare languages, although we can give examples of differences between languages. For instance, Finnish Sign Language (FinSL) has the handshape shown in (4) which does not occur as a phonemic handshape in NGT. This handshape, however, does exist as an allophone of the handshape  in NGT (see (16)).

### *Finnish Sign Language*

(4)



In order to determine which handshapes should be in the handshape inventory of a specific sign language, we have to consider finer aspects of handshapes and the features that describe them. An important distinction in the division of these features is that between the selection and the position of the fingers (Section 11.2.1). In Section 11.2.2, we address the frequency of handshapes and the notion of markedness. Finally, we will look at the allophones that exist within the handshape parameter (Section 11.2.3).


### 11.2.1 Selection and position of fingers

When describing the characteristics of handshapes, a distinction is made between the selection of fingers and the position of the fingers. We explain this distinction by means of the five handshapes shown in (5).

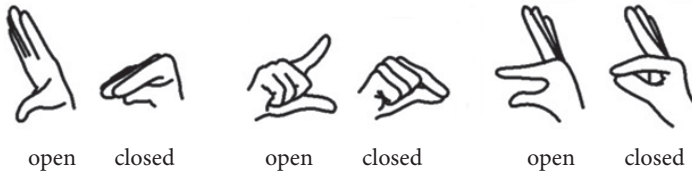
(5)





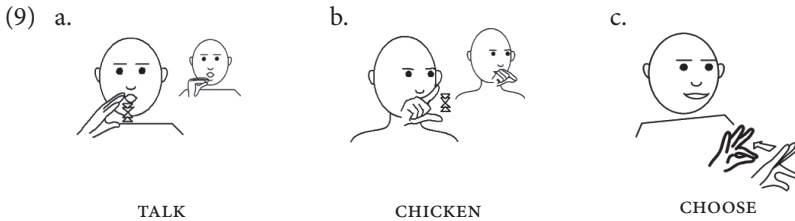
other in the spreading of the fingers. Furthermore, handshapes can be distinguished from each other on the basis of an aperture feature specifying the relation between the selected finger(s) and the thumb. In the -hand, the thumb and index finger make contact. This contact is represented using the feature 'closed'. Pairs of open and closed handshapes are shown in (8).

(8) Open and closed handshapes






When the position of the fingers changes during the articulation of a sign, then we are usually dealing with a change from open to closed or vice versa. Apparently, the position of the fingers can change within a sign, but the selected fingers cannot (see Section 11.5). In NGT, the 'open' handshapes shown in (8) only occur in signs in combination with their 'closed' counterparts. Examples of NGT signs that involve these pairs of open and closed handshapes are given in (9).

*Sign Language of the Netherlands*



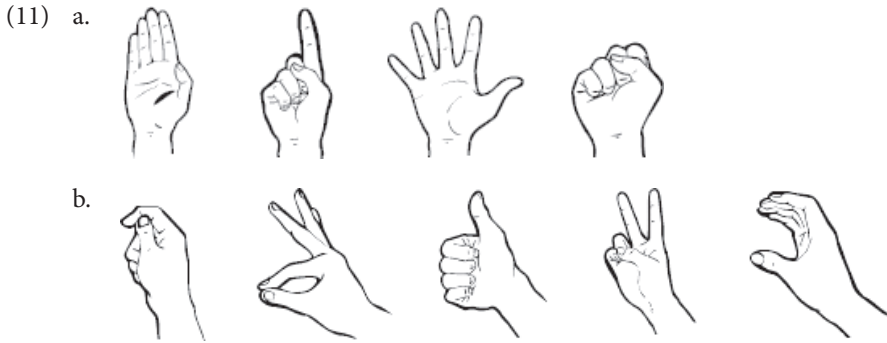
The **position** of the selected fingers can be described using three position features (10). All finger positions are described by means of aspects of these three groups. These position features always refer to the selected fingers.




(10) Position features of the fingers

- curving of the fingers (for example in the -hand);
- spreading of the fingers (for example in the -hand);
- an aperture relation between the thumb and the selected fingers (for example in the -hand).

### 11.2.2 Frequency and markedness




The handshapes that relatively occur most frequently in most known sign languages are presented in (11).






The handshapes in (11a) occur in many sign languages and in many signs and are referred to as **unmarked** handshapes. Unmarked handshapes are easy to produce (ease of articulation; see Section 10.2), and are quite distinct in terms of perception (ease of perception; see Section 10.3). They are also the first to be acquired by children (see Section 3.3.2). Furthermore, unmarked handshapes combine best with other parameters, such as location. That is to say, we find these unmarked handshapes at more different locations than **marked** handshapes. The handshapes in (11b), while also quite frequent across sign languages and across signs, are more complex and more marked. Some highly marked, and much less frequent, handshapes are depicted in (12). The -handshape, for instance, is a marked handshape in NGT and does not occur in combination with the various locations on the head and the body. However, this constraint does not hold for all sign languages. As has been shown in (1), in CSL the -hand can be used in combination with a location below the chin. Another feature of marked handshapes is that they never occur on the passive or non-dominant hand in two-handed signs, unless the non-dominant hand has the same handshape as the dominant hand (see Section 11.7 for further discussion). In contrast, the unmarked -handshape can be found in combination with all locations, and it frequently occurs on the non-dominant hand in two-handed signs.







A phonological description of the handshapes can help us understand why children usually acquire the unmarked handshapes before the marked handshapes. The descriptions of the unmarked handshapes  and  in (11a) look rather simple, as they require only one feature: a feature specifying finger selection, as is shown in (13). In contrast, the description of the more marked -handshape in (11b) requires more features and is thus more complex.

(13) Features of marked and unmarked handshapes

	Handshape	Description
Unmarked		finger selection: [4]
		finger selection: [1]
Marked		finger selection: [4]
		flexing: [curved] aperture: [open]

For the description of really unusual handshapes, we often need exceptional features, that is, features which are not otherwise used in the description of handshapes. The feature [crossed], for example, which indicates that the middle finger is crossed over the index finger, is only needed for the description of the -handshape. It seems that handshapes that are characterized by exceptional features, such as the crossing of the fingers in , often have special functions and, unlike other handshapes, in fact carry some referential meaning. These meaningful handshapes can be subdivided into three categories: classifier handshapes, handshapes representing a letter, or handshape representing a number.

Classifiers have already been discussed in Section 9.6.2. Remember that classifier handshapes are handshapes that either refer to a group of nouns which share certain form features, or they represent how some object is handled or manipulated. Some handshapes are only, or at least most frequently, used with a classifier function; three examples of such handshapes are given in (14).

(14)

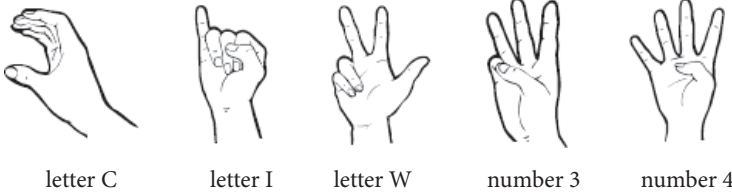


Handshapes may also be used to refer to a letter of the manual alphabet which is used for fingerspelling words from a particular spoken language (see Section 1.4) or to represent the numbers of the manual counting system. Signs that contain an alphabet handshape which refers to the initial letter of a word from a spoken language are called **initialized signs**. Another group of signs frequently containing handshapes from the manual alphabet is the group of name signs. Examples of NGT handshapes referring



either to letters or numbers are given in (15). Except for the leftmost handshape, these handshapes are rarely used besides for fingerspelling and initialization or counting and numeral incorporation.

(15)



letter C


letter I

letter W

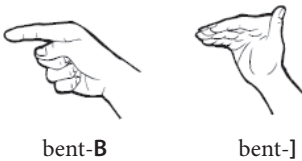
number 3

number 4

### 11.2.3 Allophonic handshapes





Some handshapes are different phonetically but not phonologically. If the exact context in which either of the variants occurs can be described, then these handshapes are allophones. We will illustrate this allophonic relation by means of the bending of the fingers. Fingers can be flexed in two ways. All of the finger joints can be flexed (this is called ‘curved’), or the fingers can be flexed only at the knuckles at the base of the fingers. This last feature is called ‘bent’. The -hand is an example of a handshape with curved fingers. Two examples of bent handshapes are shown in (16).

(16) Bent handshapes



bent-B

bent-]

These bent handshapes are possible handshapes of the inventory of a sign language since they are visually distinct from their counterpart with extended fingers (i.e. the - and -hands). However, the occurrence of these bent handshapes is often predictable on the basis of other phonological or phonetic features of the sign (see Chapter 10.4). The bent handshapes in (16) can therefore be considered **allophones** or **phonetic variants** of the - and -hand, respectively. As illustrated by the NGT verb VISIT, discussed in Section 10.4 and repeated below in (19), in the inflected form expressing the meaning ‘you visit me’, the tips of the selected fingers make contact with a location on the upper body. Contact with the upper body is one of the factors that motivate the use of an allophonic bent hand. The orientation of the fingertips – pointing towards the body – determines the bending of the fingers. In order to clarify the allophonic relationship between the handshapes with straight fingers and their bent counterparts, we first have to discuss the orientation of the hand.

### 11.3 Orientation

The NGT signs for SUPPOSE-THAT and EASY shown in (17) form a minimal pair; they only differ in the **orientation** of the hand. We can describe their orientation by looking at the direction in which the palm and fingers point. In both signs, the fingers points upwards. In the sign for EASY (17a), however, the palm points towards the body while in the sign for SUPPOSE-THAT, it points to the left (17b).

#### *Sign Language of the Netherlands*

(17) a.



EASY

b.



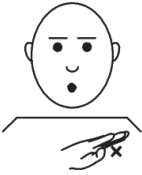
SUPPOSE-THAT

Another, and as we shall see better, way to describe orientation is by identifying the part of the hand that points towards the location of the sign. In the sign EASY, it is the palm that points towards the location (the chin), and in the sign SUPPOSE-THAT, it is the thumb side of the hand that points towards the same location. We now actually do not say anything about the orientation of the fingers, but assume that the easiest way for the palm or thumb side of your hand to make contact with the chin is with your fingers pointed (more or less) upwards.

The advantage of this description of orientation is that it can help us in dealing with the considerable variation in articulation that exists both between signs and signers. If we were to describe orientation on the basis of the absolute direction of the palm and the fingers, then we would have to say that the NGT sign ALSO as articulated in (18a) has a phonological orientation value different from that of its variant in (18b). This is undesirable for a phonological description, as the phonological representation focuses on the essence of the form; this essence is always the same, irrespective of the exact articulation of the sign. What generally remains constant in various articulation variants is the side of the hand that points towards the location, as can clearly be seen in the two articulation variants of the NGT sign ALSO.

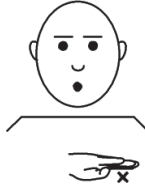
*Sign Language of the Netherlands*

(18) a.



ALSO(1)

b.



ALSO(2)

In both variants of ALSO, the thumb side of the hand makes contact with the chest, while the orientation of the palm and fingers varies. The description ‘thumb side of the hand points towards the location’ is accurate for all articulation variants of the sign ALSO. Consequently, the orientation features that we can distinguish correspond to the sides of the hand that can either point towards a location or make contact with the location: that is, the palm, the back of the hand, the thumb side (radial side), the little finger side (ulnar side), the wrist side, and the tips of the fingers.

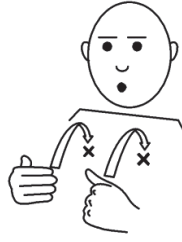
By describing orientation as a relation between a part of the hand and a location, we can also uniformly describe the different forms of verbs that inflect spatially (see Section 9.5.2 for discussion). Consider the two forms of the NGT verb VISIT in (19) that were already discussed in Section 10.4.

*Sign Language of the Netherlands*

(19) a.


 ${}_1\text{VISIT}_2$   
 ‘I visit you.’

b.


 ${}_2\text{VISIT}_1$   
 ‘You visit me.’

In all conjugations of the verb VISIT, the fingertips point towards the person or thing that is being visited. As we can see in this example, the handshape adjusts to the direction of the fingertips. In  ${}_1\text{VISIT}_2$  (19a), the fingertips point towards the addressee, and the fingers are extended. In contrast, in  ${}_2\text{VISIT}_1$  (19b), the base joints of the  $\text{H}$ -hand are flexed, as this is the easiest way to articulate the relative orientation value [fingertips] in combination with the final location [chest]. This example thus shows that by means of **relative orientation**, we can formulate clear conditions for the occurrence of the bent

handshape allophones  and , discussed in Section 11.2.3: when a sign articulated on the chest has the orientation value [fingertips], then both the -hand and the -hand will be realized in their bent variants.

## 11.4 Location

As has already been demonstrated by the minimal pair in (3), the **location** where a sign is articulated is one of the features that may distinguish the meaning of signs. In BSL, a rotated index finger near the side of the mouth means SWEET, whereas the same movement articulated with the same handshape near the throat means CRUEL. This minimal pair thus provides evidence that these two locations (side of the mouth and throat) belong to two different phonological categories in that sign language.

We can distinguish roughly four major location categories in every sign language: the head, the upper body, the non-dominant (or weak) hand, and the neutral space. The two BSL signs just mentioned are both made near the head, while the NGT sign ALSO in (18) is articulated on the upper body. The subdivision of the parameter location into these four groups is motivated. When a sign makes contact at the beginning and end of the movement (a so-called double contact sign), the two locations always fall into the same major location. The double-contact sign DEAF from Brazilian Sign Language (Libras) in (20) illustrates this: the hand moves from the ear to the cheek, both of which belong to the location group 'head'. There are, however, no mono-morphemic signs that begin, for example, at a location on the head and end on the weak hand.

### *Brazilian Sign Language*

(20)

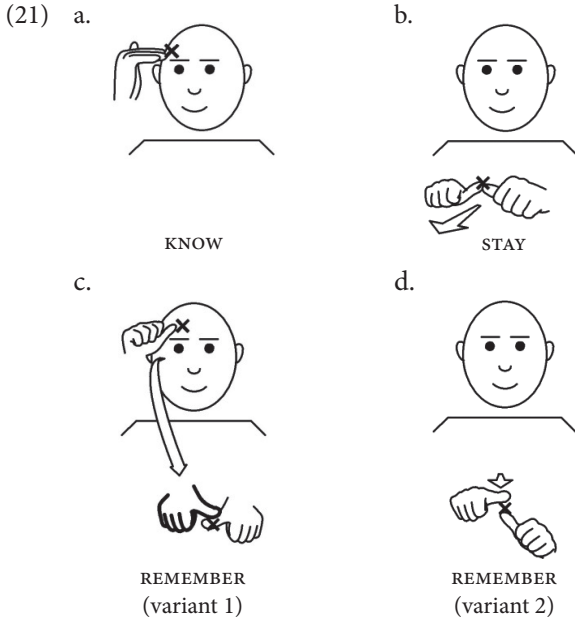


DEAF

In fact, a closer look at double contact signs reveals that the movement does not only stay within one of the four location groups, but actually remains within an even smaller area within a major location. The location phonemes seem to be small areas rather than points. The Libras sign DEAF then has 'cheek' as its location and is specified for a double-contacting movement within that area. For morphologically simple (i.e. non-compound) signs, a location is an area within which the hand can move. This implies that we will, for example, not find mono-morphemic signs in the location group 'head' in which the hand moves from the forehead to the cheek, or from the nose to the chin.

The restriction on major location does not always apply to multi-morphemic signs such as compounds or signs that originally were compounds (see Section 9.3). For example, in the complex ASL sign *REMEMBER*, the hand moves from the forehead (head) to the weak hand (21c). This is possible because *REMEMBER* is originally a compound sign that is made up of the individual signs *KNOW* (21a) and *STAY* (21b).

### American Sign Language



Interestingly, a second variant of this sign has developed (21d). While in variant 1 (21c), the hand moves between the two original locations of *KNOW* and *STAY*, variant 2 (21d) has only one location, the weak hand, taken from *STAY*. This variant of the compound has lost its special phonological feature (i.e. two major locations), which marked it as a compound, and thus resembles morphologically simple (non-compound) signs (see Section 13.4.1 for a discussion of phonological change).

This phonological analysis of locations as areas within which the hand moves has the advantage that fewer locations are needed to describe a sign language. And there is yet another advantage: the movement does not only stay within a phonemic location, it also seems to make optimal use of it. Broadly speaking, the articulator always moves from one side of the location (area) to the other. To some extent, this allows us to predict what the relative size of a movement will be: movements on the chin are smaller than movements on the chest, and movements on the arm are bigger than movements on the cheek.

The largest number of distinctive locations are found within the location group 'head'. Common areas found in sign languages are the forehead, the temple (the side of the forehead), the cheek, the ear, the nose (the center of the face), the mouth, and the chin. As mentioned in Section 10.3, when people are looking at signs, they actually focus on the face of the signer. This focus makes it easier to distinguish the numerous different locations on the face than the different distinct locations on the chest. Furthermore, the head features a number of prominent visual points, such as the eyes, nose, and mouth. Taken together, there are several phonetic reasons to expect more phonological location distinctions on the head than, for instance, on the upper body.

These prominent visual points or 'landmarks' that function as locations on the head are commonly related to specific meaning aspects of signs. The location of the sign is often predictable on the basis of its meaning when this meaning contains a clear reference to the function of one of those 'landmarks'. Thus, all signs related to 'eating' or 'talking' are produced near the mouth (see Section 8.3 on iconicity).

In contrast, we do not find many locations that distinguish meaning on the upper body. An exception is formed by the lower half of the upper body. In signs made there the location is often related to their meaning. In many sign languages, the signs HUNGRY, GIVE-BIRTH, and URINATE, for example, are made on the lower part of the upper body. The NGT sign for KIDNEY is articulated at a location which is not used for any other sign (22). The Hong Kong Sign Language (HKSL) sign TAIL is made on the lower back and again, this location is not used for any other sign. In these cases, the meaning of the sign determines a more specific location on the body.

### *Sign Language of the Netherlands*

(22)



The specific location of the hand on the body can also be related to the orientation of the hand (i.e. which side of the hand makes contact with the body, see Section 11.3). In the one-handed NGT signs ALSO (18) and BROTHER (27a), the thumb side of the hand makes contact with the body. To facilitate articulation, the location of the hand is more on the 'opposite' side of the body (the contralateral side) than the side from which the hand comes (the ipsilateral side).

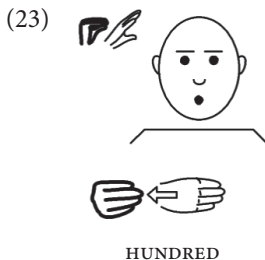
In principle, we could distinguish many different locations in the space in front of the body, the so-called ‘neutral’ signing space. It seems that these locations are not used to distinguish signs in the lexicon though. Rather, the space in front of the body seems to be used primarily for other grammatical functions, such as localization of referents and verb inflection (Section 9.5.2). Similar to signs on the upper body, some signs in the neutral space are articulated with the hands in a relatively high or low position. This is usually related to the meaning of the signs as well. For example, in many sign languages, the signs SUN, SHOWER, and ATTIC are made relatively high in neutral space.

Finally, as we have seen, the non-dominant hand can also be used as a location. We will discuss two-handed signs and the phonological constraints related to them in Section 11.6.

## 11.5 Movement

**Movement** has been considered to be one of the phonological parameters since Stokoe’s phonological description of ASL. There are two types of movements: movements of the fingers and the wrist (**hand-internal movements** and **orientation changes**) and movements of the entire hand (**path movements**). An example of a sign with a long path movement is the ASL sign REMEMBER in (21c), in which the hand moves from the forehead to the weak hand. But the small movement of the entire hand in the NGT sign ALSO (18) is also considered a path movement. NGT signs with a hand-internal movement – a handshape change from open to closed handshape – have been illustrated in (9). Apart from signs with only a path movement or only a hand-internal movement, there are also signs in which a path and a hand-internal movement are combined. An example of this is the NGT sign HUNDRED (23): the path movement proceeds from a central position towards the ipsilateral side, and during the movement, the hand closes.



### *Sign Language of the Netherlands*



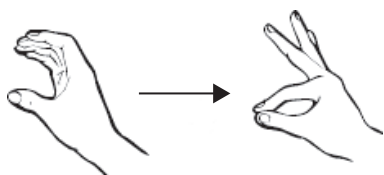
One of the reasons to consider the movement in HUNDRED a more complex movement is that children acquiring a sign language often at first omit one of the two simultaneously occurring movement components. Thus, a child acquiring NGT would either



produce the sign HUNDRED by using only the final handshape and the path movement, or by making the closing hand-internal movement first, followed by the path movement.

The change in aperture between the thumb and the selected fingers, as in (9) and (23), is the most frequent hand-internal movement. We could describe this movement as a transition from one handshape to another. The problem with such a description is that any sequential combination of two handshapes should theoretically be a possible hand-internal movement. This makes it hard to explain why in practice this is not the case. For example, a sign in which a -hand closes to a -hand, as shown in (24), has not been found in any sign language to date.

(24) An impossible hand-internal movement



In hand-internal movements that are attested, only the position of the fingers appears to change, but not the finger selection. This is true for the sign HUNDRED in (23) as well as for the signs TALK, CHICKEN, and CHOOSE in (9). This constraint on hand-internal movements is called the ‘**selected finger constraint**’.

Apart from path movements and hand-internal movements, there are also movements that result from an orientation change by means of a rotation of the lower arm. Examples of this are the BSL signs CRUEL and SWEET in (3). As is the case with hand-internal movement, an orientation change can be simultaneously combined with a path movement, as is illustrated by the NGT sign RECOGNITION in (25).

*Sign Language of the Netherlands*

(25)



RECOGNITION

A complex movement usually does not consist of a hand-internal movement in combination with an orientation change, although there are a few cases (see e.g. the BSL sign WIN in Section 9.5.1). As we have seen, both can be combined with a path movement though. In (26), we provide an overview of the different movement types and their possible combinations.

## (26) Simple and complex movements

Simple movements	Complex movement
Path movement	
Hand-internal movement	path movement + hand-internal movement
Orientation change	path movement + orientation change

Movements in lexical signs can usually be described as transitions between the initial and the final location; that is, almost all lexical movements can be predicted when the initial and the final position of the hand are known. Thus, (predictable) straight movements, as, for example, in FinSL *TEA* (4) or ASL *STAY* (21b) do not require a phonological description. In contrast, circular movements, as in FinSL *CYCLE* (Chapter 10, Example (7b)), require further specification of the shape of the movement.

Just as with location, the movement parameter of a sign can often be related to its meaning. The FinSL sign *CYCLE*, for instance, imitates the moving of the feet on the bicycle pedals. Moreover, signs depicting negative emotions often involve a downward movement, as is true for the ASL sign *DEPRESSED* and the NGT sign *DISAPPOINTED*, and vice versa: signs referring to positive emotions are often specified for an upward movement, as in, for example, the BSL sign *HAPPY* (see Sections 8.3 and 8.7).

## 11.6 Non-manual aspects in the lexicon

While most phonological properties of signs relate to the articulation by the hand(s), there is also a role for non-manual aspects in lexical items (as already mentioned in Section 1.2). By **non-manual aspects**, we mean form elements that relate to the posture of the body and the head, facial expressions, and certain movements or configurations of the mouth. As detailed in previous chapters, they play a more significant role in prosody, relating to the syntax and discourse of sign languages (see Section 11.10). Also, given that parts of the face can function as separate ‘articulators’, non-manual aspects are also found as bound morphemes. An example of a non-manual marker functioning as a bound morpheme are puffed cheeks that add the meaning ‘thick’ when articulated simultaneously with, for example, the nouns *SWEATER* or *COAT* (see Section 5.4.2).

Here, however, we are interested in non-manual aspects that fulfil a phonological function, that is, that are lexically specified. Non-manual aspects play a rather modest role in the lexicon. Broadly speaking, we can distinguish the upper and the lower part of the face. The lower part of the face, especially the cheeks and the mouth, play the biggest role as part of lexical signs. As set out in Section 1.2, within the lexicon, movements of

the mouth are subdivided into **mouthings** and **mouth gestures**. Mouthings are loan elements that are derived from the articulation of words in spoken languages, whereas mouth gestures are not. Both can play a role in distinguishing meaning. The NGT sign in (27a,b) can mean either ‘brother’ or ‘sister’, depending on whether it is accompanied by the mouthing ‘broer’ (27a) or ‘zus’ (27b). The Dutch word is in fact often greatly reduced. Not all sign languages use mouthings in the same way: Saudi Arabian Sign Language, for example, has a separate sign **SIBLING** and indicates gender by adding another sign. It does not rely on mouthing in this case. Also, some sign languages appear to make less use of mouthings than others.

### *Sign Language of the Netherlands*

(27) a.



BROTHER

b.



SISTER

c.



IDIOT

The NGT sign **IDIOT** (27c) illustrates the use of a lexically specified mouth gesture. The mouth gesture consists of a lax tongue hanging slightly out of the mouth while some air is being blown out. Mouth gestures, in contrast to mouthings, do not have an independent meaning.

## 11.7 Two-handed signs

An important and unique feature of sign languages is that, in contrast to spoken languages, they have multiple active articulators. Apart from the mouth, which can be seen as an independent articulator, we have two hands, which can move largely independently from each other. To an extent, this also happens in signed utterances. For instance, while one hand is held in space to refer to a referent, the other hand can keep on signing. In lexical signs, however, there are far fewer possibilities of using the two hands. In Chapter 10, we saw that this is partly due to limitations in motor control. However, motor limitations cannot be the only reason: after all, certain complex



interactions of the two hands that do not occur in lexical signs are attested in utterances. This suggests that, apart from motor limitations, there are also linguistic constraints which apply in the lexicon, but not, for example, in syntactic constructions.

The limitations on **two-handed signs** were originally formulated for ASL, but subsequent studies on various other sign languages indicate that they hold for all sign languages. This suggests that the constraints originate in articulatory limitations or cognitive restrictions. Two important constraints have been identified. The first one, the so-called **Symmetry Condition**, applies to signs in which both hands are moving (28a); the second one, the **Dominance Condition**, constrains the form of signs in which only one hand is moving while the other hand functions as a location (28b).

(28) a. *Symmetry Condition*

When both hands are moving, they have the same handshape and orientation and they make the same or an alternating movement.

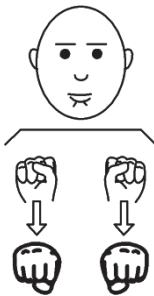
b. *Dominance Condition*

When the hands have different handshapes, one hand will be the weak hand (also called non-dominant or passive hand) and will not move. The handshape of the weak hand comes from a limited set (in ASL, that set consists of the handshapes , and ).

In (29), we provide three examples of symmetric signs (i.e. signs which meet the Symmetry Condition) from different sign languages; in (30), three examples are given of signs that comply with the Dominance Condition.

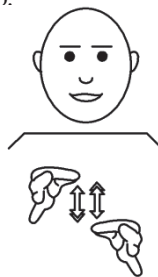
*Sign Language of the Netherlands (a), British Sign Language (b), and Saudi Arabian Sign Language (c)*

(29) a.



NGT: DECIDE

b.



BSL: POLITICS

c.



SaudiSL: ISLAM

*Sign Language of the Netherlands (a), British Sign Language (b), and Japanese Sign Language (c)*

(30) a.



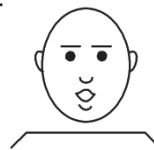
NGT: POLITICS

b.





BSL: PHONOLOGY

c.

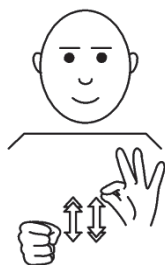


JSL: DANCE

These two conditions constitute an important restriction on phonetically possible signs, but, as mentioned previously, this restriction only applies to lexical signs. It explains why, in the sign languages studied to date, we will not find signs like the one shown in (31), which combines a -handshape on the right hand and a -handshape on the left hand, the two hands performing an alternating up- and downward movement.

A non well-formed sign

(31)



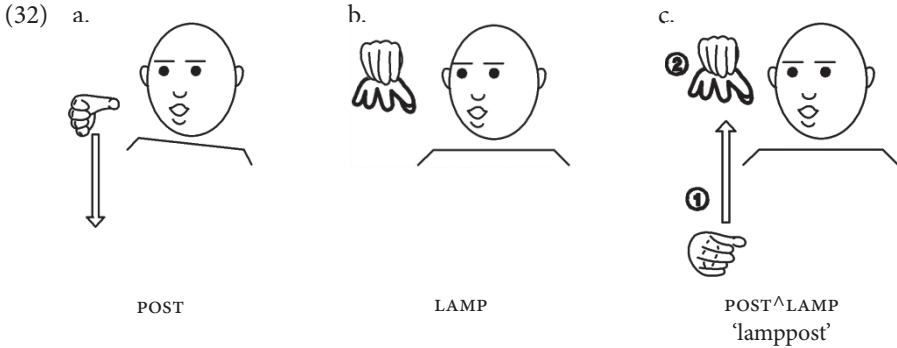
In some signs, two-handedness is a distinctive feature. This means that some pairs of signs can be found that only differ from each other by the presence of the second hand.



## 11.8 Phonological processes

Phonology does not only study the inventory of form elements that distinguish meaning, but it also aims to describe the form adjustments or **assimilations** that occur when words or signs are strung together in utterances, as already mentioned in Section 10.4. As we saw in Section 9.3, such assimilations are very common in compounds. Another example of assimilation can be seen in the movement direction of the NGT sign *POST*,

when it appears in the compound  $\text{POST}^{\wedge}\text{LAMP}$  ‘lamppost’, which is built up from the signs  $\text{POST}$  and  $\text{LAMP}$ . When occurring on its own, the sign  $\text{POST}$  is specified for a downward movement (32a). However, when it is followed by the sign  $\text{LAMP}$ , which is articulated somewhat higher in the signing space (32b),  $\text{POST}$  is articulated with an upward movement (32c).

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Another example of a phonological process is **reduction**. Reduction implies that lexically specified phonological information gets lost in the pronunciation (see Section 10.4). The application of such a reduction process in a spoken language can be exemplified by the English word *banana*. The vowel in the first syllable is produced as schwa: /bəˈnana/. A condition for this process to apply is that the schwa cannot be in a stressed position of the word. Phonological information can also be completely lost: in the same word *banana*, the whole first syllable /ba/ can be deleted resulting in /ˈnana/, a form often used with and by children. In sign languages, certain signs that are lexically specified for articulation with two hands may sometimes be produced with only one hand. This **deletion** of one hand in a two-handed sign is called ‘**weak drop**’, as was already mentioned in Section 10.2. The weak hand can easily be omitted in symmetrical signs, such as those in (29). Also, the -hand in asymmetrical signs can often be omitted. As symmetry and the presence of the -hand are phonological features of the sign, we can consider weak drop as a phonological reduction (or deletion) process.

## 11.9 Iconicity and phonology

Signs are commonly characterized by iconic features, which implies that parts of the form resemble (parts of) the meaning (see Section 8.3 for discussion). In spoken languages, relationships between form and meaning occur only incidentally as, for example, in the onomatopoeic English word *hiss*. Iconic motivation of the form occurs,

however, very frequently in all sign languages studied so far. Whereas phonemes or distinctive features of spoken language are generally meaningless, we find iconic elements at all levels of the phonological organization in sign languages.

When we consider so-called iconic signs more closely, we see that the iconic motivation of signs is often connected to one or more specific phonological parameters. This is illustrated by the Turkish Sign Language (TİD) sign SAY in (33a) and the German Sign Language (DGS) sign EAT in (33b). The location of the signs (the mouth) is connected to the fact that both speaking as well as eating involve the mouth, and it is used iconically in most sign languages for such actions.

*Turkish Sign Language (a) and German Sign Language (b)*

(33) a.






TİD: SAY

b.



DGS: EAT

Handshapes are also often used **iconically**. As we saw in Section 8.3, the Libras verb DRINK uses the -handshape to represent the flask being drunk out of. In the same sign language, the -handshape is also used to represent the shape of a plane (its wings) in the sign AIRPLANE. The handshape of the Estonian Sign Language sign HEARING-AID (34b) represents the shape of the object it refers to. Equally, the handshape of NGT CHICKEN (9b) represents the beak of the bird.

Movements in a sign can also be iconic. We have already mentioned the circular movements of the hands in the FinSL sign CYCLE. The movement in the Japanese Sign Language sign DANCE (30c) also represents the action of dancing (while the -handshape refers to the legs of the dancer).

Iconicity can lead to infrequent (exceptional) form elements. The locations used in the NGT sign KIDNEY (22) and the HKSL sign TAIL do not usually occur in those respective sign languages. Such exceptionality is particularly common for the location parameter, as the body may function as an absolute location. This also explains the unusual location used in the sign COCHLEAR-IMPLANT, which in Estonian Sign Language (as in many other sign languages) is articulated above and behind the ear, where the real device is located (34a), although this location is not otherwise used. The same applies to the sign HEARING-AID (34b).







elevated compared to other fingerspelled words produced by the same signer (indicated in the gloss by ‘↑’). Also, the fingerspelled sequence was accompanied by a brow raise.

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(37) *Context: Which language did your brother learn?*

— br  
INDEX<sub>3</sub> a-s-l(↑) LEARN.  
‘He learned ASL.’

Taken together, the prosodic structure of signed utterances may be marked by manual and non-manual cues. Such cues may signal the sentence type (e.g. question intonation), may prosodically structure complex constructions, and may be used to highlight individual signs.

### Summary

Similar to words in spoken language, signs can be constructed of form elements which are meaningless in themselves but which have the capacity to distinguish meaning; that is, these form elements are **distinctive**, just as **phonemes** are in spoken language. The phonological building blocks that have been identified for sign languages – handshape, orientation, location, and movement – are referred to as **parameters**. Signs that only differ in one of these parameters are called **minimal pairs**; predictable variants of parameter values are called **allophones** or **phonetic variants**.

**Handshapes** can be described by two groups of **distinctive features**, one describing the **selected fingers** and the other one specifying the **position** of selected fingers. Frequently used, **unmarked** handshapes require a less complex description than infrequent, **marked** handshapes. The parameter **orientation** is often taken to include orientation of the palm and of the fingers, but a phonological description of signs profits from the notion of **relative orientation**. In all sign languages, roughly four major **location** categories have to be distinguished: head, upper body, non-dominant hand, and neutral space. Distinctive locations are areas rather than points. As for the movement parameter, **hand-internal movements** and **orientation changes** can combine with **path movements**. Hand-internal movements (handshape changes) are subject to the **selected finger constraint**. Apart from these manual building blocks, **non-manual aspects** can also play a role in the phonology of sign languages. At the lexical level, mouth movements, for instance, can play a distinctive role. We distinguish mouth movements that originate from spoken language, the so-called **mouthings**, and mouth movements that do not, the so-called **mouth gestures**. The specification of handshapes and movement in **two-handed signs** is constrained by the **Symmetry Condition** and the **Dominance Condition**.

Similar to spoken languages, form adjustments or **assimilations** are often observed when signs are produced consecutively; also **reduction** or **deletion** of phonological features can occur, as, for instance, deletion of the non-dominant (weak) hand in **weak drop**. In contrast to phonemes in spoken languages, form elements in sign language, such as handshapes that are used as classifiers and in **initialized signs**, are not always meaningless. In fact, all parameters bear **iconically** motivated elements.

Important components of **prosody** are **intonation** and stress. As for the former, in sign languages, **domain** and **boundary markers** commonly flag **intonational phrases**; when these markers are realized non-manually, they constitute a **suprasegmental** layer. **Stress** may be signalled by manual and non-manual cues.

### Test yourself



1. Which parts of the sign (groups of distinctive features) can be distinguished?
2. Give an example of a minimal pair in a sign language. In what respect does it differ from the English minimal pair *sell – tell*?
3. Handshapes are described in terms of finger selection and finger position. Why? Name a feature for both of them.
4. What groups of exceptional handshapes can be distinguished? What makes them exceptional?
5. What is the advantage of giving a relative description of orientation over an absolute description?

### Assignments

1. Describe the following handshapes with the help of the handshape features introduced in Section 11.2.



Which handshape is the least 'marked' and why is this?

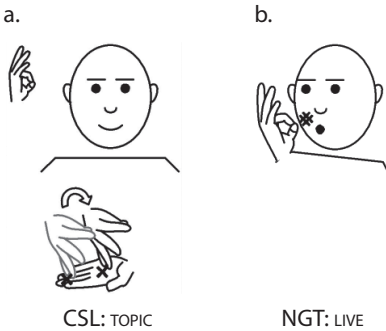
2. Argue that the -hand and the bent version of it (-hand) are/could be allophones. Make use of the information on pronunciation variance in Chapter 10.



3. Children that grow up with Brazilian Sign Language (Libras) acquire handshapes in the following order:



Which features are acquired here in the various stages?

4. Why is the phonological description of the handshape in the Chinese Sign Language sign for TOPIC (a) not identical to that of the handshape in the NGT sign LIVE (b)?



5. In the sign DELICIOUS from Khmer Sign Language, the handshape changes from -hand to -hand. What makes the hand-internal movement in this sign unusual? Why do you think it is still possible?



## References and further reading

When starting to analyze a (new) sign language, it is useful to look at Klima & Bellugi (1979, Chapter 2), which is still an excellent introduction to the phonology of sign languages. Brennan et al. (1984) contains an analysis of the form elements of BSL and gives a good though somewhat more complicated introduction. The first phonological analysis of a sign language by Stokoe (1960) is still a very accessible classic. A more recent overview of the phonology of sign languages can be found in Brentari (2012). Comprehensive analyses of the phonological systems of individual sign languages are available for ASL (Sandler 1989; Brentari 1998), NGT (Van der Kooij 2002), and VGT (Demey 2005). All of these studies contain a great deal of information, but cannot be read without some theoretical background knowledge. The studies by Van der Kooij and Demey offer a detailed discussion of the iconic motivation of phonological parameters. Nyst (2007) includes an investigation of the phonological system of AdaSL. The emergence of phonological structure in homesign and in a young sign language is described in Brentari et al. (2012) and Sandler et al. (2011), respectively.

For an analysis of handshapes, we refer the reader to Van der Hulst (1993, 1995), Sandler (1996a), Brentari (1998), and Van der Kooij (2002). The notion of orientation as discussed in this chapter originates in Crasborn & Van der Kooij (1997, 2003). The parameter movement is addressed by Sandler (1996b) and Hansen (2011). Concerning the function of the mouth, we refer to the studies on various sign languages compiled in Boyes Braem & Sutton-Spence (2001), as well as to Nadolske & Rosenstock (2007) on ASL, Bank (2014) on NGT, and Crasborn et al. (2008) for a comparison of NGT, BSL, and SSL. Limitations on two-handed signs were first described in Battison (1978); more recently, these limitations have been investigated for Kenyan Sign Language by Morgan & Mayberry (2012). More on the phonological representation of two-handed signs can be read in Sandler (1993) and Van der Hulst (1996). For references on assimilation and weak drop, see Chapter 10. Aspects of sign language prosody are discussed in Sandler (1999), Brentari & Crossley (2002), and Dachkovsky & Sandler (2009); for an overview, see Sandler (2012). Wilbur & Schick (1987) investigated the realization of stress in ASL.

The examples from Tlingit are derived from Ladefoged & Maddieson (1996). The CSL signs are taken from the standard lexicon of Yau (1977). Information on Saudi Arabian Sign Language was found in the study by Kozak & Tomita (2012). In the section on prosody, the Hindi example is from Zeshan (2004b), the IPSL example from Zeshan (2003b), the DGS example from Herrmann (2010), and the NGT example from Crasborn & van der Kooij (2013). Finally, the Libras acquisition data are from Karnopp's (1999) dissertation.