The Position of Unselected Fingers
Els van der Kooij

1. Introduction

The way fingers are positioned in the articulation of a sign — the handshape — is a distinctive formational unit in all sign languages studied so far. Phonological models that do not take handshape as an atomic, unanalyzable unit, often make a distinction between selected and unselected fingers (Mandel 1981). In Brentari et al. (1996) we claim that the position of unselected fingers (USF) is not specified underlyingly, and we assume that it is predictable from the position of the selected fingers. A potential problem for this claim is a set of handshapes that seem to be distinguished on the basis of unselected finger position only. In this article I investigate this problematic set and discuss the factors that may determine the position of the USF. I will show that next to articulation and perception, semantic motivation should be taken into account.

In Section 1 the handshape model (Brentari et al., 1996) that formed the basis of this investigation is explained. The distinction between selected and unselected fingers as proposed in Mandel (1981) is discussed in Section 3. The prediction the model makes with respect to the position of USF is the topic of Section 4. In this section a set of possible problematic handshapes is introduced. The procedure of the investigation will be explained in Section 5. The results of the investigation and possible explanations for the results are offered in Section 6. I conclude the paper with a summary and discussion of some implications.

2. The One-All model

Ever since Stokoe’s formational analysis of American Sign Language (Stokoe, Casterline, and Croneberg, 1976), handshape is distinguished as one of the formational parameters of signs. Handshape in Stokoe’s notation of formational elements, is taken as an atomic and static unit. Handshapes are labelled with names such as ‘A-hand’, ‘G-hand’, etc. In the One-All model we do not consider handshape to be an atomic label, but we argue, following other scholars (e.g.

One type of motivation for internal composition comes from the handinternal movements. In signs exhibiting a handinternal movement two elements tend to be unchanged; the set of fingers that execute the handinternal movement and the joints that are selected for flexion of the fingers into a certain configuration. The first tendency has been pointed out with respect to different domains.

(1) There is one set of selected fingers
   - per monomorphemic sign (Sandler, 1989)
   - per syllable (Brentari, 1990; Perlmutter, 1992)
   - per prosodic word (Brentari, to appear)

In Stokoe's model handinternal movement is represented with a movement diacritic that is added to the handshape label. These labels indicate for instance an opening or closing movement of the hand. In models that involve sequential structure — a timing tier — sequences of handshapes are specified to express handinternal movement (e.g. Liddell and Johnson, 1989; Sandler, 1989). In the representation of handinternal movements in sequential models any sequence of handshapes can occur: no sequence of handshapes is better than another. This implies that in sequential models constraints have to be formulated on the number and type of handshapes that can occur per sign. In the One-All model we rather cling to Stokoe's idea of 'one handshape per sign'. In case of a handinternal movement, a finger configuration feature changes, leaving the rest of the representation unaffected. In (2) the One over All model$^1$ (Brentari et al, 1996) is illustrated.

(2) One over All — handshape model

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Handshape
   Finger Selection
      SF2
         Side
            SF [Ulnar]
            Thumb [Select]
      SF 0
         [One]
         [All]
   Finger Configuration
      Flexion [ext [flex]]
      Aperture [open [close]]
      Spreading [spread [adduct] [cross]]
```
In this model finger selection is distinguished from finger configuration. Finger Configuration is specified for the selected fingers. Finger Selection specifies how many and which of the fingers are selected and Finger Configuration specifies the position of these fingers.

Finger Selection is the head of the representation, expressing the generalization that the set of selected fingers is stable throughout the sign. The head of Finger Selection dominates two features [One] and [All], which, in different combinations, can generate all possible sets of selected fingers. Thumb selection is only specified in signs in which the thumb bends, contacts or points towards a location. Side dominates only one feature — [Ulnar] — and is used to specify on which side of the hand the selected fingers are located.

Finger configuration is the dependent, and it dominates all the nodes that can express handshape changes. The ‘Flexion’-node specifies the knuckle(s) selected for the type of bending of the finger(s). The ‘Aperture’-node specifies the opening or closing relation between the thumb and the selected fingers. In the Spreading-node spreading between the fingers is specified.

It follows from (2) and the discussion above that in the One-All model only the position of the selected fingers is relevant. The position of the unselected fingers (USF) is not a phonological primitive and cannot be specified. Although USF position seems to be distinctive in a very limited set of cases (discussed in Section 4), we do not want to ‘pollute’ the set of features with a predictable feature.

In the following sections I will discuss phonetic and semantic factors that have to be considered if we want to maintain the claim that USF is not a phonological primitive. I will first discuss the distinction between selected and unselected fingers.

3. Selected vs. unselected fingers — diagnostics

The idea that Mandel (1981) put forward in his thesis on the phonotactics of American Sign Language is that selected fingers are the fingers that are in focus; they are the foregrounded or prominent fingers. This idea materializes in the following way.

The selected fingers can move (i.e. exhibit the handinternal movement), point (and come first in a path movement), and make contact with a specified location, whereas the unselected fingers cannot do any of these things (Mandel, 1981, p. 83). Although this seems to be a valid generalization for NGT too, in (Klima and Bellugi, 1979) it is suggested that Chinese Sign Language has a class of signs that seem to exhibit focus of the unselected fingers. For instance in the sign
TOPIC (illustrated in 3) the USF of an F-hand contact the palm of the other hand repeatedly, moving in the direction of the wrist. According to Klima and Bellugi this would be an ungrammatical sign in ASL.  

On the position of the selected fingers Mandel notes that selected fingers may be in any position, except in closed position (p.83). Unselected fingers according to Mandel are always in uniform position; they may only be either all extended or all closed.

Regarding the criteria mentioned above, typically extended fingers are the selected fingers. It is assumed in the One-All model that the default position of selected fingers is extended. We cannot, however, equate extension with selection because there are handshapes like F and open 8 (illustrated in 4) in which the unselected fingers are extended, whereas the other (i.e. selected) fingers exhibit the handinternal movement, come first in the movement and make contact.

Neither can we equate flexed or closed fingers with unselected-ness. If we assume that the default position of selected fingers is extended, it would be straightforward to say that in handshapes with no fingers extended — fists — there are no selected fingers. In handshape changes containing a fist, however, we want to maintain that, at least phonologically, the set of selected fingers does...
not change. For instance in the ASL sign THROW — a fist opening to a hand with index and middle finger extended — we claim that the index and middle finger are also selected in the initial fist. Phonetic evidence for this claim comes from anticipation. The bent-in knuckles of the index and middle finger of the initial handshape (a fist) of THROW stick out a little in comparison to the ring finger and the pinky. We conclude that, phonetically at least, selected fingers can be in closed position.

On the grammatical function of the two sets of fingers Mandel notes that only the set of selected fingers is relevant to (morpho-)phonology. It is not clear whether this claim can be maintained, because in Section 6 some meaning aspects will be discussed that can be associated to the USF, giving the USF morphemic status.

Summarizing we can say that Finger Selection cannot be related directly to extendedness, and is thus a notion that has no unique phonetic interpretation. Finger Selection tends to be stable within the sign (or some prosodic domain) and Finger Configuration features are specified for the selected fingers. Within the sets of both selected and unselected fingers, the fingers have a uniform position. USF can only be all extended or all flexed. According to Mandel USF are not relevant for morphophonology.

4. Predictions and problems

In the discussion of the handshape model in Section 2, I indicated that unselected finger position cannot be specified phonologically. This implies that the position of the unselected fingers is redundant information. I will try to show that this claim can be maintained only if we allow for several types of information to be predictive: factors of perception, articulation and meaning.

Following Sandler (1989) a general redundancy rule on the position of the unselected fingers is given in (5).

\[(5)\] If the selected fingers are extended, the unselected fingers are folded or restrained by the thumb.

It seems reasonable to ground this redundancy rule in perception theory. The occurrence of an element of a certain dimension that fortifies the effect of an element of another dimension goes by the name of ‘enhancement’ in the phonetic literature (cf. Ohala, 1995; Stevens and Keyser, 1989). The redundancy rule in (5) is a case of ‘enhancement’, as the selected and unselected fingers are realized simultaneously. In order for the selected fingers to be optimally perceived, the unselected fingers fold to ‘hide away’.
A possible problem for the assumption that unselected fingers is not a phonological primitive in the One-All model, are the pairs of handshapes illustrated in (6). These handshapes would all have the feature [One] as their selected finger specification. The dynamic handshapes in b. have a branching Aperture node; from [close] to [open] or from [open] to [close]. In these pairs USF position is potentially distinctive, as they seem to be distinguished by USF position only.

(6) “Handshapes” with the index finger selected: [One]-hands

a. **Static:**

b. **Dynamic:**

One reason for not taking USF as a distinctive feature, is that no minimal pairs were found in NGT on the basis of USF position in [One]-hands. Later we will see that we have to be more specific on this claim; it seems that ‘meaning distinctive’ has to be distinguished from ‘meaning bearing’. Unselected finger position seems to be meaning distinctive only as far as it is meaning bearing.

Another important reason for not specifying USF position underlyingly is that in the set of hands in (6), variation in unselected finger position can be observed frequently. Some signs typically made with extended USF can have realizations with folded USF and vice versa.5 For signs containing the handshapes in (6), variation of the USF position is also observed for ASL (Ann, 1990).
5. Procedure and results

In order to find out what could determine the position of USF in [One]-hands, a collection of signs was made that involved one of the handshapes illustrated in (6). I consulted the SignPhon-database, the NSDSK Dictionary CD-ROMs of NGT, several paper word lists, and I also asked informants to think of signs involving the [One]-hands. This resulted in a collection of 99 signs.

After recording all these signs, I changed the USF-position of the original signs: signs containing a handshape with extended unselected fingers received folded unselected fingers in their modified form and vice versa. I then offered the signs with modified USF to two informants, who were asked to judge the acceptability and meaning of the modified sign.

It was quite remarkable that only 14 signs allowed for a change in the position of the unselected fingers without a change in meaning, that is, only in 14 signs the two positions of the unselected fingers were in free variation. This small number is not what we would expect from the One-All model where no formal slot was created for the position of the unselected fingers. Free variation of the USF position is to be expected in all cases, or at least in more cases than observed.

In Section 6 the results of the judgements on the meaning of the modified signs are given. Firstly, however, I will discuss the distribution of USF position in the original signs and hypothesize phonetic explanations for the tendencies that I found.

About half of the original signs contained a dynamic handshape (see 6b). Most of the dynamic signs were closing, only seven signs had an opening movement. Of the static handshapes (see 6a) only 5 signs had folded USF.

<table>
<thead>
<tr>
<th>USF</th>
<th>static (51)</th>
<th>dynamic (48)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>opening (7)</td>
<td>closing (41)</td>
</tr>
<tr>
<td>extended</td>
<td>46 (90%)</td>
<td>2 (28%)</td>
</tr>
<tr>
<td>folded</td>
<td>5 (10%)</td>
<td>5 (72%)</td>
</tr>
</tbody>
</table>

If we compare the frequencies of USF-positions in static and dynamic handshapes the following tendencies can be detected.

- Static [One]-hands (6a) prefer extended unselected fingers (90 % of the static signs)
- Dynamic [One]-hands (6b) prefer folded unselected fingers (67% of
The first tendency of extended USF in static handshape can be related to the idea of enhancement of the cotemporal contrast between the SF and the USF, cf. the redundancy rule in (5). If the selected fingers are folded, an extended position of the unselected fingers gives an optimal perceptual contrast.

However, the preferred folded USF position in dynamic handshapes cannot be explained by referring to perceptual contrast. In principle we do not know whether the initial or the final handshape in a handshape change (cf. 6b.) has the optimal contrast between selected and unselected fingers. In case of dynamic handshapes production factors seem to be relevant. Although it is hard to find straightforward biomechanic or physiological evidence, the informants commented on the modified dynamic signs that had extended in stead of folded USF, that the movement in these signs 'felt heavy'.

Clearly, more work needs to be done on this topic. For now I will hypothesize that folded USF are preferred in dynamic hands for production reasons.

Summarizing, I hypothesized that perceptual contrast between selected and unselected fingers motivate the high frequency of extended USF in static handshapes and ease of articulation motivate folded USF in dynamic handshapes.

But even if more independent evidence would enforce the hypotheses, we would still be left with the question how to account for the 10% folded USF in static handshapes and the 33% extended USF in dynamic handshapes. In the next section I will show that these exceptions can be accounted for by referring to semantic aspects of USF.

6. Semantic aspects of USF

From the judgements of the informants on acceptability of the modified signs, clear patterns of meaning expressed by the USF position could be extracted. I will firstly illustrate these meaning components. Then I will show to what extent they can account for the folded USF we find in static signs and for the extended USF we find in dynamic signs. At the end of this section I will discuss two more factors that can determine USF position.

Both in static and dynamic signs extended USF position was associated to one of the following meaning aspects.

If the hand refers to the way an imaginary object is handled, extended USF indicate that the object is handled in a delicate way. It is implied that the imaginary object that is handled in this way is thin.
THE POSITION OF UNSELECTED Fingers

Extended USF refer to the handling of thin delicate objects
VINDEN ‘to find’
KIEZEN ‘to choose’
ONDERBROEK ‘underpants’
SOK ‘socks’
KALENDER ‘calendar’
TAFELLAKEN ‘table cloth’
PLUKKEN ‘to pick (flowers)’

If a sign in which extended USF are used to refer to the handling of a thin, delicate object is allowed for, the implication of a thin delicate object is lost in the modified form (i.e. with the folded USF). For instance if the sign KALENDER ‘calendar’ — which mimics flipping the pages of a calendar — is made with folded USF, thick paper is implied.

A second meaning aspect of extended USF can be distinguished. Here the extended fingers are related to size, or to amount of components or elements. Large amounts or big size is associated to extended USF and small amounts or size is expressed by folded USF. In the examples in (10), all signs allowed for a modified form. When the modified form of sign is referred to, this is indicated between brackets, right after the gloss (e.g. GLOSS (mod.)).

(10) a. Extended USF is associated to a larger size or amount
STRIK ‘knot’ big ribbon
LIPPESTIFT(mod.) ‘lipstick’ a thick layer of lipstick
OOGSCHADUW(mod.) ‘eye shadow’ a thick layer of eye shadow
DOEK ‘cloth’ large cloth

b. Folded USF refers to a smaller size or amount
STRIK(mod.) small ribbon
LIPPESTIFT a normal amount of lipstick
OOGSCHADUW normal eye shadow
DOEK(mod.) small cloth

Large amount of components or smaller elements are expressed by extended USF in the following signs:
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(11)

POES 'cat' referring to whiskers
MASKER(mod.) 'mask' an elaborated, decorated party mask
STERREN 'stars' reference to beams of light
Signs referring to (parts of) plants:
STRO 'straw'
Palm 'palm tree'
BLAUW DRUIFJE 'bluebell'
MADELIEFJE 'daisy'
ROOS 'rose'
HALM 'stalk', 'blade'
RIET 'reed'
AAR 'ear'

It was remarkable that some signs with folded USF in their original form, were rejected when USF were extended because the meaning aspect expressed by the extended USF — large amounts of — was incompatible with the core meaning of the sign. Examples are WEINIG 'little, a bit' and VERNEDEREN 'to humiliate, to make small', both made with a closing handinternal movement.

Next to these meaning associations of USF position, two considerations related to the perception of signs are relevant. In Section 5 I related the frequency tendencies of extended and folded USF in static and dynamic signs to enhancement of cotemporal contrast and ease of production. The disfavoured extended USF in dynamic signs can all be accounted for by the semantic motivation of extended USF discussed above. We still need some explanation for the 10% of folded USF in static signs.

It turned out that all static signs with folded USF were made on or near the face. Examples are LIPSTICK, MASCARA, EYE SHADOW. But not only static signs made near or on the face had folded USF. Also dynamic signs preferred folded USF in this location. This observation can be related to a historical development of signs observed for ASL (Frishberg, 1975): signs made on the head tend to move from the centre to the periphery of the face in order not to obscure the face, as the face often provides grammatical information. It is clear that folded USF obscure the face less than extended USF do.

A nice illustration of this tendency is the fact that the sign IK-PIK-HET-NIET 'I won't take this (from you)' was made near the head by one informant and in space in front of the body by the other informant. The informant that used the head as the location of the sign, did not allow for a modified form with extended USF. The informant that made the sign in space, however, did allow for a modified form.

A final tendency concerns signs in which the (closing) One-hand outlines a virtual object. The effect of outlining an imaginary object is achieved better if
index finger and thumb are the only extended fingers. Extended unselected fingers would obscure the ‘drawing’ of a virtual surface made by the selected fingers. Examples are: JAPAN, VLEES ‘meat’, CHEQUE, EYELINER, GLIMLACH ‘smile’ (opening movement), VRIJGEZEL ‘bachelor’, WEGGAAN/UITGAAN ‘to go away/to go out’.

The sign STERREN ‘stars’ is remarkable because it is ‘counter-phonetic’ in two ways. Remember that in Section 5, I claimed that the tendencies could be related to factors of perception and of production. In dynamic handshapes folded USF are preferred for production reasons. And moreover, if we assume that the second position in a handshape change is more prominent than the first position we would expect the USF to be folded in an opening movement from a perception point of view. Although the original sign was made with extended USF, STERREN does have an articulation with folded USF, which would be preferred phonetically. In the articulation with folded USF no reference is made to the rays of light.

This example brings us to the question how the factors that are claimed to determine the position of USF are related. In order to find out how semantic motivation is ranked with respect to phonetic factors, I selected from the 99 signs all signs that were completely arbitrary, that is, where I could not find any motivated form-meaning relation. None of these signs allowed for a modified form, and, more interestingly, they all complied with the phonetic tendencies. This leads me to conclude that the semantic motivation — if present — has more force than phonetic grounding (which is what we — intuitively — would expect to be the case of course).

7. Summary and concluding remarks

In (12) a summary is given of factors that can determine the position of USF in One-hands. Next to production and perception, association of a semantic aspect to the USF-position is demonstrated to be relevant.

(12) Factors in USF position

<table>
<thead>
<tr>
<th>USF</th>
<th>perception</th>
<th>production</th>
<th>semantics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>static</td>
<td>open</td>
<td>close</td>
</tr>
<tr>
<td>extend</td>
<td>v</td>
<td>*</td>
<td>v</td>
</tr>
<tr>
<td>folded</td>
<td>*</td>
<td>v</td>
<td>v</td>
</tr>
</tbody>
</table>

v = favourable position
* = disfavourable position
Mandel's claim that only the selected fingers are relevant for morphophonology is shown problematic as far as he means that only selected fingers can be distinctive. I have shown that meaning aspects can be associated to the position of USF. The USF position can attribute to the meaning of the sign. But does the fact that meaning can be associated to USF position imply that it is phonological? For now I want to answer this question negatively, because USF position is distinctive only as far as it is meaning bearing. Moreover, if it is not meaning bearing, it is phonetically predictable. My proposal is to categorize USF position as a morphophonetic feature. Further investigations are needed on the question how this type of features would fit in (or coexist with) a grammatical model.

Acknowledgments

I would like to thank Karin Kok and Annie Ravensbergen for their enthusiastic cooperation in this project. I am also indebted to Onno Crasborn, Harry van der Hulst and Jan Kooij and an anonymous reviewer for useful comments on earlier versions of the manuscript.

Notes

1. Henceforth the 'One-All model'
2. In general the position of the thumb is predictable from the information specified in the Finger Selection node (e.g. [one] implies that the thumb restrains the nonselected fingers) and the Finger Configuration node (e.g. an aperture specification implies a position of the thumb that is opposed to the selected fingers)
3. Although the strong hand in this sign looks the same as an ASL F-hand (see 4), we might also analyze it as a hand with the pinky, ring and middle finger selected, and the index finger unselected (represented as [All:One], [ulnar] in the One-All model). The index finger is restrained by the thumb in these CSL signs, as we would expect of unselected fingers. Unfortunately no primary data on CSL are available to me at this point.
4. I refer to the flexion or closing of the unselected fingers as 'folded' in this article to distinguish it from the notions of [flex] and [closed] that can be specified over the selected fingers only.
5. Based on non-systematic observations.
6. The informants were asked to answer the following questions: Is this the same sign as the original sign? Does this sign have the same meaning as the original sign? If not, what does the sign mean?
7. According to one of the informants, or both. If only one of the informants allowed for a change in position of the USF without a change in meaning, the other informant did not
allow for a change in position, so the question whether the meaning of the sign changed was irrelevant.

8. Probably there is a relation with the position of the wrist here (the so-called wrist-knuckle connection (Mandel, 1979). It is harder to fold the unselected fingers when the wrist is flexed.

9. A closing One-hand moving away from the body, palm facing forward.

10. Two One-hands with extended USF open (release of the index finger) repeatedly in an alternating way, the palm is oriented front-upwards

11. Preferably this selection would have been made by the informants. I did however exclude all signs that I had any doubts on. The following signs were considered: LEUK ‘nice’, PER ONGELUK ‘accidental’, TOEVALLIG ‘by accident’, BEKWAAM ‘skilled’, TERUG ‘back’, BELANGRIJK ‘important’, NETJES ‘tidy’, PLEZIER ‘fun’.

12. It was suggested by Marc van Oostendorp that the weight of semantic motivation might be less if we would look at the same signs in running signing. In his analysis of stylistic reversion faithfulness constraints are higher ranked in higher registers than in less formal registers, resulting in less reduction and insertion of formal material (van Oostendorp, 1997). This analysis could also be useful in comparing signs in isolation as used in this investigation vs. the same signs in current signing. Semantic motivation (as form-meaning faithfulness) is expected to play a less prominent role in current signing at the cost of phonetic factors.

13. If we assume that the final position of a handinternal movement is more prominent for enhancement of cotemporal contrast than the initial position.

References


