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# On the other hand☆

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**Abstract**

Signs can be made with one hand or two and there are minimal pairs where two signs have the same handshape and movement, but differ in being one- or two-handed. The fact that two-handed signs exist has drawn the attention of many sign language researchers. Perhaps this is in part because the articulation of spoken languages does not have an equivalent to something like 'two identical articulators'. Another reason is no doubt that not all two-handed signs make use of both hands in the same way. The question of exactly how to formally represent the various types has generated a number of positions. In this article, I take side with those who have argued for a uniform (i.e. isotypic) representation of the weak hand in *all* two-handed signs. This implies that the 'extra' hand is not represented as a feature that annotates structures that are otherwise used for one-handed signs. The fundamental motivation behind this proposal is that asymmetries between properties of the two hands follow the pattern of so-called head-dependent asymmetries (HDAs), as discussed in Dresher and van der Hulst (1995, forthc. a,b), but additional arguments are also presented.

## 1. Introduction

### *1.1. The central claim*

Signs can be made with one hand or two. Whereas the choice of the hand in one-handed signs is never distinctive, (near-)minimal pairs can be found that differ only in being one or two-handed. Els van der Kooij (p.c.) suggested the following examples to me from Sign Language of the Netherlands (SNL): 'to wait' vs. 'child', 'to live' vs. 'to know', 'to support' vs. 'difficult', 'to choose vs. blanket':

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(1) *A minimal pair involving one- or two-handedness*

(a) KIEZEN 'to choose'

(b) LAKEN 'blanket'

Following Padden and Perlmutter (1987) I use the terms *strong* and *weak* hand; the preference hand will normally be the strong hand, but this is not a necessity. Various types of two-handed signs have been distinguished. The criterion for distinguishing these types is the degree to which the specifications of the weak hand differ from those of the strong hand. A discussion of the various types that have been identified in the literature (mainly on ASL) is given in section 2.

The central question that this article addresses is how to formally represent the various types of two-handed signs. A number of different answers to this question have been provided. In this article, I take side with those who have argued in favour of a uniform (i.e. isotypic) representation of the weak hand in *all* two-handed signs. I discuss various other positions in section 3.

The motivation for the isotypic view is found in well-attested asymmetries between properties of the strong and the weak hand. I will show that the nature of these asymmetries is very reminiscent of so-called head-dependent asymmetries that hold between units in phonological representations for spoken languages. In section 4 I offer a discussion of the recurrent properties of these head-dependent asymmetries, summarizing some of the findings reported in Dresher and van der Hulst (1995, forthc.).

Section 5 briefly introduces the model of sign structure that I have argued for elsewhere (van der Hulst 1993, forthc. a,b). The reader who is unfamiliar with sign phonology terminology might wish to skip ahead to this section, before reading sections 2–4, or consult the introductory article in this issue (especially section 3). Section 6 offers the structure that I wish to propose for two-handed signs. I conclude, in section 7, with a reanalysis of the data that proponents of the other views have used to support their positions.

## 2. Two types of two-handed signs

### *2.1. A descriptive typology*

The most basic distinction among two-handed signs is that between *balanced* and *unbalanced* signs. In the former, the configuration of the weak hand (its shape and orientation) is identical to that of the strong hand. The local (or hand-internal) movement (if present) and/or the global (or path) movement of the weak hand are also identical to that of the strong hand. The weak hand, in short, behaves like a mirror image of the strong hand as if a mirror is placed in a 90° angle on the midsaggital line on the body (cf. (2b)). Included in the class of balanced signs are those in which the movement of both hands is not in phase, but rather, what is usually called, alternating; cf. (2a).

(2) *An alternating and non-alternating balanced sign*

(a) FIETS 'bicycle'

(b) OCHTEND 'morning'

In unbalanced signs, the weak hand has no (independent; cf. below) movement (neither local nor global), whereas the strong hand has. The configuration of both hands can, but need not be the same:

(3) *Unbalanced signs with one and two handshapes*

(a) GROEN 'green'

(b) SINAASAPPEL 'orange'

Of crucial importance to the central claim of this article is the fact that the choice of handshape for the weak hand is severely limited in unbalanced signs. Several researchers (e.g. Kegl and Wilbur, 1976; Battison, 1978; Mandel, 1981; Brentari, 1990; Sandler, 1995) refer to the set of possible handshapes as the 'unmarked' handshapes (cf. section 2.3). Unbalanced signs in which the handshapes (not necessarily the orientation) are identical have been singled out as a special type in Battison (1978), cf. (3a). In this type, the choice of handshape for the weak hand is somewhat less limited. Battison (1978) refers to balanced signs (both alternating and non-alternating) as type I and to the unbalanced signs in (3) as type II and III, respectively.

In Battison (1978) and Mandel (1981) various constraints have been formulated that govern the well-formedness of two-handed signs, which I will not spell out in order to avoid getting caught in a comparative study of these careful but sometimes opaque statements. It seems to me that the basic division is clear enough. In Stokoe (1960, 1978) and subsequent literature type I has been opposed to type II and III, the idea being that in the latter types the non-preference hand can be seen as a 'place of articulation'. Sandler (1989, 1993) offers a formal elaboration of this view and provides empirical support for the distinction between type I (*echo articulator signs*) and type II/III (*h2-place signs*). The terms *balanced* and *unbalanced* were adopted in van der Hulst (1993).[1]

Frischberg (1993) recognizes a further type, thus making a four-way distinction:

| (4) | *balanced* | *unbalanced* |
|---|---|---|
| one handshape | type I (2) | type II (3a) |
| two handshapes | type IV | type III (3b) |

[1] These two types have also been referred to as *two-handed* and *double-handed*.

Type IV is rather rare, however, and in fact excluded by the constraints that Battison and Mandel proposed. An example is *ASL* TOTAL COMMUNICATION. In such cases, the two hands both show the same movement (as in type I), but they have different handshapes. Such signs are typically consciously created or enter the languages as borrowings from sign *systems*. They are 'unnatural' and over time tend to change to type I (in which case the handshapes become the same), which is what happened to *LIS* WEEK (cf. Radutzky, 1990). It is also possible, presumably, that they change into a type II sign (if the weak hand loses the movement).[2]

In unbalanced signs, then, the weak hand cannot move independently. This does not imply that it cannot move. A special case of unbalanced type I signs arises when the weak hand has contact with the moving strong hand and therefore *must* move along (*ASL* SHOW, EXAMPLE). One could, but would not like to analyze these cases as balanced type IV signs. Such an analysis would leave unexplained why cases of this type must involve contact.

For all types discussed so far, I assume that the two hands contribute to the representation of a single morpheme. There are also two-handed signs that involve the weak hand as a *classifier*, e.g. JUMP-OVER-A-FENCE, in which the weak hand represents a fence while the strong hand makes a jumping movement over it. Despite the different morphological status of such cases, their phonology tends to be similar to that of unbalanced signs in that the classifier typically has an unmarked handshape and is held still. Related to (or, depending on use of terminology, overlapping with) cases that involve a classifier are those that Battison (1974) terms *coarticulated signs*. In this case the two hands execute two different signs simultaneously. Battison observes that one hand is typically limited to a holding position and that it usually occurs with an unmarked handshape. He adds: "thus it is possible to encode two different signs with the two hands, but only when one hand has something relatively simple to express" (p. 9). It is perhaps to be expected that a distinction between signs involving a weak hand classifier and coarticulated signs is not always easy to make. Coarticulated signs in which both hands have a relatively high degree of semantic independence can, when co-occurring frequently, presumably develop into signs that involve a classifier and eventually into unbalanced signs. In many unbalanced signs it is indeed not difficult to view the weak hand as a classifier, rather than as a pure formational unit without meaning properties of its own (Els van der Kooij, pc.).

### *2.2. Balanced signs in more detail*

My characterization of balanced signs as involving mirroring (modulo alternation), excludes a class that is distinguished in the phonetic notation system *HamNoSys* (Prillwitz et al., 1989).

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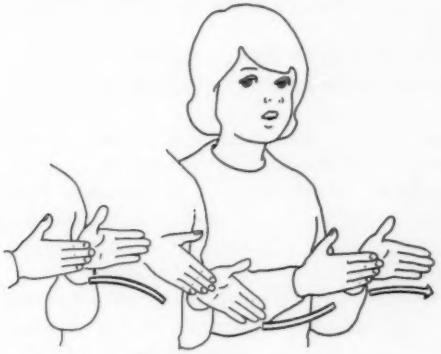
[2] Padden and Perlmutter (1987) also discuss two-handed signs like *ASL* JESUS, CRUCIFY, GLOVES. What is special about these cases is that they are two-handed in two ways. Firstly, they are normal unbalanced signs and, secondly, they are 'two-handed' in the sense that the (unbalanced) sign is performed twice with switch of preference hand. The second sense of two-handedness is what makes these signs special, but that property is not relevant in this context.

HamNoSys calls this class *parallel* two-handed signs and I will refer to them as *shadow signs*. In shadow signs, movements are not mirror images (still assuming that the mirror separates the two symmetrical parts of the body). In exact mirror signs the strong and the weak hand are like the practising ballet dancer and her image in the mirror, whereas in shadow signs both hands perform their action 'at the same side of the mirror' (put differently: there is no mirror) like a dancing couple, and the weak hand follows (or shadows) the lead of the strong hand. In (5a) below I give two examples of shadow signs.

(5) *A shadow sign*

(a) VERKEER 'traffic'



(b) BOOT 'boat'

Shadow signs share a property with alternating signs. In both cases exact mirroring is 'disturbed'. In alternating signs the mirroring is disturbed in a *temporal* fashion (i.e. the weak hand comes behind in time), whereas in shadow signs we see a *spatial* disruption (i.e. the weak hand acts in parallel rather than symmetrically).

### *2.3. Unbalanced signs in more detail*

In balanced signs both hands are active. In unbalanced signs the strong hand is *active* and the weak hand is *passive*. The passive hand is kept still (unless it contacts the strong hand). Both hands can have independent orientation properties and their handshape may, but need not differ. If the handshapes do not differ we have a type II sign; cf. (4). If the handshapes differ, only a small number of handshapes are possible for the weak hand (or at least among the most frequent cases):

(6) (a) ASL: A, S, B, 5, G, C, O (Battison, 1978)
(b) SLN: S, B, 5, C (Harder and Schermer, 1986)

The details of these lists are not crucial at this point, given that the notion 'most frequent' is necessarily fuzzy. It is clear, however, that there is a strong tendency for unbalanced signs to use handshapes that may be considered to be unmarked. According to Battison (1974: 6–7) a number of criteria can be used to classify handshape as unmarked:

(7) (a) they are maximally distinct both in articulatory and perceptual terms,
(b) they have a high frequency of occurrence in a wide variety of contexts,
(c) they are found in all sign languages studied to date,
(d) they are among the first handshapes acquired by children,
(e) they are the outcome of substitution errors,
(f) they are capable of contacting other body parts in a greater variety of ways.

Kegl and Wilbur (1976), Mandel (1981) and Brentari (1990), among others, also discuss markedness criteria for handshapes. Sandler (1995) offers a broad discussion of the markedness issue and proposes a featural characterization of unmarked shapes in terms of unary features and dependency relations which aims at characterizing the unmarked handshapes as relatively simple compared to other handshapes. In her view the least marked set comprises G, 5, and A, presumably forming perceptual extremes (cf. Klima and Bellugi, 1979: ch. 7).

Unbalanced signs are normally produced in neutral space and I will assume that this is a generalization that must be captured. There are, however, cases of unbalanced *simple* signs in which both hands are positioned at, or make contact with, a major body location; see Brentari (in prep.) for a discussion of potential examples of this.

## 3. Different views on the representation of two-handed signs

In this section I will briefly discuss the three positions that have been defended in the literature on two-handed signs. I also refer to van der Hulst and Sandler (1994) for a comparative discussion.

### *3.1. The no-weak-hand theory*

Perlmutter (1991, 1994) takes the position that there is no separate weak hand constituent in either balanced or unbalanced signs.[3] The representation of both types of signs involves extra features. For balanced signs, the relevant feature would simply be something like [two-handed], specified somewhere in the structure of representations that would otherwise be for one-handed signs. For unbalanced signs the weak hand is treated as the place of articulation and coded in terms of a place feature [weak hand] (an insight already expressed by Stokoe, 1960; cf. Sandler, 1993).

This position makes the correct prediction (as Perlmutter points out) that unbalanced signs must be articulated in neutral space, assuming that a sign can have only one place specification (which is [weak hand] in unbalanced signs) and that neutral space is taken to be the default location.

The motivation that Perlmutter gives is based in part on a simplicity argument (there is no need for anything more complicated than features) and in part on what I will call the analogy argument: spoken language phonology does not have anything resembling two identical articulators, so we expect things to be analogous in sign language.

In section 7.1 I will present my objections to Perlmutter's view (especially the part that denies an isotypic weak hand representation for unbalanced signs) and evaluate the force of the analogy argument.

### *3.2. The weak-hand-sometimes theory*

Sandler (1989, 1993) makes a more fundamental distinction between balanced and unbalanced signs than Perlmutter. In her model, balanced signs have two isotypic 'hand' nodes. The weak hand node, however, is left unspecified and thus becomes a copy of the strong hand. Unbalanced signs have just one hand node. As in the previous position, the weak hand is taken to function as the place in this case, i.e. the weak hand is literally specified under the Place node and nowhere else. To make such a fundamental distinction between balanced and unbalanced signs, is supported, according to Sandler, by two processes that affect the weak hand in only one of the two types.

She first addresses a process called *Weak Drop* (WD), which involves the phenomenon that two-handed signs may be realized with the strong hand only (cf. Bat-

[3] The discussion of his position must also be limited because it is based on an oral presentation plus accompanying handout, and personal communication.

tison (1974) and Padden and Perlmutter (1987) for a discussion of this process). If the weak hand in unbalanced and balanced signs has a totally different structural position we expect a different behaviour of the weak hand in both types and indeed WD applies to balanced signs only.

I agree with Sandler that a representational difference between the two types must be made to explain the failure of WD to apply to the weak hand in unbalanced signs, but this does not imply that the representation of the weak hand must be different in the way suggested by Sandler. In section 7.2 I will show that an isotypic approach using underspecification also provides a principled basis for the asymmetrical behaviour of *WD*. The approach that I will suggest has the additional advantage of explaining why WD, in fact, fails to apply to certain types of balanced signs.

The second process considered by Sandler involves what I will call here *Weak Hand Spreading* (WHS). The phenomenon is that a one-handed sign, when preceding a two-handed unbalanced sign (in a compound), may be realized with the weak hand of the upcoming signs already present. This weak hand *anticipation* is discussed in Liddell and Johnson (1989). Sandler (1989, 1993) proposes a spreading analysis which involves regressive spreading of the place feature of the upcoming sign. The crucial question, of course, is whether WHS only affects unbalanced signs and Sandler claims that this is indeed the case. Again we might say that the asymmetrical behaviour of this process justifies a representational distinction between the two types, but in this case too it could be argued that another kind of difference could do the job as well. In section 7.2 I will take another perspective, however, and argue that regressive assimilation applies to balanced signs as well, so that, in fact, there is no asymmetry between the weak hand's behaviour in both types of signs. The key to this argument is the process which I will call *Two-hand Copy* (also discussed in Sandler, 1993). This process causes a one-handed sign to become (balanced) two-handed if the next sign in the compound is balanced two-handed. I will demonstrate that this phenomenon is formally identical to WHS.

In support of Sandler (1989) and arguing against Brentari and Goldsmith (1993), Blevins (1993) also defends the view that the weak hand is represented in balanced signs only. I draw special attention to her model because she explicitly proposes to represent the weak hand as a *dependent* of the strong hand.

In the next section, I will discuss the third position, the weak-hand-always theory. But first let us realize that another version of the weak-hand-sometimes theory would be one in which the weak hand is represented in unbalanced signs only. This is not a priori an untenable position. In balanced signs, the weak hand has no independent properties and is represented as an empty node in the structure in Sandler's theory. I could imagine that some might take this to be hardly different from specifying a feature like [two-handed]. On the other hand, in unbalanced signs, the weak hand typically has independent properties (such as its own orientation and handshape features), which seems to call for representing it more fully than through a place feature. Still, I am not aware of a defence of this approach in the literature.

### 3.3. The weak-hand-always theory

The claim that both hands are represented as isotypic units goes back to Stokoe (1960) and occurs in work of Liddell and Johnson (e.g. 1989). Brentari (1990) stands in this tradition, but she furthermore proposes to represent the weak hand as a syllable 'coda', which is essentially a *dependent* constituent. Brentari (in prep.) provides further support for the dependency perspective. My own proposal, arrived at on partially different grounds, is very similar to that elaborated in Brentari (in prep.), if we ignore minor differences in implementation.[4]

In section 6 I will discuss this position in more detail. Before that I will make a few remarks about *head-dependent asymmetries* (section 4) and the model for sign structure that I have proposed elsewhere (section 5).

## 4. Head-dependent asymmetries

In most linguistic theories it is assumed that the compositional structure that underlies the morpho-syntactic and phonological organization of utterances can be properly represented in the form of *tree structures*. Many theories make the additional assumption that non-atomic (or non-terminal) constituent nodes are labelled in a way that is determined by one of their daughters. This daughter is called the *head*, while other daughters are called non-heads or *dependents*. A further claim limits the number of dependents to *one* or, if more than one dependent is admitted, adjoins these at different levels so that the non-dependent daughter is the head of a number of inclusive constituents. The limitation to *binary headed trees* is accepted in this article (cf. (8)).

Head-dependent asymmetries play an important role in various approaches to syntax. In generative phonology scattered references to the notions 'head' and 'dependent' have become more frequent over the years, but a unifying picture has not emerged, either with respect to the use of these notions at various levels of phonological representation (i.e. segments, syllables, feet and so on), or with respect to their use in both morpho-syntax and phonology. The only attempt to systematically investigate the role of head-dependent relations in phonology (and morpho-syntax) is found in the work of John Anderson. The approach to phonology that emerged from his works, known as Dependency Phonology (Anderson and Ewen, 1987), has inspired various more recent models such as Government-based Phonology (Kaye et al., 1985, 1990), Radical CV Phonology (van der Hulst, 1994, 1995) and several other approaches (cf. Ewen, 1995, for an overview).

Dresher and van der Hulst (1995, forthc.) investigate head-dependent relations in phonology, proposing a typology of such relations. A distinction they make is that between 'α–α' and 'α–β' relations. The former involves a relation between two *iso-*

[4] In this article I will not discuss the differences between my proposal and that of Brentari (1990, in prep.) in order not to capitalize on certain potential consequences of small unclarities in the interpretations of our formalisms. For the present purpose I regard our models as essentially equivalent.

*typic* constituents, for example between two place features forming a complex articulation or two syllables forming a foot, whereas the latter relates two non-isotypic constituents, such as the manner and place gesture forming a segment, or a nucleus and coda forming a rhyme.

The asymmetries between heads and dependents that can be detected for both types of relations have somewhat different properties and Dresher and van der Hulst's work is no more than a first attempt to identify the nature of these properties. An important asymmetry in case of α–α dependency involves *complexity*: the complexity of the dependent can never exceed that of the head and is typically severely reduced. A clear example of this involves the fact that dependent syllables often must be less complex than head syllables with respect to the number of vowel contrasts that may occur in their nuclei. α–β asymmetries are less well understood. What appears to be important here is that the head itself is atomic and thus *not* complex in principle, whereas the dependents need not be atomic. α–β relations also typically allow adjunctions at different levels (leading to a distinction between complement (ß) and specifier (τ):

(8) (a)


(b)

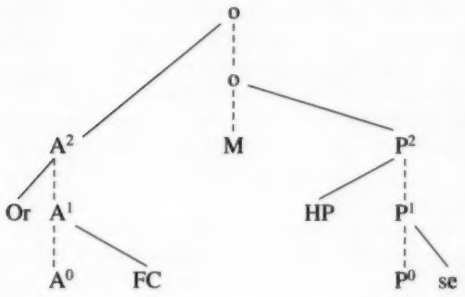

Within the analysis of spoken languages it is now accepted (especially in dependency quarters, but perhaps more generally as well) that the structures in (8) and their associated properties cut through different modules of the grammar, even though many questions regarding the 'cross-module identity' of the relevant concepts remain unanswered to date. The central thesis of van der Hulst (1993, forthc. a,b) is that these concepts also cut through modalities and that sign language morpho-syntax and phonology reveals organizational properties that can be captured in terms of the structures in (8). The specific proposals that I put forward in these publications will be summarized in section 5.

The central claim in this article is that two-handed signs fulfil the typical properties of α–α relations (as in (8a)), i.e. both hands are represented as constituents of the same type, forming a unit within which one hand is the head (the *strong* hand) and the other the dependent (the *weak* hand). This analysis leads us to expect that the weak hand will be limited in terms of its structural possibilities. This is precisely what we have seen in section 2: the choice for the weak hand is limited to either copying the properties of the strong hand (in balanced signs) or allowing only a few unmarked handshapes (in unbalanced signs). The explanatory force of the dependency approach lies in identifying this pattern as a recurrent property of the head-dependent α–α relation. In this way we provide the observed reduction in contrast with a principled explanation and at the same time we make it an instance of a widely attested phenomenon.

## 5. The structure of simple signs

In this section I will briefly outline the model for one-handed monomorphemic signs that I develop in van der Hulst (1993, forthc. a,b). The essential insight of Stokoe (1960), viz. that the manual part of a sign is composed of three packages of information is taken over. Corresponding to his *tab*, *sig*, and *dez* my model adopts three subnodes: *articulator*, *manner*, and *place*:

(9) *The representation of one-handed signs*




$A^2$ = articulator node
$A^1$ = handshape
$A^0$ = selected fingers
Or = orientation
FC = finger configuration
M = manner (of movement)
$P^2$ = place2
$P^1$ = place1
$P^0$ = place0
HP = hand position
Se = setting
Sk = skeleton

The structure of the Articulator node is taken from Sandler (1989) and modeled in the form of a dependency structure (cf. (8b)). The head of this unit, $A^0$, specifies the set of selected fingers, which, combined with the node that specifies the configuration of the fingers (FC), forms the Handshape node ($A^1$).

*Palm Orientation* (Or) specifies whether the palm is up or down, toward or away from the signer and perhaps also includes finger orientation features. *Finger Configuration* (FC) contains the units *Joint Selection* (specifying bending and curving) and *Aperture* (specifying closure); cf. van der Hulst (forthc. b). Both Orientation and

Finger Configuration may change during the articulation of monomorphemic signs. These changes are called *local* (or *hand-internal*) movements. The only node that does not allow a change of value during the (monomorphemic) sign is $A^0$. In van der Hulst (1993) I propose to regard *invariance* as a property of heads in α–β head-dependency relations, claiming that invariance is a manifestation of the requirement that heads must be atomic (cf. section 4). The node Or is represented as a specifier, because it is able to be involved in assimilatory processes (cf. Sandler, 1989). In van der Hulst (1993) I argue that 'mobility' is inversely correlated with closeness to the head, the head itself being unable to move or spread.

$P^2$ stands for place unit. Following Sandler (1989) I make a distinction between major body location and setting. Settings subcategorize the major place feature, much like features such as [posterior] and [laminal] subdivide the feature [coronal]. If *two* setting values are specified this implies a movement of the hand (called a global or path movement). It has been observed that global movements are limited to specific subspaces of the signing space. To express this, researchers such as Sandler (1989) have hypothesized that a movement can only involve specifying two setting values, leaving the place value itself always invariant. Among the class of major place features we find [head], [trunk], [neck], [arm] and [weak hand]. I emphasize here the presence of the last-mentioned feature, since this feature obviously will play a role in the representation of unbalanced signs. The node $P^0$, then, is taken to be the head because (as in the case of $A^0$) within monomorphemic signs no change of the value of $P^0$ is possible.

The highest dependent within Place, *Hand Position*, specifies how the hand is placed vis-à-vis the movement or point of contact (i.e. side of the hand, fingertips or flat side of the hand). This node (as well as its affiliation under $P^2$), which does not appear to have the option of a change in value, is not crucially motivated in van der Hulst (1993, forthc. a). It may turn out that its function can be performed by the Orientation node if this is enriched with features for finger orientation. I will not investigate this issue in this article, however.

The Manner unit (which specifies properties of movement) remains a 'black box' for the moment. With respect to the overall organization of the sign structure, both the Place and the Articulator unit are represented as dependents of Manner (which again gives a structure as in (8b)). The head status of Manner expresses the perceptual centrality of movement properties. The reason for making the Articulator the higher dependent is that this unit appears to be the more mobile package in assimilatory processes. Closeness to the head entails immobility, the head itself being completely immune to spreading tendencies. Van der Hulst (1993) proposes to identify *immobility* as a second typical head property (i.e. next to *invariance*).

The final ingredient of the diagram in (9) that calls for comment is the *skeleton*. A major addition to the parameters that Stokoe proposed has been a tier to represent sequential properties of signs. The essential motivation for this enrichment lies in the necessity to refer to the beginning and end point of signs in both phonological and morphological rules. I refer to van der Hulst (1993), Sandler (1996) and the introductory article in this issue for further details and discussions of the various forms that this development has taken. The proposal implied by (9) is that non-head fea-

tures of signs can be associated with the first or second skeletal slot in case a change in value is specified.

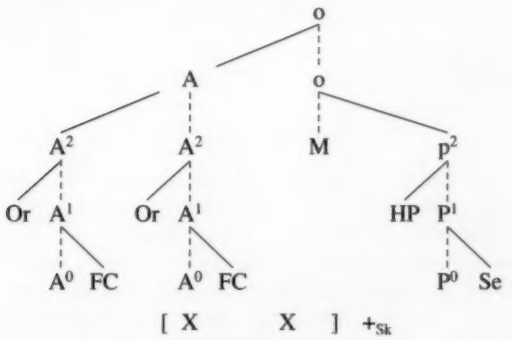
In the next section I will elaborate the structure in (9) and show how various types of two-handed signs can be accommodated.

## 6. A proposal for *the representations of two-handed signs*

We now turn to the question how the various types of two-handed signs can be represented in a formal model. Against the background of the foregoing sections, the presentation of my proposal can be brief.

In very general terms I take the representations of all two-handed signs to be that in (10):

(10) *Two-handed signs*

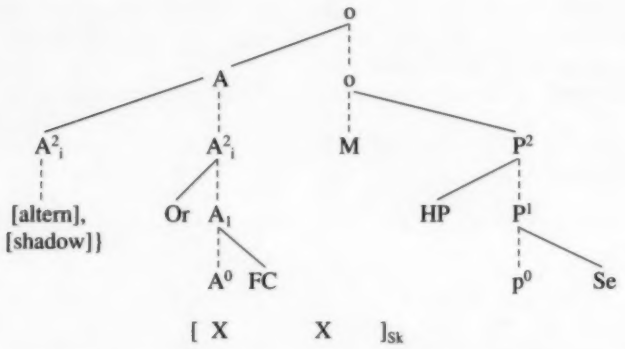



What this representation immediately explains is that the Manner and Place ($P^2$) specification of both hands cannot be different. Whatever type of two-handed sign we deal with, it does not seem to be the case that the two hands can have different places of articulation or different modes of movement. I therefore do not want to propose that two-handed signs involve a combination of two complete sign units, i.e. twice the structure given in (8). Note also that two-handed signs come with a single skeleton in order to account for the fact that the two hands are simultaneously present.

In *all* two-handed signs the weak hand shows various degrees of underspecification, most extremely in balanced signs. Put differently: the weak hand generally shows a low degree of contrast. This, in fact, forms the basis for my claim that the weak hand occupies a dependent position in the structure of signs. Following the terminology in Dresher and van der Hulst (1995, forthc. a,b) and the discussion in section 4, we can say that a general diagnostic for a head-dependent relation is an asymmetry that is manifested in a loss of contrastive possibilities for the dependent unit, witnessed by the fact that the dependent's contrastive possibilities are never greater than those of the head in actual head-dependent combinations.

I will now go over the various degrees of underspecification of the weak hand, starting with balanced signs. In these cases we can say that the dependent hand lacks *all* contrastive options; it can only be a complete copy of the strong hand, assuming that unspecified nodes are realized as copies of the corresponding node of the strong hand. In the diagram that follows, copying relations are indicated by indexes:

(11) *Balanced signs*




I assume that [alternating] is a 'unary feature' (as argued in Brentari, 1990), which can be specified on the $A^2$ node. A reason for specifying it here is that only signs that are two-handed can have this property. In addition, as I show in section 7.2, it is the presence of properties on the $A^2$ node that blocks Weak Drop.

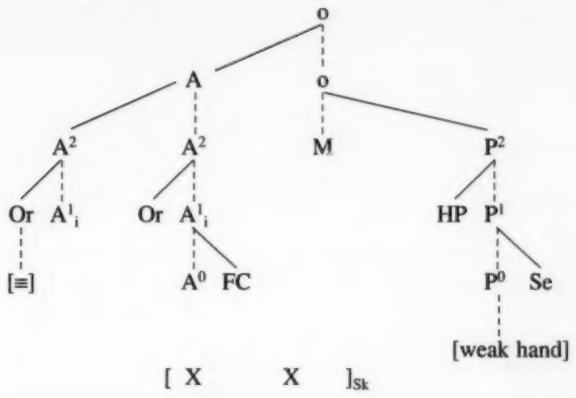
For shadow signs I propose a similar treatment. An alternative approach to shadow signs would be to say that the weak hand has non-mirrored place properties. This would necessitate a representation, alluded to above, that doubles the whole one-hand structure for two-handed signs. I have been reluctant to explore this alternative because it ultimately predicts that the class of possible two-handed signs contains cases in which both hands are specified completely independently for all nodes.

The approach we have taken is already very liberal, since nothing stops us in principle from specifying a balanced sign in which both hands have different hand configurations. One might say that this option is necessary for type IV signs (e.g. ASL TOTAL COMMUNICATION, cf. (4)), but it remains unexplained why such signs are highly marked and unstable.

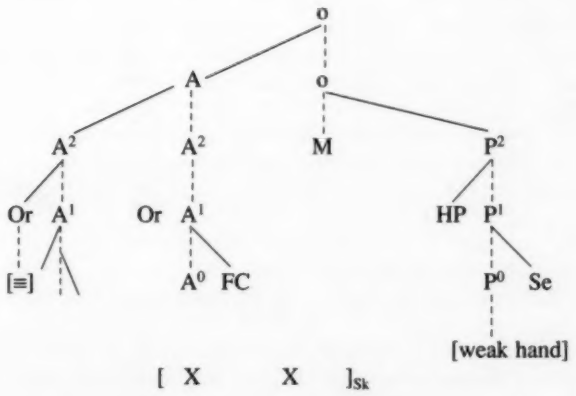
Unbalanced signs can be represented as in (12), with the place feature [weak hand] specified under $P^0$, and with independent orientation features.[5] The difference between type II and type III signs is that the former have an empty $A^1$ node (i.e. a copy of the $A^1$ node of the strong hand), whereas type III signs have independent specification for $A^1$.

[5] That representing the weak hand in these signs does not exclude adopting a place feature [weak hand] was made clear to me by Scott Liddell, p.c.

(12) (a) *Unbalanced signs (type II)*




(b) *Unbalanced signs (type III)*




As expected, we only find the less marked options for $A^1$ in case of type III signs. This is manifested in the fact that the handshapes are limited, but also in that the weak hand does not allow branching nodes. This excludes orientation and aperture change for the weak hand. The orientation nodes of both articulators specify their position in neutral space.

The crucial difference between type I and type II/III (besides the orientation specification for the latter) is that in the former the weak hand moves (copying the movement of the strong hand). I would like to claim that the immobility of the weak hand in type II/III signs is ensured by the fact that the place has been specified as [weak hand] assuming that this forces the hand to be kept still.

In the next section I will return to the alternatives discussed in section 3. My aim is to show that the two-hand-always theory can be reconciled with the empirical considerations offered by Sandler for the weak-hand-sometimes theory. I will point to certain problems for the no-weak-hand theory and conclude with an additional argument for the weak-hand-always theory.

## 7. Comparison with alternatives

### *7.1. The no-weak-hand theory*

My main objection to this theory regards the decision to represent the weak hand in unbalanced signs in terms of a place feature only. The featural approach in its most restrictive form would have to claim that the weak handshapes are predictable from other properties of the sign. Perlmutter (1991) indeed makes this claim. Sandler (1989, 1993), however, acknowledges that the shape of the weak hand can be distinctive in unbalanced signs, which implies that several place features must be postulated (i.e. [weak hand: A-shape], [weak hand: B-shape] and so on).

It should be clear at this point that the feature analysis of unbalanced signs totally disregards the fact that our dependency approach seeks to explain, i.e. the unmarkedness of the weak handshapes. I have tried to show that the representation of the weak hand as a dependent node provides a basis for the reduction of contrastive possibilities to a set of handshapes that can be regarded as unmarked on independent grounds (i.e. acquisition, change, frequency and so on; cf. section 2). The reduction of contrastive possibilities is a characteristic of dependent units, as I have argued in section 4. In Perlmutter's (and Sandler's) model no such rationale can be provided. There is strictly speaking no formal explanation for the fact that only a quite specific handful of weak hands can function as a place.

In section 7.3 I discuss diachronic transitions between balanced and unbalanced signs claiming that only the weak-hand-always theory provides a natural basis for such relations. This, then, can also be taken as an argument against the no-weak-hand theory.

Let us now examine the analogy argument. Perlmutter avoids a separate weak hand unit because spoken language phonology does not have two identical articulators either. In my view, this position looks for correspondences between signed and oral language at a level that is too close to the phonetic substance. Phonology imposes a cognitive-linguistic categorization on the phonetic substance and it specifies a mapping from these categories into a certain range of the substance. In short, phonology deals with abstract categories and their relation to phonetic exponents. Accepting that spoken and sign language structures are products of the same language capacity, we expect the organization of the abstract categories and the way they relate to the substance to be subject to the same set of principles. What we do not expect is that there will be far-reaching resemblances between the actual structures and the number of categories, simply because spoken and sign language make use of entirely different phonetic substance. In van der Hulst (forthc. a) I discuss the

phonetic differences in detail and argue that the phonology of spoken language not only lacks an analogue to a 'branching articulator node', but that – at the phonological level – it even lacks an articulator node altogether. For sign languages on the other hand, the Articulator node is highly relevant because, firstly, the hands (unlike the tongue) can take many shapes, and, secondly, there are two of them. It should not be surprising that such rather large differences in phonetic substance are clearly reflected in the shape of the phonological structure, but this fact need not undermine the claim that both modalities are governed by the same language capacity if analogous principles are identified at the appropriate level of abstractness.

### *7.2. The weak-hand-sometimes theory*

This theory, like the previous one, has no representation for the weak hand in unbalanced signs and it therefore faces the objection presented in the previous section of failing to explain the unmarked nature of the weak handshapes. This section focusses on Sandler's claim that certain processes discriminate between two-handed signs in a way that is expected if balanced signs and unbalanced signs have fundamentally different representations.

#### *7.2.1. Weak Drop*

*Weak Drop* (WD) involves the phenomenon that two-handed signs may be realized with the strong hand only. Sandler (1989, 1993) argues that if the weak hand in unbalanced and balanced signs has a totally different structural position it is expected that WD will differentiate between them.

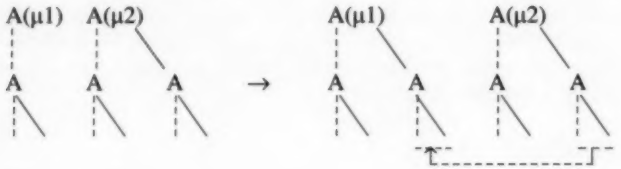
The approach I would like to suggest is based on the insight expressed in Battison (1974) that deletion is disfavoured in cases where independent (i.e. irrecoverable) specifications will be lost. We expect, then, that WD will not only fail to apply in unbalanced signs, but in all two-handed signs in which the $A^2$ node bears some sort of specification. We have argued that such specifications are present in unbalanced signs but also in balanced signs which are alternating or shadowing (cf. (11)). As Battison (1974) suggests, WD is not likely to occur in these cases. For a detailed examination of the conditions under which WD is either favoured or disfavoured I refer to Brentari (in prep.), who clearly shows that the asymmetrical behaviour of WD does *not* point to a fundamental difference between balanced and unbalanced signs. WD does not discriminate between balanced and unbalanced signs, but rather between two-handed signs with a fully *un*specified $A^2$ node and signs in which the $A^2$ bears some specification. Here, in fact, we see that it is crucial to specify the feature [Alternating] on the weak hand node. Battison suggests that the amount of information carried by the weak hand plays a role in the likelihood for WD to apply, but Brentari's results seem to indicate that WD can (or should) be stated in absolute terms: only signs with a completely unspecified $A^2$ can undergo WD. This does not imply that all such signs undergo WD. The thorough examination of the facts that Brentari offers reveals that there are more factors that inhibit WD than independent specification on the weak hand node.

*7.2.2 Weak Hand Spreading*

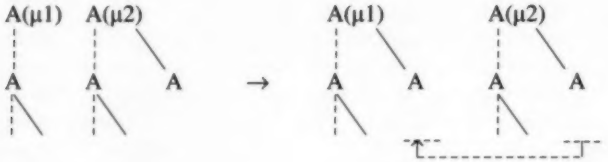
The weak hand in unbalanced signs may spread, i.e. a one-handed sign which precedes an unbalanced sign may be realized with the weak hand of the upcoming signs already present. Sandler argues that such regressive spreading does not affect the weak hand in balanced signs. In case a one-handed sign precedes a balanced two-handed sign another process may apply instead: the first morpheme becomes a balanced two-handed sign. Sandler is of course aware of this latter process (which I will call *Two-hand Copy*), but she assumes that this process is unrelated to *Weak Hand Spreading* (WHS).

I will now show that we do not have to see these two processes as fundamentally different. Consider the following (simplified) structures:

(13) (a) *Weak Hand Spreading*




(b) *Two-hand Copy*




The notation 'A(μ1)' means 'articulator node of first morpheme', etc. In the first process, a specified weak hand spreads to the first morpheme, which therefore becomes two-handed. In the second process, the spreading hand is unspecified (i.e. part of a balanced mirror sign). The crucial point to observe is that if an unspecified weak hand spreads leftward we expect it to be realized as identical to the strong hand it is adjoined to. This implies that WHS and WD can be analyzed as instances of the same process. In both cases the weak hand node of the upcoming sign invades the time span that belongs to the first sign. If this invading hand bears its own specification (as is the case if the upcoming sign is unbalanced), then we get the effect of an anticipating assimilation, but if the upcoming sign is balanced, what can spread is just an empty weak hand node, which, as we expect, copies the properties of the (strong) hand that executes the first sign.

An additional point can be made here. In van der Hulst (1993) I argue that one of the arguments for representing Major Place as a head is the non-spreading character of this category. I weaken this claim in van der Hulst (forthc. a), but maintain that

the Articulator node spreads more easily than the Place node. On this basis we are not inclined to analyze WHS as place spreading, which is what it is in the model Sandler proposes.

Notice too that the very phenomenon of WHS is awkward in both Sandler's and my model. Since Sandler represents the weak hand as a place feature, the first sign ends up as having *two* place specifications, which itself violates the constraint that signs have one major place specification. In the treatment that I propose for WHS it does not strictly follow automatically that the weak hand, as part of μ1, is kept still.

Thus, in both Sandler's and my account the first sign ends up as violating a general well-formedness condition that holds for monomorphemic signs. Presumably, then, WHS must be regarded as a typical post-lexical process which may lead to configurations that are lexically ill-formed. Having said this, we could actually dismiss the whole dataset at issue as irrelevant for a discussion regarding phonological representations, since we address an issue that regards lexical forms. Here I have chosen to follow Sandler's assumption that the phenomenon *is* relevant and I have shown that the claim that balanced and unbalanced signs differ with respect to anticipatory assimilation can be questioned.

I conclude that the phenomenon of WHS also does not support the view that a fundamental distinction must be made between balanced and unbalanced signs, simply because WHS can be analyzed as applying to both types of two-handed signs.

### *7.3. An extra argument for the weak-hand-always theory*

In the previous sections I have argued against the two rivalling positions. Brentari (1990, in prep.) discusses the importance of historical transitions and uses the attested patterns to argue in favour of a weak-hand-always theory. In this section I briefly discuss this important argument against giving both types of two-handed signs an entirely different formal treatment.

Frischberg (1975) and others report on diachronic changes in the phonology of signs. She shows that many changes involve a drift to greater symmetry. This is shown by type III unbalanced signs changing to type II, achieving symmetry in handshape. Of particular relevance for our discussion are cases in which type III unbalanced signs (in which handshapes are different) change to fully balanced two-handed mirror signs, going through a type II stage. Radutzky (1990) shows that *LIS* FRUIT has undergone this route.

In both my and Brentari's model the chain 'type III > type II > type III' involves a gradual loss of contrastive options for the *dependent* hand. If balanced and unbalanced signs have fundamentally different representations, as in Sandler's model, the change from type III to type II is fundamentally different from that from type III to the balanced type (i.e. type I).

Brentari (in prep.) shows that we also find changes going in the other direction, i.e. from type I to type II (i.e. balanced > unbalanced). In the model that I have proposed, this transition would result from adding the place feature [weak hand] to a balanced sign. Brentari points out that a similar kind of transition occurs synchronically as well when under certain conditions two-handed balanced signs may undergo

a process called *Weak Freeze* (discussed in Padden and Perlmutter, 1987), which involves the loss of movement in the weak hand.

## 8. Summary and conclusions

The central observation that underlies the proposal defended here is that the weak hand in two-handed signs is limited in a way that strikingly fits the head-dependent asymmetry 'syndrome' discussed in Dresher and van der Hulst (1995, forthc.).

It is important to realize that once one has decided for an approach to language structure that heavily relies on the head-dependency relation, it is entirely straightforward to look upon two-handed signs in the way that is suggested here. The crucial argument here appeals to what Anderson (1985) calls *structural analogy*, which embodies the idea that the architecture of language structure will make use of a uniform set of abstract concepts such as the head-dependent relation. Anderson refers to this point in order to defend applying similar concepts in syntax and phonology. Here I apply to the same point to argue that there is no good reason for assuming that the sign modality and the spoken modality differ in their abstract architecture.

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