Zwicky, Arnold M./Pullum, Geoffrey K.
1983 Cliticization vs. Inflection: English N'T. In: *Language* 59, 502–513.

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6. Plurality

Abstract

Both sign and spoken languages make use of a variety of plural marking strategies. The choice of strategy depends on lexical, phonological, and morphosyntactic properties of the sign to be modified. The description of basic plural patterns is supplemented by a typological investigation of plural marking across sign languages. In addition, we discuss the realization of the plural feature within noun phrases, the expression of plural with pronouns as well as with agreement and classifier verbs, and the structure of number systems in sign languages. Finally, we compare pluralization in spoken languages to the patterns found in sign languages and account for the modality-specific properties of plural formation in sign languages.

1. Introduction

The topic of this chapter is pluralization in sign language. All natural languages seem to have means to distinguish a single entity (singular) from a number of entities (plural). This distinction is expressed by a difference in the grammatical category number. Typically, the singular is the unmarked form, whereas the plural is the marked form, which is derived from the singular by specific morphological operations such as affixation, stem internal change, or reduplication. Plural can be expressed on nouns, pronouns, demonstratives, determiners, verbs, adjectives, and even prepositions. In this chapter, we will be mainly concerned with singular and plural forms although many languages have more fine-grained distinctions such as, for example, singular, dual, and plural (but see sections 3 and 4 that show that sign languages also allow for more fine-grained distinctions).

Patterns of plural marking have been described for a number of different sign languages: see Jones and Mohr (1975), Wilbur (1987), Valli and Lucas (1992), and Perry (2004) for American Sign Language (ASL, also see chapters 7, 11, and 13); Skant et al. (2002) for Austrian Sign Language (ÖGS); Sutton-Spence and Woll (1999) for British Sign Language (BSL, also see chapter 11); Perniss (2001) and Pfau and Steinbach (2005b, 2006b) for German Sign Language (DGS); Heyerick and van Braeckevelt (2008) and Heyerick et al. (2009) for Flemish Sign Language (VGT); Schmaling (2000) for Hausa Sign Language (Hausa SL); Zeshan (2000) for Indopakistani Sign Language (IPSL); Stavans (1996) for Israeli Sign Language (Israeli SL); Pizzuto and Corazza (1996) for Italian Sign Language (LIS); Nijhof and Zwitserlood (1999) for Sign Language of the Netherlands (NGT); and Kubuş (2008) and Zwitserlood, Perniss, and Özyürek (2011) for Turkish Sign Language (TİD). Although there are many (brief) descriptions of plural marking in individual sign languages (but only a few theoretical analyses), a comprehensive (cross-modal) typological study on pluralization in the visual-manual modality is still lacking. Parts of this chapter build on Pfau and Steinbach (2005b, 2006b), who provide a comprehensive overview of plural marking in DGS and discuss typological variation and modality-specific and modality-independent aspects of pluralization in sign languages.

In section 2, we start our investigation with the nominal domain and discuss plural marking on nouns and noun phrases. We first describe the basic patterns of plural marking, which are attested in many different sign languages, namely (two kinds of) reduplication and zero marking. Then we discuss typological differences between sign languages. In section 3, we address pronouns, number signs, and numeral incorporation. Section 4 turns to the verbal domain and describes plural marking on agreement and classifier verbs. Section 5 gives a brief typological survey of typical patterns of plural formation in spoken languages and discusses similarities and differences between spoken and sign languages. We also try to account for the modality-specific properties of pluralization in sign languages described in the previous sections. Finally, the main findings of this chapter are summarized in section 6.

2. Nouns and noun phrases

Descriptions of pluralization in many different sign languages show that within a single sign language, various plural marking strategies may exist. On the one hand, certain strategies such as reduplication and the use of numerals and quantifiers are attested in most sign languages. On the other hand, sign languages differ from each other to a certain degree with respect to the morphological realization of plural features. Firstly in this section, we discuss the realization of the plural feature on the noun (section 2.1). Then, we turn to pluralization and plural agreement within noun phrases (section 2.2). We illustrate the basic patterns with examples from DGS but also include examples from other sign languages to illustrate typological variation.

2.1. Nominal number inflection

Two general patterns of nominal plural formation that are mentioned frequently in the literature are zero marking and reduplication (or, to be more precise, triplication, see

below) of the noun. Reduplication typically comes in two types: (i) simple reduplication and (ii) sideward reduplication. Interestingly, both kinds of reduplication only apply to certain kinds of nouns. We will see that the choice of strategy depends on phonological features of the underlying noun (for phonological features, cf. chapter 3, Phonology). Hence, we are dealing with phonologically triggered allomorphy and the pluralization patterns in sign languages can be compared to phonologically constrained plural allomorphy found in many spoken languages. We come back to this issue in section 5.

2.1.1. Phonological features and plural marking strategies

In (1), we provide an overview of the phonological features constraining nominal plural marking in DGS (and many other sign languages) and the corresponding plural marking strategies (cf. Pfau/Steinbach 2005b, 2006b). As illustrated in (1), in DGS plural marking, some of these features depend on others. The distinction between complex and simple movement, for instance, is only relevant for non-body anchored nouns. Moreover, the distinction between lateral and midsagittal place of articulation applies only to non-body anchored nouns performed with a simple movement. Consequently, we arrive at four different classes (1a–d) and potentially four different patterns of plural marking. However, since all nouns phonologically specified for either complex movement or body anchored use the same pattern (zero marking) and reduplication comes in two types, we have basically two strategies of plural marking all together: (i) (two kinds of) reduplication and (ii) zero marking.

(1)

	phonological feature	*plural marking strategy*
a.	body anchored	**zero marking**
	non-body anchored	
b.	(i) complex movement	**zero marking**
	(ii) simple movement	
c.	(iia) midsagittal place of articulation	simple **reduplication**
d.	(iib) lateral place of articulation	sideward **reduplication**

It will become clear in the examples below that plural reduplication usually involves two repetitions. Moreover, various articulatory factors may influence the number of repetitions: (i) the effort of production (more complex signs like, e.g., VASE tend to be repeated only once), (ii) the speed of articulation, and (iii) the syllable structure of a mouthing that co-occurs with a sign since the manual and the non-manual part tend to be synchronized (cf. Nijhof/Zwitserlood 1999; Pfau/Steinbach 2006b). In addition, the prosodic structure may influence the number of repetitions, which seems to increase in prosodically prominent positions, for instance, at the end of a prosodic domain or in a position marked as focus (Sandler 1999; cf. also chapter 13 on noun phrases). Finally, we find some individual (and probably stylistic) variation among signers with respect to the number of repetitions. While some signers repeat the base noun twice, others may either repeat it only once or three times. Although additional repetitions may emphasize certain aspects of meaning, we assume that the distinction between reduplication and triplication is not part of the morphosyntax of plural marking proper. Because two repetitions (i.e. triplication) appears to be the most common

pattern, the following discussion of the data is based on this pattern. To simplify matters, we will use the established term 'reduplication' to describe this specific morphological operation of plural marking in sign languages. We will address the difference between reduplication and triplication in more detail in section 5 below. Let us first have a closer look at the four classes listed in (1).

2.1.2. Zero marking

In DGS, body anchored nouns (1a) pattern with non-body anchored nouns which are lexically specified for a complex movement (1b) in that both types do not permit the overt morphological realization of the plural feature. In both cases, zero marking is the only grammatical option. As can be seen in Figures 6.1 and 6.2 above, simple as well as sideward reduplication leads to ungrammaticality with these nouns. Note that in the glosses, plural reduplication is indicated by '++', whereby every '+' represents one repetition of the base form. Hence the ungrammatical form WOMAN++ in Figure 6.1b would be performed three times in total. '>' indicates a sideward movement, that is, the combination of both symbols '>+>+' stands for sideward plural reduplication. The direction of sideward movement depends on the handedness of the signer.

Obviously, in DGS, phonological features may block overt plural marking. Both kinds of plural reduplication are incompatible with the inherent place of articulation feature *body anchored* and the complex movement features *repeat*, *circle*, and *alternat-*

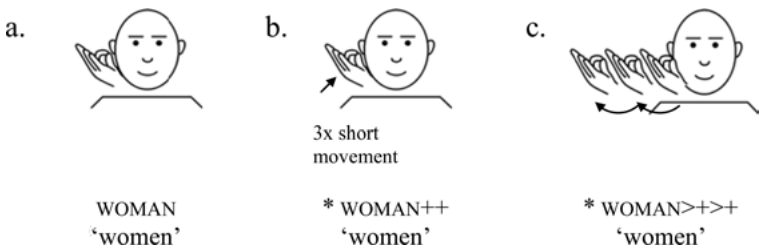


Fig. 6.1: Plural marking with the body anchored noun WOMAN in DGS. Copyright © 2005 by Buske Verlag. Reprinted with permission.

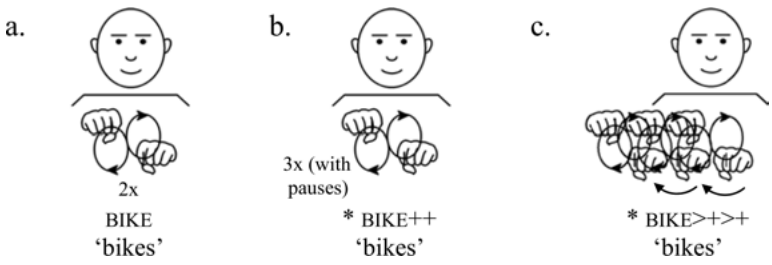


Fig. 6.2: Plural marking with the complex movement noun BIKE in DGS. Copyright © 2005 by Buske Verlag. Reprinted with permission.

ing. Like many other morphological processes in sign languages, such as agreement (cf. chapter 7) or reciprocal marking (Pfau/Steinbach 2003), plural marking is also constrained by phonological features of the underlying sign. We come back to the influence of phonology in section 5. Interestingly, the features that block plural reduplication do not block similar kinds of reduplication in aspectual and reciprocal marking. Hence, it appears that certain phonological features only constrain specific morphological processes (Pfau/Steinbach 2006b).

2.1.3. Reduplication

So far, we have seen that reduplication is not an option for DGS nouns that are body anchored or involve complex movement. By contrast, non-body anchored midsagittal and lateral nouns permit reduplication. Figures 6.3 and 6.4 illustrate that for symmetrical midsagittal nouns such as BOOK, the plural form is marked by simple reduplication of the whole sign, whereas the crucial morphological modification of non-body anchored lateral nouns such as CHILD is sideward reduplication. Sideward reduplication is a clear example of partial reduplication since the reduplicant(s) are performed with a shorter movement. The case of simple reduplication is not as clear. Typically, the reduplicant(s) are performed with the same movement as the base; in this case, simple reduplication would be an example of complete reduplication. Occasionally, however,

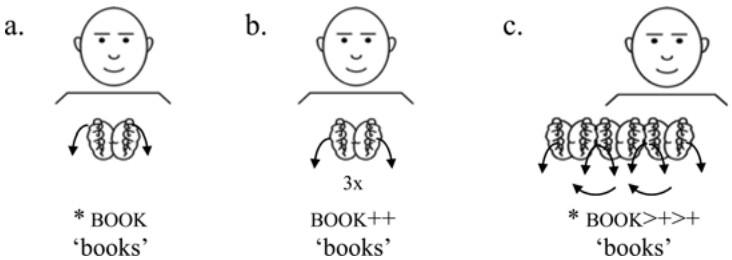


Fig. 6.3: Plural marking with the midsagittal noun BOOK in DGS. Copyright © 2005 by Buske Verlag. Reprinted with permission.

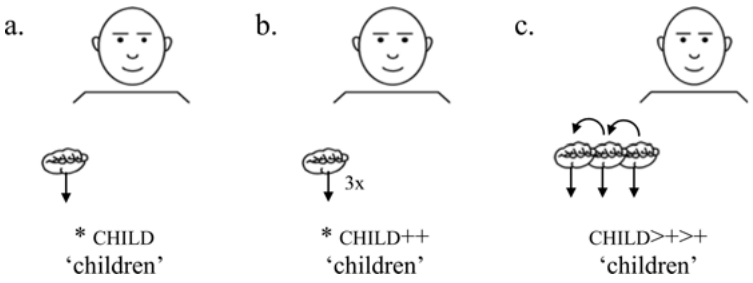


Fig. 6.4: Plural marking with the lateral noun CHILD in DGS. Copyright © 2005 by Buske Verlag. Reprinted with permission.

the reduplicant(s) are performed with a reduced movement and thus, we are dealing with partial reduplication.

Note that body-anchored nouns denoting human beings have an alternative way of plural marking that involves reduplication. The plural form of nouns like WOMAN, MAN, or DOCTOR can be formed by means of the noun PERSON. Since PERSON is a one-handed lateral sign, its plural form in (2) involves sideward reduplication. Syntactically, PERSON is inserted right-adjacent to the noun. Semantically, PERSON is simply an alternative plural marker for a specific class of nouns without additional meaning.

(2) WOMAN PERSON>+>+ [DGS]
'women'

2.1.4. Typological variation

The basic strategies described for DGS are also found in many other sign languages (see the references listed at the beginning of this chapter). Typologically, reduplication and zero marking seem to be the basic strategies of plural marking across sign languages. Likewise, the constraints on plural formation are very similar to the ones described for DGS. In BSL, for example, pluralization also involves reduplication and sideward movement. According to Sutton-Spence and Woll (1999), the plural form of some nouns is marked by a 'distributive bound plural morpheme', which triggers two repetitions (i.e. triplication) of the underlying noun. Both repetitions are performed in different locations. Like sideward reduplication in DGS, sideward reduplication in BSL is only possible with non-body anchored nouns and signs without inherent complex movement. The plural of body anchored nouns and nouns with complex movement is marked without any reduplication, i.e. the only remaining option for these nouns is zero marking. Likewise, Pizzuto and Corazza (1996) describe pluralization patterns for LIS, which are very similar to those described for DGS and BSL. Again, reduplication is the basic means of plural formation. Pizzuto and Corazza also distinguish between body anchored nouns and nouns signed in the neutral sign space. The latter are subdivided into signs involving simple movement and signs involving complex movement. As in DGS and BSL, reduplication is only possible for signs performed in the neutral sign space without complex movement.

Although the patterns of plural formation appear to be strikingly similar across sign languages, we also find some variation, which mainly results from differences in the phonological restrictions on plural formation and the available manual and non-manual plural markers. A typological difference in the phonological restrictions can be found between DGS, on the one hand, and ASL and NGT, on the other. Unlike DGS, NGT allows simple reduplication of at least some body anchored nouns like GLASSES and MAN (cf. Nijhof/Zwitserlood 1999; Harder 2003; Pfau/Steinbach 2006b). In DGS, simple reduplication is neither possible for the phonologically identical sign GLASSES, nor for the phonologically similar sign MAN. While there are differences with respect to the behavior of body anchored nouns, nouns with inherent complex movement and nouns performed in the lateral sign space or symmetrically to the midsagittal plane seem to behave alike in DGS and NGT. Only the latter permit sideward reduplication in both sign languages.

ASL also differs from DGS in that reduplication in plural formation is less constrained. Moreover, ASL uses additional plural marking strategies. Only one of the four strategies of plural formation in ASL discussed in Wilbur (1987) is also found in DGS. The first strategy applies to nouns articulated with one hand at a location on the face. With these nouns the plural form is realized by repeating the sign alternately with both hands. The second strategy applies to nouns that make contact with some body part or involve a change of orientation. In this case, the plural form is realized by reduplication. Typically, a horizontal arc path movement is added. The third strategy holds for nouns that involve some kind of secondary movement. Such nouns are pluralized without reduplication by continuing the secondary movement (and possibly by adding a horizontal arc path movement). The fourth strategy is similar to that which has been described for DGS above: nouns that have inherent repetition of movement in their singular form cannot undergo reduplication. Hence, in contrast to DGS, ASL permits plural reduplication of some body anchored nouns and nouns with complex movement and has a specific plural morpheme, i.e. a horizontal arc path. Moreover, plural reduplication of secondary movements is only possible in ASL but not in DGS. However, both languages permit sideward reduplication of lateral nouns and simple reduplication of midsagittal nouns.

Skant et al. (2002) describe an interesting plural marking strategy in ÖGS which is similar to the first strategy found in ASL. With some two-handed signs like HIGH-RISE-BUILDING, in which both hands perform a parallel upward movement, the plural is expressed by a repeated alternating movement of both hands. With one-handed nouns, the non-dominant hand can be added to perform the alternating movement expressing the plural feature. This strategy can be analyzed as a modality-specific stem internal change. A similar strategy is reported in Heyerick and van Braeckevelt (2008) and Heyerick et al. (2009), who mention that in VGT, two referents (i.e. dual) can be expressed by articulating a one-handed sign with two hands, i.e. 'double articulation'. A non-manual plural marker has been reported for LIS (cf. Pizzuto/Corazza 1996). With many body anchored nouns the plural form is signed with an accompanying head movement from left to right (at least three times). In addition, each movement is marked with a head-nod. Moreover, in LIS inherent (lexical) repetitions tend to be reduced to a single movement if the non-manual head movement accompanies the plural form of the noun.

Let us finally turn to two languages that mainly use the zero marking strategy. In IPSL, all nouns can be interpreted as singular or plural because IPSL does not use overt plural marking strategies such as simple or sideward reduplication (cf. Zeshan 2000). The interpretation of a noun depends on the syntactic and semantic context in which it appears. Zeshan points out that the lateral noun CHILD is the only noun in IPSL with a morphologically marked plural form that occurs with some frequency. Just like the phonologically similar lateral sign in DGS (cf. Figure 6.4 above), CHILD in IPSL also permits sideward reduplication. Likewise, Zwitserlood, Perniss, and Özyürek (2011) report that TİD does not exhibit overt morphological marking of the plural feature on the noun. Instead, plurality is expressed by a variety of spatial devices, which reflect the topographic relations between the referents. These spatial devices will be discussed in section 4 below in more detail. Zwitserlood, Perniss, and Özyürek argue that although information about the number of referents falls out as a result of the use of sign space, "the primary linguistic function of these devices is [...] not the

expression of plurality [...], but rather the depiction of referent location, on the one hand, and predicate inflection, on the other hand". They conclude that TİD, like IPSL, does not have a productive morphological plural marker (but see Kubuş (2008) for a different opinion).

The absence of overt plural marking in IPSL and TİD is, however, not exceptional. We will see in the next subsection that in most sign languages, overt plural marking (i.e. reduplication) is only possible if the noun phrase does not contain a numeral or quantifier. Moreover, in contexts involving spatial localization, it is not the noun but the classifier handshape that is (freely) reduplicated. Besides, Neidle (this volume) argues that in ASL "reduplication may be correlated with prosodic prominence and length" (cf. chapter 13 on noun phrases). Therefore, plural reduplication is more likely to occur in prosodically prominent positions, i.e. in sentence-final position or in positions marked as focus. Consequently, reduplication is only grammatical for a small class of nouns in a limited set of contexts and even with lateral and midsagittal nouns we frequently find zero marking. Hence, reduplication is expected to be rare although it is the basic morphological means of plural formation in sign languages (cf. also Baker-Shenk/Cokely 1980).

2.1.5. Summary

Reduplication and zero marking appear to be two basic pluralization strategies in the nominal domain attested in many different sign languages. Besides simple and sideward reduplication, some sign languages have at their disposal (alternating) movement by the non-dominant hand, reduplication of secondary movements, a horizontal arc path movement, and non-manual means. The general phonological restrictions on overt plural marking seem to be very similar across sign languages: sideward reduplication is restricted to lateral nouns and simple movement to midsagittal nouns. Nouns with complex movement only allow zero marking. Only within the class of body anchored nouns do we find some variation between languages: some sign languages permit simple reduplication of body anchored nouns, while others do not.

2.2. Pluralization and number agreement within noun phrases

This section deals with plural marking within the noun phrase, which is an important domain for the realization of grammatical features such as gender, case, and number. Therefore, in many languages, pluralization does not only affect nouns but also other elements within the noun phrase such as determiners and adjectives. Moreover, we find a considerable degree of variation in the realization of the number feature within the noun phrase: while some languages show number agreement between nouns, adjectives, and numerals or quantifiers, others do not. Here we focus on sign languages. Spoken languages will be discussed in section 6. For number marking and number agreement within the noun phrase, see also chapter 13 on noun phrases.

Languages with overt plural marking on head nouns have two options: they can express the plural feature more than once within the noun phrase or they only express plurality on one element within the noun phrase. In the latter case, plural is usually

(semantically) expressed by a numeral or quantifier and the head noun is not inflected for number. Most sign languages belong to the second class of languages, i.e. languages without number agreement within the noun phrase. In the previous subsection, we have seen that in sign languages, plural reduplication is only found with some nouns in some contexts and we already mentioned that one reason for this infrequency of overt nominal plural marking is that simple and sideward reduplication is blocked whenever a numeral or quantifier appears within the noun phrase, as is illustrated by the DGS examples in (3ab). Similarly, in noun phrases containing an adjective, the plural feature is only expressed on the head noun even if the adjective has all relevant phonological properties for simple or sideward reduplication. Again, noun phrase internal number agreement is blocked (3c).

(3) [DGS]

a. * MANY CHILD>+>+	a'. MANY CHILD
'many children'	'many children'
b. * FIVE BOOK+ +	b'. FIVE BOOK
'five books'	'five books'
c. * CHILD>+>+ TALL>+>+	c'. CHILD>+>+ TALL
'tall children'	'tall children'

The prohibition against number agreement within the noun phrase is a clear tendency but not a general property of all sign languages. ASL and Israeli SL are similar to DGS in this respect (Wilbur 1987; Stavans 1996). In ASL, for instance, quantifiers like MANY, which are frequently used in plurals, also block overt plural marking on the head noun. Nevertheless, sign languages, like spoken languages, also differ from each other with respect to number agreement within the noun phrase. In NGT, ÖGS (Skant et al. 2002), LIS (Pizzuto/Corazza 1996), and Hausa SL (Schmaling 2000), number agreement within the noun phrase seems to be at least optional.

2.3. Summary

Given the phonological restrictions on plural marking and the restrictions on number agreement, plural reduplication is correctly predicted to be rare in simple plurals. Although reduplication can be considered the basic morphological plural marker, it is rarely found in sign languages since it is blocked by phonological and syntactic constraints (cf. also section 5 below). Table 6.1 illustrates the plural marking strategies and the manual and non-manual plural markers used in different sign languages. '√' stands for overt marking and '∅' for zero marking. The strategy that seems to be typologically less frequent or even nonexistent is given in parentheses. Note that Table 6.1 only illustrates first tendencies. More typological research is necessary to get a clearer picture of nominal plural marking in sign languages.

Tab. 6.1: Plural marking strategies in sign languages

	phonological feature			
	body anchored	*complex movement*	*midsagittal*	*lateral*
noun	∅ (√)	∅ (√)	√ (∅)	√ (∅)
noun with numeral/ quantifier	∅	∅	∅ (√)	∅ (√)
manual and non-manual plural markers	– simple reduplication – double articulation – alternating movements – horizontal arc path movement – head movement and head nod	– simple reduplication – horizontal arc path movement	– simple reduplication – alternating movements	– sideward reduplication

3. Pronouns, numeral incorporation, and number signs

In spoken languages, pronouns usually realize at least two morphological features, namely person and number. Similarly, sign language pronouns also realize these two features. As opposed to spoken languages, however, sign languages do not employ distinct forms (cf. English *I, you, he/she/it, we, you, they*) but systematically use the sign space to express person and number. Concerning person, there is a long-standing debate whether sign languages distinguish second and third person. By contrast, the realization of number on pronouns is more straightforward (for a more detailed discussion of this issue, cf. McBurney (2002), Cormier (2007), and chapter 11, Pronouns).

3.1. Pronouns

Sign languages typically distinguish singular, dual, and distributive and collective plural forms of pronouns. In the singular form, a pronoun usually points with the index finger directly to the location of its referent in sign space (the R-locus). The number of extended fingers can correspond to the number of referents. In DGS, the extended index and middle finger are used to form the dual pronoun 2-OF-US which oscillates back and forth between the two R-loci of the referents the pronoun is linked to. In some sign languages, the extension of fingers can be used to indicate up to nine referents. We come back to numeral incorporation below. The collective plural form of a

pronoun is realized with a sweeping movement across the locations in sign space associated with the R-loci of the referents. These R-loci can either be in front of the signer (non-first person) or next to the signer including the signer (first person). By contrast, the distributive form involves multiple repetitions of the inherent short pointing movement of the pronoun along an arc. Plural pronouns are usually less strictly related to the R-loci of their referents than singular pronouns. An interesting question is, whether sign languages have a privileged (lexicalized) dual pronoun, which is not derived by numeral incorporation. The dual form seems to differ from number incorporated pronouns. While the dual form is performed with a back and forth movement, pronouns with numeral incorporation are performed with a circular movement. Moreover, number marking for the dual form seems to be obligatory, whereas the marking of three or more referents by numeral incorporation appears to be optional (cf. McBurney 2002).

3.2. Numeral incorporation

A modality-specific property of sign languages is the specific kind of numeral incorporation found with pronouns, as illustrated in (4), and temporal expressions, as illustrated in (5). Numeral incorporation has been documented for various sign languages (see Liddell (1996) for ASL, chapter 11 on pronouns, for BSL, Perniss (2001) and Mathur/Rathmann (2011) for DGS, Schmaling (2000) for Hausa SL, Zeshan (2000) for IPSL, Stavans (1996) for Israeli SL, Zeshan (2002) for TİD, and Heyerick/van Braeckevelt (2008) and Heyerick et al. (2009) for VGT).

(4) *Numeral incorporation with pronouns*
2-OF-US, 3-OF-US, …, 2-OF-YOU, 3-OF-YOU, …, 2-OF-THEM, 3-OF-THEM, … [DGS]

(5) *Numeral incorporation with temporal expressions*
a. 1-HOUR, 2-HOUR, 3-HOUR, … [DGS]
b. 1-WEEK, 2-WEEK, 3-WEEK, …
c. 1-YEAR, 2-YEAR, 3-YEAR, …
d. IN-1-DAY, IN-2-DAY, IN-3-DAY, …
c. BEFORE-1-YEAR, BEFORE-2-YEAR, BEFORE-3-YEAR, …

Pronouns and temporal expressions have the ability to 'incorporate' the handshape of numerals. Usually, the handshape corresponds to the numeral used in a sign language (cf. below). Number incorporated pronouns are performed with a small circular movement in the location associated with the group of referents. Because of the physical properties of the two manual articulators, sign languages can in principle incorporate numbers up to ten. With pronouns, five seems to be the preferred upper limit of incorporation (note, however, that examples with more than five are attested). With temporal expressions, examples that incorporate numbers up to ten are more frequent. The specific restrictions on pronominal numeral incorporation may be related to the following difference between pronouns and temporal expressions. Unlike temporal expressions, number incorporated pronouns involve a small horizontal circular movement in a specific location of the sign space. This particular movement between the R-loci the pronoun is linked to is harder to perform with two hands and may therefore be blocked

for phonetic reasons (cf. also section 4 for phonetic blocking of plural forms of agreement verbs). By contrast, temporal expressions are not linked to loci in the sign space. Therefore, a two-handed variant is generally easier to perform. Finally note that phonological properties of individual number signs such as the specific movement pattern of TEN in ASL can block numeral incorporation.

3.3. Number signs

So far, we have seen that numeral incorporation targets the handshape of the corresponding number sign. But where do the number signs come from? Number systems of sign languages are constrained by the physical properties of the articulators. Since sign languages use two manual articulators with five fingers each, they can directly express the numbers 1 to 10 by extension of the fingers. Hence, the number systems used in many sign languages have a transparent gestural basis. For number systems in different sign languages, see Leybaert and van Cutsem (2002), Iversen, Nuerk, and Willmes (2004), Iversen et al. (2006), Iversen (2008), Fernández Viader and Fuentes (2008), McKee, McKee, and Major (2008), and Fuentes et al. (2010).

Since the manual articulators have 10 fingers, the base of many sign language number systems is usually 10. The DGS number system is based on 10 with a sub base of 5. By contrast, ASL uses a number system that is only based on 10. In addition to this typological variation, we also find variation within a system. This 'dialectal' variation may affect the use of extended fingers, the use of movement to express numbers higher than 10, or idiosyncratic number signs. Let us consider the number system of DGS first. The first five numbers are realized through finger extension on the dominant hand. ONE is expressed with one finger extended (either thumb or index finger), TWO with two fingers extended (either thumb and index finger or index and middle finger), THREE with three fingers extended (thumb, index and middle finger), and FOUR with four fingers extended (either thumb to ring finger or index finger to pinky). Finally, FIVE is expressed with all five fingers extend. The number signs SIX to TEN are expressed on two hands. The non-dominant hand has all five fingers extended and the dominant hand expresses SIX to TEN just like ONE to FIVE. Number signs for numbers higher than 10 are derived from this basis. In DGS, the number signs ELEVEN, TWELVE, THIRTEEN, … as well as TWENTY, THIRTY, … and ONE-HUNDRED, TWO-HUNDRED, THREE-HUNDRED … use the same handshape as the basic number signs ONE to NINE. In addition, they have a specific movement expressing the range of the number (i.e. 11 to 19, 20 to 90, 100 to 900, or 1000 to 9000). The signs for 11 to 19 are, for example, performed either with a circular horizontal movement or with a short movement, changing the facing of the hand(s) (at the beginning of this short movement, the palm is facing the signer, at the end it faces down) and the signs for 20 to 90 are produced with a repeated movement of the extended fingers. Finally note that complex numbers like 25, 225, or 2225 are composed by the basic number signs: 25 is, for instance, a combination of the signs FIVE and TWENTY. An exception are the numbers 22, 33, 44, … which are expressed by sideward reduplication of TWO, THREE, FOUR, …

As opposed to DGS, ASL only uses one hand to express the basic numbers 1 to 10. ONE starts with the extended index finger, TWO adds the extended middle finger, THREE THE ring finger, FOUR the pinky, and FIVE the thumb. Hence, the ASL number sign for

FIVE is identical to the corresponding sign in DGS. In ASL, the number signs for 6 to 9 are expressed through contact between the thumb and one of the other four fingers: in SIX, the thumb has contact with the pinky, in SEVEN with the ring finger, in EIGHT with the middle finger, and in NINE with the index finger. TEN looks like one version of ONE in DGS, i.e. only the thumb is extended. In addition, TEN has a horizontal movement of the wrist. Other one-handed number systems differ from ASL in that they use the same signs for the numbers 6 to 9 as one variant in DGS uses for 1 to 5: SIX is expressed with the extended thumb, SEVEN with the extended thumb and index finger, EIGHT with the extended thumb, index, and middle finger, … In ASL, higher numbers are expressed by producing the signs for the digits in linear order, i.e. '24' = TWO + FOUR, '124' = ONE + TWO + FOUR. Note that the number system of ASL, just like that of DGS, also shows some dialectal variation.

A comparison of DGS and ASL shows that two-handed number systems like DGS only use five different handshapes, whereas one-handed systems like ASL use ten different handshapes. Moreover, the two-handed system of DGS expresses higher numbers through a combination of basic number and movement. The one-handed system of ASL expresses higher number by a linear combination of the signs for the digits. And finally, DGS, like German, expresses higher numbers by inversion (i.e. '24' is FOUR + TWENTY). In ASL, the linear order must not be inverted.

4. Verb agreement and classifier verbs

In the last section, we have seen that in sign languages, pronouns can express number by modification of movement (i.e. by the addition of a sweeping movement) or by repetition of the pronoun (i.e. a distributed pointing motion towards multiple locations). In this section we will discuss two related phenomena: the plural forms of agreement verbs and classifier verbs. We will see that both use the sign space in a similar way to express plurality. A comprehensive overview of verb agreement can be found in chapter 7. Classifier verbs are extensively discussed in Zwitserlood (2003), Benedicto and Brentari (2004), and in chapter 8 on classifiers.

4.1. Verb agreement

In spoken and sign languages verb agreement seems to have primarily developed from pronouns (for sign languages see Pfau/Steinbach 2006a, 2011). In both modalities, pronominalization and verb agreement are related grammatical phenomena. Hence, it comes as no surprise that agreement verbs use the same spatial means as pronouns to express pluralization. Agreement verbs agree with the referential indices of their arguments, which are realized in the sign space as R-loci. Verbs, like pronouns, have a distributive and a collective plural form. The distributive form of plural objects is, for instance, realized by multiple reduplication along an arc movement in front of the signer. In some contexts, the reduplication can also be more random and with one-handed agreement verbs, it can also be performed with both hands. The collective form is realized with a sweeping movement across the locations associated with the R-loci,

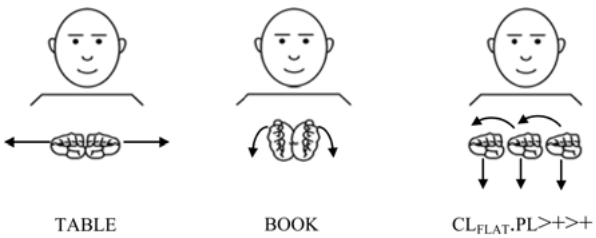
i.e. by an arc movement without reduplication. The plural feature is thus realized spatially in the sign space. In chapter 7, Mathur and Rathmann propose the following realizations of the plural feature in verb agreement. According to (6), the singular feature is unmarked and realized as a zero form. The marked plural feature encodes the collective reading. The distributive plural form in (6ii) may be derived by means of reduplication of the singular form (for a more detailed discussion, cf. chapter 7 on verb agreement and the references cited there).

(6) Number
  i. Features
    Plural (collective): [+pl] ↔ horizontal arc (marked)
    Singular: [−pl] ↔ Ø
  ii. Reduplication: exhaustive (distributive), dual

Note that phonetic constraints may cause agreement gaps. Mathur and Rathmann (2001, 2011) show that articulatory constraints block first person plural object forms such as 'give us' or 'analyze us' in ASL or third person plural object forms with reduplication of the verbs (i.e. distributive reading) like ASK in ASL or TEASE in DGS (for phonetic constraints, cf. also chapter 2, Phonetics).

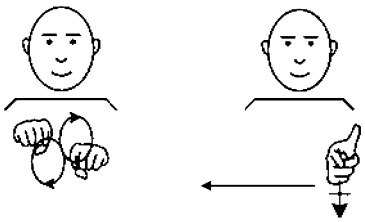
4.2. Classifier verbs

Many spoken languages do not mark plural on the head noun but use specific numeral classifier constructions. Sign languages also have so-called classifier constructions. They make extensive use of classifier handshapes, which can be used with verbs of motion and location. Sign language classifiers can be compared to noun class markers in spoken languages. Classifier verbs are particularly interesting in the context of plural marking since the plurality of an entity can also be expressed by means of a spatially modified classifier verb. Consider the examples in Figures 6.5, 6.6, and 6.7, which show the pluralisation of classifier verbs. Figure 6.5 illustrates the sideward reduplication of the classifier verb. In Figure 6.6, a simple sideward movement is added to the classifier verb and in Figure 6.7 more random reduplications performed by both hands in alternation are added.



'Books are lying next to each other on the table.'

Fig. 6.5: Sideward reduplication of a classifier verb in DGS. Copyright © 2005 by Buske Verlag. Reprinted with permission.



BIKE $CL_{VERTICAL}$.PL>

'Many bikes are standing in a line.'

Fig. 6.6: Simple sideward movement of a classifier verb in DGS.

Fig. 6.7: Random reduplication of a classifier verb in DGS. Copyright © 2005 by Buske Verlag. Reprinted with permission.

Like verbal agreement inflection, the illustrated spatial modification of classifier verbs is a clear instance of verbal plural inflection (for a detailed discussion of the differences between classifier verbs in sign languages and numeral nominal classification in spoken languages, cf. Pfau/Steinbach 2006b). Consequently, numerals or quantifiers do not block the reduplication of the classifier handshapes. The examples in Figures 6.5 to 6.7 would also be grammatical if we added the quantifier MANY or the numeral FIVE (i.e. FIVE BIKE $CL_{VERTICAL}$.PL+>+>). Moreover, the spatial modification of classifier verbs does not only express the plurality of the referent the classifier verb agrees with. It usually also induces the additional semantic effect of a particular spatial localization or arrangement of the referents.

Interestingly, the number of reduplications and the spatial localization of agreement and classifier verbs are not grammatically restricted and can thus be modified more freely. Therefore, the whole sign space can be used, as is illustrated in the examples in Figures 6.5 to 6.7 above. If a right handed signer wants to express that exactly five bikes are standing in a certain spatial relation on the left, s/he can repeat the classifier verb five times in the left ipsilateral sign space. Conversely, the simple plural form of lateral nouns is usually restricted to two repetitions and to the lateral area of the sign space.

In section 2 we mentioned that in many sign languages midsagittal nouns such as HOUSE or FLOWER also permit sideward reduplication of the whole sign (cf. Figure 6.8). With these nouns, the semantic effect described for classifier verbs is achieved by sideward reduplication of the whole sign. Hence, under certain circumstances, sideward reduplication can also be found with midsagittal nouns. However, in this case the un-

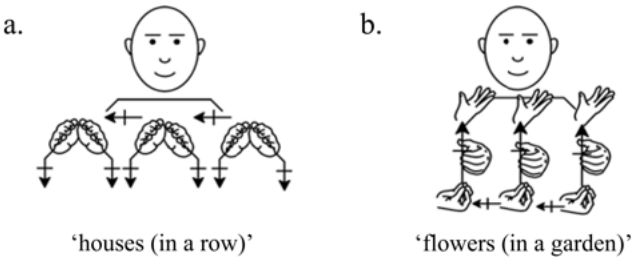


Fig.6.8: Sideward reduplication of midsagittal nouns in DGS. Copyright © 2005 by Buske Verlag. Reprinted with permission.

marked plural form, i.e. simple reduplication, blocks the simple plural interpretation. Like sideward reduplication of classifier verbs, sideward reduplication of midsagittal nouns does not only express a simple plurality of the entity the noun refers to, but also a specific spatial configuration of these entities. Again, more than two repetitions and the use of the whole sign space is possible.

The spatial interpretation of sideward reduplication of agreement and classifier verbs and certain nouns is clearly modality-specific. Since sign languages make use of the three-dimensional sign space, they have the unique potential to establish a relation between plural reduplication and spatial localization of referents (for similar observations in LIS, NGT, BSL, and TİD, cf. Pizzuto/Corazza 1996; Nijhof/Zwitserlood 1999; Sutton-Spence/Woll 1999; Zwitserlood/Perniss/Özyürek 2011).

5. Pluralization across modalities

Finally, in this section we compare the expression of plurality in sign languages to pluralization in spoken languages. First we discuss constraints on plural marking in spoken language before we turn to differences in the constraints on plural marking and in the output forms in both modalities.

5.1. Pluralization in spoken languages

Plural marking in spoken languages has some interesting similarities to plural marking in sign languages (for a detailed discussion of spoken languages, cf. Corbett 2000). As in sign languages, plural marking in spoken languages is determined by phonological properties of the noun stem. Moreover, many spoken languages also use reduplication to express the plural feature. In section 2, we have seen that reduplication is the basic means of plural marking in sign languages. Sideward reduplication has been described as a case of partial reduplication and simple reduplication as complete reduplication. Likewise, in spoken languages, pluralization can also be realized by means of partial and complete reduplication. Partial reduplication is illustrated in example (7a) from Ilokano, where only the first syllable of the bisyllabic stem is reduplicated (Hayes/

Abad 1989, 357). The example from Warlpiri in (7b) is an example of complete reduplication (Nash 1986, 130). Although both modalities use complete and partial reduplication as a means of plural marking, there are also two crucial differences: (i) only sign languages allow for sideward reduplication since they use a three-dimensional sign space and (ii) reduplication in sign languages usually involves two repetitions (i.e. triplication) whereas reduplication in spoken languages usually only involves one repetition (but see Blust (2001) for some rare examples of triplication in spoken languages).

(7)	a. púsa 'cat'	a'. pus-púsa 'cats'		[Ilokano]
	b. kurdu 'child'	b'. kurdu-kurdu 'children'		[Warlpiri]

There are two more obvious similarites between plural marking in both modalities: (i) both, sign and spoken languages, use zero marking and, (ii) the form of a plural morpheme may be determined by phonological properties of the stem. In German, for instance, zero marking is quite common (i.e. *Segel* ('sail' and 'sails') or *Fehler* ('mistake' and 'mistakes'). Phonological restrictions can be found, for instance, in English and Turkish. In English, the plural suffix /z/ assimilates the feature [±voice] of the preceding phoneme, i.e. [z] in *dogs* but [s] in *cats*). In Turkish, suffix vowels harmonize with the last vowel of the stem with respect to certain features. In pluralization, the relevant feature for the plural suffix *-ler* is [± back], i.e. *ev-ler* ('houses') but *çocuk-lar* ('children').

Besides these cross-modal similarities in nominal plural formation, there are two obvious differences between spoken and sign languages. First, many spoken languages, unlike sign languages, use affixation and word internal stem change as the basic means of plural inflection. Affixation is illustrated in the English and Turkish examples above. An example for stem change is the German word *Mütter*, which is the plural form of *Mutter* ('mother'). In this example, the plural is only marked by the umlaut, i.e. a stem internal vowel change. In sign languages, stem-internal changes, which are frequently observed in other morphological operations, are rarely used for plural marking. Simultaneous reduplication of the sign by the non-dominant hand (as attested, for instance, with some ÖGS signs) is an exception to this generalization. Likewise, sign languages do not use plural affixes – one exception might be the horizontal arc path movement that is used to express plurality in some sign languages (cf. section 2). The lack of affixation in plural marking in the visual-manual modality reflects a general tendency of sign languages to avoid sequential affixation (cf. Aronoff/Meir/Sandler 2005).

Second, in spoken languages, the choice of a plural form is not always constrained phonologically but grammatically (i.e. gender), semantically (i.e. semantically defined noun classes), or lexically (cf. Pfau/Steinbach 2006b). The choice of the plural form in German is, for instance, to a large extend idiosyncratic and not determined by phonological properties of the stem. This is illustrated by the German examples in (8). Although the two words in (8ab) have the same rhyme, they take different plural suffixes. In (8cd) we are dealing with two homonymous lexical items, which form their plural by means of different suffixes where only the former is accompanied by umlaut (cf. Köpke 1993; Neef 1998, 2000).

(8) a. Haus ‘house’ a’. Häus-er ‘houses’ [German]
b. Maus ‘mouse’ b’. Mäus-e ‘mice’
c. Bank ‘bench’ c’. Bänk-e ‘benches’
d. Bank ‘bank’ d’. Bank-en ‘banks’

A further difference concerns number agreement. Unlike in most sign languages, plurality can be realized more than once within a noun phrase in many spoken languages. The English example in (9a) illustrates that some determiners display at least number agreement with the head noun (but not with the adjective). The German example in (9b) illustrates that within the noun phrase, plurality is usually expressed on all elements on the left side of the head noun, i.e. the possessive and the adjective. Note that in both languages, the presence of a numeral does not block number agreement within the noun phrase.

(9) a. these (two) old cars [English]
b. mein-e zwei alt-en Auto-s [German]
1SG.POSS-PL two old-PL car-PL
‘my (two) old cars’

Other spoken languages pattern with sign languages. In Hungarian, for instance, the head noun can only be marked for plural if the noun phrase does not contain a numeral or quantifier, cf. (10) (Ortmann 2000, 251f). Hence, like in sign languages, plurality is only indicated once within the noun phrase in these languages. Hence, without numerals and quantifiers, only the head noun inflects for plural. Multiple realization of the plural feature within the noun phrase as in example (10c) leads to ungrammaticality (cf. Ortmann 2000, 2004).

(10) a. hajó
ship
‘ship’ a’. hajó-k
ship-PL
‘ships’ [Hungarian]
b. öt/sok hajó
five/many ship
‘five/many ships’ b’. *öt/sok hajó-k
five/many ship-PL
‘five/many ships’
c. gyors hajó-k
fast ship-PL
‘fast ships’ c’. *gyors-ak hajó-k
fast-PL ship-PL
‘fast ships’

Finally note that in some spoken languages, plural cannot be marked on the head noun but must be marked on other elements within the noun phrase. In Japanese, for instance, a noun does not morphologically inflect for the plural feature. Example (11a) illustrates that plurality is marked within the noun phrase by means of numerals or quantifiers, which are accompanied by numeral classifiers, cf. Kobuchi-Philip (2003). In Tagalog, plurality is also expressed within the noun phrase by means of a number word, i.e. *mga*, as illustrated in (11b), cf. Corbett (2000, 133f).

(11) a. [san-nin-no gakusei-ga] hon-o katta [Japanese]
3-CL-GEN student-NOM book-ACC bought
'Three students bought a book.'
b. mga bahay b'. mga tubig
PL house PL water [Tapalog]
'houses' 'cups/units of water'

Spoken languages like Japanese and Tagalog equal IPSL, where nouns cannot be reduplicated and the plural feature must be expressed by a numeral or quantifier. However, unlike in Japanese and Tagalog, in most sign languages, nouns can be overtly inflected for plural and numerals and quantifiers only block overt plural marking on the head noun within the noun phrase.

5.2. Output forms

So far, we discussed differences and similarities in the constraints on plural formation in spoken and sign languages. Now we turn to the output of plural formation. In plural formation, we do not only find examples of simple determination but also examples of under-, over-, and hyperdetermination of the plural feature. Let us first consider morphological underdetermination. Underdetermined plurals involve zero marking and are attested in both modalities. The second category, simple determination, is quite common in spoken languages since in affixation, stem internal change or reduplication, one morphological marker is usually used to expresses the plural feature overtly (i.e. an affix, a stem internal change, or a reduplicant respectively). By contrast, in sign language, there is no case of simple determination of the plural feature. Reconsider midsagittal nouns, which typically allow simple reduplication. At first sight, the plural form of the noun BOOK in Figure 6.3 above looks like a case of simple determination. The plural feature is only expressed once by means of reduplication. No additional morphological marker is used. However, as already mentioned above, in sign languages the base noun is not only repeated once but twice, i.e. it is triplicated. Actually, a single repetition of the base noun would be sufficient to express the plural feature. Therefore, triplication can be analyzed as an instance of the third category, i.e. overdetermination. In spoken languages, overdetermination usually involves double marking (i.e. stem change in combination with affixation) as illustrated in (8a'–c') above. Double marking clearly overdetermines the plural form since it would suffice to express the plural form by one marker only. The fourth category, hyperdetermination, is only attested in sign language pluralization. Recall that the plural form of lateral nouns such as CHILD in Figure 6.4 above combine triplication with sideward movement (i.e., the reduplicant is not faithful to the base with respect to location features). This type of double overdetermination can be categorized as an instance of hyperdetermination. While overdetermination of morphosyntactic categories (e.g., number, agreement, or negation) is quite common in spoken languages, hyperdetermination is rare.

The following table taken from Pfau and Steinbach (2006b, 176) summarizes the main similarities and differences in the strategies, quantities, and morphosyntax of plural marking in both modalities. Recall that affixation and stem change may not be

Tab. 6.2: Plural marking in spoken and sign languages

	spoken languages	*sign languages*
plural marking: strategy		
zero marking	√	√
affixation	√	–
reduplication	√	√
stem change	√	–
plural marking: quantity		
underdetermination	√	√
simple determination	√	–
overdetermination	√	√
hyperdetermination	??	√
expression of plural within the noun phrase		
use of numeral classifiers	√ / –	–
number agreement in the noun phrase	√ / –	√ / –

complete absent in sign languages. Nevertheless, both morphological operations are at least very rare.

5.3. The impact of modality

How can we account for the differences between spoken and sign languages discussed in the previous sections? The first obvious difference is that only spoken languages frequently use affixation in plural formation. We already mentioned that the lack of affixation in sign languages reflects a tendency of the visual-manual modality to avoid sequential affixation (cf. Aronoff/Meir/Sandler 2005). Moreover, the use of sign space in verb agreement and classifier verbs is also directly related to the unique property of the visual-manual modality to use a three-dimensional sign space in front of the signer to express grammatical or topographic relations. Another interesting difference is that the two basic plural marking strategies in sign languages involve either over- or hyperdetermination. Again, this difference seems to be due to specific properties of the visual-manual modality (cf. Pfau/Steinbach 2006b). Over- and hyperdetermination seem to increase the visual salience of signs in the sign space. Since much of the manual signing is perceived in peripheral vision, triplication as well as spatial displacement enhances phonological contrasts (cf. Siple 1978; Neville/Lawson 1987). In pluralization, nouns seem to exploit as many of these options as they can. This line of argumentation is supported by the claim that movements are functionally comparable to sonorous sounds in spoken language. Sign language syllables can be defined as consisting of one sequential movement. Triplication increases the phonological weight of the inflected sign (for syllables in sign language, see chapter 3 on phonology). Another determining factor might be that a fair number of signs already inherently involve lexical repetition. Hence, triplication distinguishes lexical repetition from morphosyntactic modification and is therefore a common feature in the morphosyntax of sign languages. Various

types of aspectual modification, for instance, also involve triplication (or even more repetitions, cf. chapter 9 on Tense, Aspect, and Modality).

The clear tendency to avoid number agreement within noun phrases in sign languages can be related to modality-specific properties of the articulators. Sign language articulators are relatively massive and move in the transparent sign space (Meier 2002). This is true especially for the manual articulators involved in plural reduplication. Therefore, an economy constraint might block reduplication of the head noun in noun phrases whenever it is not necessary to express the plural feature (i.e. if the noun phrase contains a numeral or quantifier). Likewise, the strong influence of phonological features on plural formation can be explained by these specific properties of the articulators. In sign languages, many morphological operations such as verb agreement, classification, or reciprocity depend on phonological properties of the underlying stem and many morphemes consist of just one phonological feature (cf. Pfau/Steinbach (2005a) and chapter 3, Phonology; for similar effects on the interface between phonology and semantics, cf. Wilbur (2010)).

6. Conclusion

We have illustrated that sign languages use various plural marking strategies in the nominal and verbal domain. In the nominal domain, plurals are typically formed by simple or sideward reduplication of the noun or by zero marking. Strictly speaking sign languages do not use reduplication but triplication, i.e. two repetitions of the base sign. Besides, some sign languages have specific strategies at their disposal such as an additional sweep movement, movement alternation or non-manual markers. In all sign languages investigated so far, the nominal strategies are basically constrained by phonological properties of the underlying nominal stem. Another typical property of many (but not all) sign languages is that plural reduplication of the head noun is blocked if the noun phrase contains a numeral or quantifier. Consequently, reduplication is only possible in bare noun phrases and therefore predicted to be infrequent. In the verbal domain, sign languages make use of the sign space to inflect agreement and classifier verbs for plural.

The comparison of sign languages to spoken languages has revealed that there are some common strategies of pluralization in both modalities but also some modality-specific strategies and restrictions. Among the strategies both modalities choose to mark plurality on nouns are reduplication and zero marking. By contrast, affixation and stem internal changes are a frequent means of spoken language pluralization but not (or only rarely) found in sign language pluralization. Another similarity between both modalities is that the choice of strategy may depend on phonological properties of the underlying noun. Moreover, in both modalities, noun phrase internal number agreement may be blocked. However, while in sign languages number agreement within the noun phrase seems to be the exception, number agreement is quite common in many spoken languages. And finally, while under- and overdetermination can be found in both modalities, simple determination is attested only in spoken languages and hyperdetermination only in sign languages.

Of course, much more research on the typology of pluralization in sign languages is necessary in order to document and understand the extent of phonological, morphological, and syntactic variation across different sign languages and across spoken and sign languages.

7. Literature

Aronoff, Mark/Meir, Irit/Sandler, Wendy
2005 The Paradox of Sign Language Morphology. In: *Language* 81, 301–344.
Baker-Shenk, Charlotte/Cokely, Dennis
1980 *American Sign Language: A Teacher's Resource Text on Grammar and Culture*. Silver Spring, MD: T.J. Publishers.
Benedicto, Elena/Brentari, Diane
2004 Where Did All the Arguments Go? Argument-changing Properties of Classifiers in ASL. In: *Natural Language & Linguistic Theory* 22, 743–810.
Blust, Robert
2001 Thao Triplication. In: *Oceanic Linguistics* 40, 324–335.
Corbett, Greville G.
2000 *Number*. Cambridge: Cambridge University Press.
Cormier, Kearsy
2007 Do All Pronouns Point? Indexicality of First Person Plural Pronouns in BSL and ASL. In: Perniss, Pamela/Pfau, Roland/Steinbach, Markus (eds.), *Visible Variation: Comparative Studies on Sign Language Structure*. Berlin: Mouton de Gruyter, 63–101.
Fernández-Viader, María del Pilar/Fuentes, Mariana
2008 The Systems of Numerals in Catalan Sign Language (LSC) and Spanish Sign Language (LSE): A Comparative Study. In: Quadros, Ronice M. de (ed.), *Sign Languages: Spinning and Unraveling the Past, Present, and Future. Forty-five Papers and Three Posters from the 9th Theoretical Issues in Sign Language Research Conference, Florianopolis, Brazil, December 2006*. Petrópolis: Editora Arara Azul. [Available at: www.editora-arara-azul.com.br/EstudosSurdos.php].
Fuentes, Mariana/Massone, María Ignacia/Fernández-Viader, María del Pilar/Makotrinsky, Alejandro/Pulgarín, Francisca
2010 Numeral-incorporating Roots in Numeral Systems: A Comparative Analysis of Two Sign Languages. In: *Sign Language Studies* 11, 55–75.
Harder, Rita
2003 *Meervoud in de NGT*. Manuscript, Nederlands Gebarencentrum.
Hayes, Bruce/Abad, May
1989 Reduplication and Syllabification in Ilokano. In: *Lingua* 77, 331–374.
Heyerick, Isabelle/Braeckevelt, Mieke van
2008 *Rapport Onderzoeksmethodologie Meervoudsvorming in Vlaamse Gebarentaal*. Vlaamse GebaarentaalCentrum (vgtC), Antwerpen.
Heyerick, Isabelle/Braeckevelt, Mieke van/Weerdt, Danny de/Van der Herreweghe, Mieke/Vermeerbergen, Myriam
2009 Plural Formation in Flemish Sign Language. Paper Presented at *Current Research in Sign Linguistics (CILS)*, Namur.
Iversen, Wiebke
2008 *Keine Zahl ohne Zeichen. Der Einfluss der medialen Eigenschaften der DGS-Zahlzeichen auf deren mentale Verarbeitung*. PhD Dissertation, University of Aachen.

Iversen, Wiebke/Nuerk, Hans-Christoph/Jäger, Ludwig/Willmes, Klaus
2006 The Influence of an External Symbol System on Number Parity Representation, or What's Odd About 6? In: *Psychonomic Bulletin & Review* 13, 730–736.
Iversen, Wiebke/Nuerk, Hans-Christoph/Willmes, Klaus
2004 Do Signers Think Differently? The Processing of Number Parity in Deaf Participants. In: *Cortex* 40, 176–178.
Jones, M./Mohr, K.
1975 *A Working Paper on Plurals in ASL*. Manuscript, University of California, Berkeley.
Kobuchi-Philip, Mana
2003 Syntax and Semantics of the Japanese Floating Numeral Quantifier. Paper Presented at *Incontro di Grammatica Generativa XXIX*, Urbino.
Köpcke, Klaus-Michael
1993 *Schemata bei der Pluralbildung im Deutschen: Versuch einer kognitiven Morphologie*. Tübingen: Narr.
Kubuş, Okan
2008 *An Analysis of Turkish Sign Language (TID) Phonology and Morphology*. MA Thesis, The Middle East Technical University, Ankara.
Leybaert, Jacqueline/Cutsem, Marie-Noelle van
2002 Counting in Sign Language. In: *Journal of Experimental Child Psychology* 81, 482–501.
McBurney, Susan Lloyd
2002 Pronominal Reference in Signed and Spoken Language: Are Grammatical Categories Modality-dependent? In: Meier, Richard/Cormier, Kearsy/Quinto-Pozos, David (eds.), *Modality and Structure in Signed and Spoken Languages*. Cambridge: Cambridge University Press, 329–369.
McKee, David/McKee, Rachel/Major, George
2008 Sociolinguistic Variation in NZSL Numerals. In: Quadros, Ronice M. de (ed.), *Sign Languages: Spinning and Unraveling the Past, Present, and Future. Forty-five Papers and Three Posters from the 9th Theoretical Issues in Sign Language Research Conference, Florianopolis, Brazil, December 2006*. Petrópolis: Editora Arara Azul. [Available at: www.editora-arara-azul.com.br/EstudosSurdos.php].
Mathur, Gaurav/Rathmann, Christian
2001 Why not 'GIVE-US': An Articulatory Constraint in Sign Languages. In: Dively, Valerie/Metzger, Melanie/Taub, Sarah/Baer, Anne-Marie (eds.), *Signed Languages: Discoveries from International Research*. Washington, DC: Gallaudet University Press, 1–26.
Mathur, Gaurav/Rathmann, Christian
2010 Verb Agreement in Sign Language Morphology. In: Brentari, Diane (ed.), *Sign Languages (Cambridge Language Surveys)*. Cambridge: Cambridge University Press, 173–196.
Mathur, Gaurav/Rathmann, Christian
2011 Two Types of Nonconcatenative Morphology in Signed Language. In: Mathur, Gaurav/Napoli, Donna Jo (eds.), *Deaf Around the World*. Oxford: Oxford University Press, 54–82.
Meier, Richard
2002 Why Different, Why the Same? Explaining Effects and Non-effects of Modality Upon Linguistic Structure in Sign and Speech. In: Meier, Richard/Cormier, Kearsy/Quinto-Pozos, David (eds.), *Modality and Structure in Signed and Spoken Languages*. Cambridge: Cambridge University Press, 1–25.
Neef, Martin
1998 The Reduced Syllable Plural in German. In: Fabri, Ray/Ortmann, Albert/Parodi, Teresa (eds.), *Models of Inflection*. Tübingen: Niemeyer, 244–265.
Neef, Martin
2000 Morphologische und syntaktische Konditionierung. In: Booij, Geert et al. (ed.), *Morphologie: Ein internationales Handbuch zur Flexion und Wortbildung*. Berlin: de Gruyter, 473–484.

Neville, Helen J./Lawson, Donald S.
1987 Attention to Central and Peripheral Visual Space in a Movement Detection Task: An Event-related Potential and Behavioral Study (Parts I, II, III). In: *Brain Research* 405, 253–294.
Nijhof, Sibylla/Zwitserlood, Inge
1999 Pluralization in Sign Language of the Netherlands (NGT). In: Don, Jan/Sanders, Ted (eds.), *OTS Yearbook 1998–1999*. Utrecht: Utrechts Instituut voor Linguistiek OTS, 58–78.
Ortmann, Albert
2000 Where Plural Refuses to Agree: Feature Unification and Morphological Economy. In: *Acta Linguistica Hungarica* 47, 249–288.
Ortmann, Albert
2004 A Factorial Typology of Number Marking in Noun Phrases: The Tension of Economy and Faithfulness. In: Müller, Gereon/Gunkel, Lutz/Zifonun, Gisela (eds.), *Explorations in Nominal Inflection*. Berlin: Mouton de Gruyter, 229–267.
Perniss, Pamela
2001 *Numerus und Quantifikation in der Deutschen Gebärdensprache*. MA Thesis, University of Cologne.
Perry, Deborah
2004 *The Use of Reduplication in ASL Plurals*. MA Thesis, Boston University.
Pfau, Roland/Steinbach, Markus
2003 Optimal Reciprocals in German Sign Language. In: *Sign Language & Linguistics* 6, 3–42.
Pfau, Roland/Steinbach, Markus
2005a Backward and Sideward Reduplication in German Sign Language. In: Hurch, Bernhard (ed.), *Studies on Reduplication*. Berlin: Mouton de Gruyter, 569–594.
Pfau, Roland/Steinbach, Markus
2005b Plural Formation in German Sign Language: Constraints and Strategies. In: Leuninger, Helen/Happ, Daniela (eds.), *Gebärdensprache. Struktur, Erwerb, Verwendung* (*Linguistische Berichte* Special Issue 13). Opladen: Westdeutscher Verlag, 111–144.
Pfau, Roland/Steinbach, Markus
2006a Modality-independent and Modality-specific Aspects of Grammaticalization in Sign Languages. In: *Linguistics in Potsdam* 24, 5–94.
Pfau, Roland/Steinbach, Markus
2006b Pluralization in Sign and in Speech: A Cross-modal Typological Study. In: *Linguistic Typology* 10, 135–182.
Pfau, Roland/Steinbach, Markus
2011 Grammaticalization in Sign Languages. In: Heine, Bernd/Narrog, Heiko (eds.), *Handbook of Grammaticalization*. Oxford: Oxford University Press, 681–693.
Pizzuto, Elena/Corazza, Serena
1996 Noun Morphology in Italian Sign Language. In: *Lingua* 98, 169–196.
Sandler, Wendy
1999 The Medium and the Message: Prosodic Interpretation of Linguistic Content in Israeli Sign Language. In: *Sign Language & Linguistics* 2(2), 187–215.
Schmaling, Constanze
2000 *Maganar Hannu, Language of the Hands: A Descriptive Analysis of Hausa Sign Language*. Hamburg: Signum.
Siple, Patricia
1978 Visual Constraints for Sign Language Communication. In: *Sign Language Studies* 19, 97–112.
Skant, Andrea/Dotter, Franz/Bergmeister, Elisabeth/Hilzensauer, Marlene/Hobel, Manuela/Krammer, Klaudia/Okorn, Ingeborg/Orasche, Christian/Orter, Reinhold/Unterberger, Natalie
2002 *Grammatik der Österreichischen Gebärdensprache*. Klagenfurt: Forschungszentrum für Gebärdensprache und Hörgeschädigtenkommunikation.

Stavans, Anat
1996 One, Two, or More: The Expression of Number in Israeli Sign Language. In: *International Review of Sign Linguistics* 1, 95–114.
Sutton-Spence, Rachel/Woll, Bencie
1999 *The Linguistics of British Sign Language: An Introduction*. Cambridge: Cambridge University Press.
Valli, Clayton/Lucas, Ceil
1992 *Linguistics of American Sign Language: An Introduction*. Washington, DC: Gallaudet University Press.
Wilbur, Ronnie
1987 *American Sign Language: Linguistic and Applied Dimensions.* Boston: Little, Brown & Co.
Wilbur, Ronnie
2010 The Semantics-Phonology Interface. In: Brentari, Diane (ed.), *Sign Languages (Cambridge Language Surveys)*. Cambridge: Cambridge University Press, 357–382.
Zeshan, Ulrike
2000 *Sign Language in Indo-Pakistan: A Description of a Signed Language.* Amsterdam: Benjamins.
Zwitserlood, Inge
2003 *Classifiying Hand Configurations in Nederlandse Gebarentaal*. Utrecht: LOT.
Zwitserlood, Inge/Perniss, Pamela/Aslı Özyürek
2011 *An Empirical Investigation of Plural Expression in Turkish Sign Language (TID): Are There Modality Effects?* Manuscript, Radboud University Nijmegen and Max Planck Institute for Psycholinguistics, Nijmegen.

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7. Verb agreement

Abstract

This chapter compares several theoretical approaches to the phenomenon often labeled 'verb agreement' in sign languages. The overall picture that emerges is that cross-modally, there are both similarities and differences with respect to agreement. Sign languages seem to be similar to spoken languages in that they realize the person and number features of the arguments of the verbs through agreement, suggesting an agreement process that is