

Josep Quer* and Markus Steinbach

Ambiguities in sign languages

Abstract: Natural languages come in two different modalities – the aural-auditory modality of spoken languages and the visual-gestural modality of sign languages. The impact of modality on the grammatical system has been discussed at great length in the last 20 years. By contrast, the impact of modality on semantics in general and on ambiguities in particular has not yet been addressed in detail. In this paper, we deal with different types of ambiguities in sign languages. We discuss typical lexical and structural ambiguities as well as modality-specific aspects such as ambiguities in the use of the signing space and non-manual markers. In addition, we address the questions how sign languages avoid ambiguities and to what extent certain kinds of ambiguities and non-ambiguities depend on the visual-manual modality of sign languages. Since gestures use the same articulatory channel that is also active in the production of signs, we also discuss ambiguities between gestures on the one hand and grammaticalized gestures and signs on the other.

Keywords: modality and meaning, conjunction, plurality of relations, role shift, signing space

DOI 10.1515/tlr-2014-0018

1 Introduction

Natural languages have two modalities at their disposal, the oral-auditory modality of spoken languages and the visual-gestural modality of sign languages. Although the two modalities clearly differ in the production and perception of linguistic signals, the underlying linguistic structures are very similar across both modalities (Meier 2002, 2012, Sandler and Lillo-Martin 2006). Nevertheless, sign languages retain some modality-specific properties that may affect linguistic structure (Meier 2002; Aronoff et al. 2005; Pfau and Steinbach 2006a). Three differences, which are crucial for this paper, are the possibility to express

*Corresponding author: **Josep Quer:** University Pompeu Fabra. E-mail: josep.quer@upf.edu
Markus Steinbach: University of Göttingen. E-mail: markus.steinbach@phil.uni-goettingen.de

grammatical features simultaneously, the gestural basis of sign languages, and the availability of a three-dimensional signing space.

First, sign languages can grammaticalize and integrate gestural elements, since the gestural system uses the same modality and the interface between the grammatical system of sign languages and the gestural system is permeable (Liddell 2003; Emmorey 1999; Pfau and Steinbach 2006a, 2011). By contrast, there is little transparency between the signals used in auditory communication and their meaning (onomatopoeia is one marginal exception). Likewise, spoken languages cannot directly integrate gestural elements into their grammatical system because there is no overlap in modality. Second, sign languages employ various articulators such as the hands, the upper part of the body, the head, and the face simultaneously. And third, sign languages actively use the geometrical properties of the three-dimensional signing space to realize morphosyntactic, semantic, and pragmatic categories.

One important aim of this paper is to illustrate the impact of modality on semantics in general and on ambiguities in particular. Up to now, most linguistic studies have mainly discussed modality-specific formal grammatical properties of sign languages that follow from the three modality-specific properties introduced in the previous paragraph. However, with some notable exceptions like Liddell (2003), Zucchi (2009, 2012), Wilbur (2010), Schlenker (2011, 2013), Barberà (2012), Schlenker et al. (2013), Onea and Steinbach (2013), and Pfau and Steinbach (2013b), the impact of modality on semantics has not yet been addressed in detail. Moreover, the existence of lexical and structural ambiguity in sign languages has only been discussed in an indirect way so far. The present article constitutes thus the first attempt to delve into this topic by reviewing some representative instances of the phenomenon of (non-)ambiguity in the visual-gestural modality.

We focus on ambiguities and the impact of modality on ambiguities in sign languages. We discuss some selected case studies at different levels of grammar (lexicon, morphosyntax, and discourse) to illustrate how ambiguous items look like in sign languages. Some of the ambiguities discussed below do not depend on modality, i.e. they are modality-independent. However, other ambiguities clearly result from modality-specific properties of the linguistic system of sign languages. In addition, we also address interesting cases of non-ambiguities, that is, examples that are typically ambiguous in spoken languages but disambiguated in sign languages because of modality-specific factors.

This paper is organized as follows. In Section 2 we address some (non-)ambiguities on the lexical level, including manual and non-manual elements as well as lexical and functional expressions. In addition, we discuss

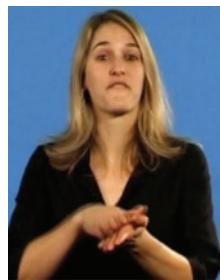
the relation between gestures and signs and ambiguities at the gesture/sign interface. In Section 3, we turn to the next level and discuss four examples of morphosyntactic (non-)ambiguities in sign languages: (i) plurality of relations, (ii) conjunction and disjunction, (iii) quantifier scope ambiguities, and (iv) ambiguities in ellipsis. Section 4 deals with semantic and pragmatic aspects of the modality-specific use of the signing space such as the topographic and anaphoric interpretation of the signing space and the use of the signing space to express reported speech. Finally, Section 5 briefly summarizes the main findings of this paper and comes back to the impact of modality on meaning.

2 (Non-)ambiguity at the sign level

In this section we briefly discuss several dimensions of lexical ambiguities in sign languages. Just like spoken languages, sign languages have many (manual) lexical items that are ambiguous or multifunctional. Some of them are mere homonyms, others are semantically underspecified and show a systematic ambiguity. Unlike spoken languages, sign languages can, however, use additional non-manual articulators such as the mouth or the face to disambiguate ambiguous lexical items. As a consequence, many manually ambiguous signs may be disambiguated by additional phonological features. One prominent disambiguating feature is mouthing, i.e. the co-articulation of phonological components of the corresponding word in the surrounding spoken language (Boyes Braem and Sutton-Spence 2001). In Figure 1, this is illustrated for an ambiguous sign in German Sign Language (DGS). The same manual sign can mean either ‘marmalade’ or ‘color’ among other meanings. The only distinctive feature between the two



‘marmalade’



‘color’

Fig. 1: Disambiguating mouthings in DGS (cf. Kestner 2009)

meanings in Figure 1 is the mouthing accompanying the sign. In the left picture, the signer produces the labial nasal /m/ (i.e. the first sound of the corresponding German word *Marmelade*, i.e. ‘marmalade’). By contrast, in the right picture the signer produces the fricative /f/, which is the first sound of the German word *Farbe*, i.e. ‘color’.

In sign languages, mouthings can be analyzed as cross-modal loan elements since the mouth actions are constrained by the articulatory features of the corresponding spoken word used in the surrounding hearing community. Mouthings are used to disambiguate semantically unrelated homonymous signs as illustrated in Figure 1. They can also be used to disambiguate semantically related homonymous signs such as signs denoting co-hyponyms (for instance the signs *DOG* or *BIRD*, which are used to refer to different kinds of birds or dogs). Note, though, that mouthings are not attested in all sign languages. In addition, mouthings are usually optional, i.e. depending on context and register signers may use an ambiguous sign without mouthing. Depending on the view about the lexical status of mouthings, one may either argue that mouthings are additional disambiguating features that do not belong to the (ambiguous) lexical entry of the manual sign but are realized simultaneously with the manual sign as a means of disambiguation or that mouthings are a proper phonological part of a non-ambiguous lexical entry (Brentari 1998).

A related type of non-manual marker used to disambiguate or semantically specify signs is mouth gesture. In DGS, signs indicating the distance between two locations can be accompanied by different mouth gestures (tongue protrusion, neutral position, open mouth) specifying the distance between the locations. In opposition to mouthings, mouth gestures are not loan expressions borrowed from the surrounding spoken language but modality-specific grammatical markers.

Another kind of lexical ambiguity found in sign languages is the specification of parts of speech and plural inflection. In many sign languages, signs are ambiguous between a verbal and nominal interpretation and many nouns do not have overt plural forms (cf. Pfau and Steinbach 2006b). The corresponding interpretation depends on the syntactic and semantic context the sign is used in. Note that this kind of ambiguity is not modality-specific since it is also found in many spoken languages.

Ambiguity does not only affect lexical signs but also functional signs such as for example the pointing sign *INDEX*, which can be interpreted as a demonstrative, indefinite, possessive, and definite determiner, and pronoun (cf. Pfau 2010 and Section 4 below). There might be subtle differences in the non-manuals accompanying the sign as well as in the kind of movement the sign is produced with (e.g. more tensed or more lax movement). If we can find such subtle but system-

atic differences in the non-manuals and the kind of movement, these devices may have a disambiguation function with the pointing sign INDEX. However, more research is necessary to decide this issue.

Similarly, in DGS, the sign PERSON/PAM, which is produced with a L-handshape (the so-called BabyC-handshape) and a downward movement, can be used to refer to a person, to localize a new discourse referent (referring to humans) in signing space, and to express agreement with plain verbs (see Pfau and Steinbach 2013a and footnote 3 below). Similar ambiguities can also be observed for (underspecified) non-manual functional markers such as brow raise, which is typically used to mark yes/no questions, topics, and conditionals among others (cf. Janzen 1999, Pfau and Steinbach 2006a – but see Wilbur and Patschke 1999 for a syntactic analysis of brow raise as an overt marker of the Specifier position of a [-wh] operator and Wilbur 2011 for a semantic analysis of brow raise as a marker of the restrictor of dyadic operators).

Finally, we would like to mention two modality-specific sources of ambiguities: First, ambiguities may be triggered by the use of the signer's body as subject (cf. Meir et al. 2007). The signer can use his or her body to refer to the acting subject of the sentence. In this case, pointing signs and verb agreement are ambiguous between a first person (signer) and a third person (subject) interpretation. In Section 4 we come back to specific uses of body as subject in more detail. Second, some signs have a gestural origin, since sign languages have the unique possibility of integrating and grammaticalizing manual and nonmanual gestures. Recall that gestures use the same articulatory channel that is also active in the production of signs. Therefore, it is not uncommon for gestures to become grammaticalized in sign languages. As a consequence, it is not always easy to distinguish between co-speech gestures and lexical and functional signs. A typical example is the so-called 'palm-up' gesture which is frequently used in spoken languages. In some sign languages, this gesture has developed into a related functional sign PALM-UP used as a multifunctional discourse marker indicating turn taking, backchanneling, or questions among others (cf. Loon et al. 2013). Consequently, it is not always possible to decide whether in sign languages the use of palm-up is gestural or grammatical.

3 Morphosyntactic (non-)ambiguities

This section concentrates on four different phenomena where (non-)ambiguities arise under specific morphosyntactic conditions: plurality of relations, coordination and scalar implicatures, relative quantifier scope, and ellipsis.

3.1 Plurality of relations

Numerous unrelated spoken languages show a systematic ambiguity of reciprocal markers, which are not only used to encode typical reciprocal relations between two or more entities, but are also commonly used to encode spatial and sociative (collective) relations. This is illustrated by the examples from English in (1) and Itelmen in (2). In English, the reciprocal marker *each other* marks a reciprocal (1a), spatial (1b), and sociative (1c) interpretation. The last two interpretations involve the additional use of a preposition. In the spatial interpretation, the reciprocal marker is combined with a spatial preposition such as for example *next to* in (1b). The sociative interpretation is expressed by the combination of the reciprocal marker with the preposition *with* (1c).

- (1) a. The children love each other.
 b. The books lie next to each other.
 c. The children play with each other.

In Itelmen, all three interpretations can be directly expressed with the same reciprocal marker, i.e. the verbal prefix *lo-* (Volodin 2007: 1830f), as is illustrated in (2).

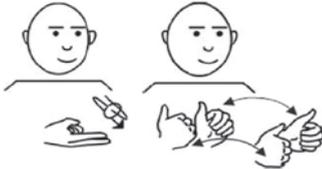
- (2) a. *lčko-s* ('to see sb') → **lo-lčko-ka-s** ('to see each other')
 b. *°sol-ka-s* ('to lie') → **lo-°sol-ka-s** ('to lie next to each other')
 c. *ma-ʔl-ka-s* ('to play') → **lo-ma-ʔl-ka-s** ('to play with each other')

Lichtenberk (1985, 2000) subsumes these three interpretations of a reciprocal marker under the label 'plurality of relations', which describes situations in which two or more participants or objects entertain a mutual relation with each other such that (typically) every participant or object is at the same time actor and undergoer of this relation. Across typologically diverse spoken languages, one ambiguous reciprocal marker can be used to encode the interpretations illustrated in (1) and (2) (cf. Lichtenberk 2000; Nedjalkov 2007). Hence, in spoken languages, the polysemy of reciprocal markers is the rule and not the exception (note, however, that spoken languages also have alternative strategies at their disposal).

Interestingly, sign languages, unlike spoken languages, do not use one semantically underspecified reciprocal marker to express the three interpretations subsumed under the notion plurality of relations but quite different modality-specific strategies (cf. Pfau and Steinbach 2013b). A crucial factor motivating the attested differences between spoken and sign languages is the

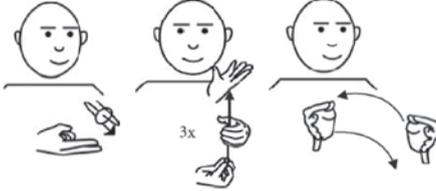
unique potential of sign languages to use signing space to express grammatical and semantic information. Instead of one ambiguous reciprocal marker that is used for all three interpretations described above, we find different (unambiguous) strategies. In Section 4, we come back the semantics and pragmatics of signing space in more detail.

First, the reciprocal interpretation is expressed by a specific simultaneous inflection pattern, which is not attested for spoken languages: sequential and simultaneous backward reduplication of the verb. We briefly illustrate this strategy with two simple examples involving two participants (for a more detailed discussion of the patterns, see Pfau and Steinbach 2003, 2006b). In German Sign Language (DGS), like in many other sign languages, the reciprocal form of the two-handed agreement *HELP* in (3) is realized by sequential backward reduplication, that is, with a parallel movement of both hands from the local index of the subject (i.e. 1) to the local index of the object (i.e. 2) and then back to the local index 1.¹

- (3)
- 
- RH: WE-TWO 1HELP₂HELP₁
 LH: 1HELP₂HELP₁
 'We are helping each other.'

Interestingly, the one-handed agreement verb *GIVE* in (4) makes use of an even more modality-specific strategy since it does not realize the backward reduplication by an additional sequential movement but by a simultaneous movement of the non-dominant hand.

¹ Notational conventions: All sign language examples are glossed in English with small caps. Subscript numbers refer to points in the signing space: 1 = towards signer's chest, 2 = towards addressee, 3 = towards non-signer, non-addressee. The scope, i.e. onset and offset, of grammatical non-manual markers is indicated by the line above the gloss (br = brow raise, t = topic, hs = negative headshake . . .); # VERB_# (verb agreeing with subject and object; the number before the verb refers to the grammatical person of the former and the one after the verb refers to the latter); IX_a (locative index pointing to locus *a*); IX_# (pronominal index; the number corresponds to person); +++ (reduplication of the sign); CL- = classifier construction; SaSS = size and shape specifier.

- (4)
- 
- RH: WE-TWO FLOWER++ ₁GIVE₂
 LH: FLOWER ₂GIVE₁
 ‘We are giving flowers to each other.’

Second, the sociative interpretation is expressed by an adverbial strategy (5), which is also attested in spoken languages. In spoken languages, this strategy usually co-exists with the use of a reciprocal marker. By contrast, in sign languages, the use of a sociative adverbial such as TOGETHER in DGS is the only strategy available to express the sociative function.

- (5) a. GARDEN INDEX₃, CHILD++ _{3a}TOGETHER_{3b} PLAY
 ‘The children are playing with each other in the garden.’
 b. YESTERDAY PARTY, POSS₁ PARENTS _{3a}TOGETHER_{3b} DANCE
 ‘Yesterday at the party, my parents danced with each other.’

And finally, the spatial interpretation is expressed by spatial modification of a classifier handshape as illustrated in (6). Again, this verbal strategy is modality-specific, since it makes semantic use of the signing space: spatial relations between discourse referents in signing space correspond to topographic relations of the corresponding referents in real world. Unlike many spoken languages, sign languages use hardly ever spatial prepositions because spatial relations between entities can be iconically realized in signing space by means of entity classifiers (cf. Perniss 2007).

- (6)
- 
- RH: MAN BROWN HAT CL(man):locR
 LH: CL(man):locL
 ‘Two men with brown hats are standing next to each other.’

We conclude that sign languages employ different strategies to express the three interpretations subsumed under the notion ‘plurality of relations’, some of which are clearly modality-specific. None of these strategies involves a pronominal reciprocal marker – a pattern that is in striking contrast to the one found in many spoken languages, which use a single ambiguous reciprocal marker yielding a reciprocal, sociative, and spatial reading. The relation between semantics and morphosyntax observed in sign languages is typologically interesting for two reasons: (i) sign languages make systematic use of the specific grammatical and semantic strategies made available by the visual-gestural modality; (ii) these strategies enable sign languages to avoid systematic ambiguities in the area of plurality of relations observed in many spoken languages. We will see, however, in the next subsection, that the use of signing space does not prevent ambiguities in sign languages in principle. Non-manual coordination, for instance, also systematically uses the signing space. Nevertheless, it is ambiguous between a conjunctive and a disjunctive reading. Interestingly, both interpretations are not disambiguated in space.

3.2 Coordination

Davidson (2011, 2013) discusses an interesting ambiguity of two general coordinators in American Sign Language (ASL), i.e. the manual coordinator COORD-L on the left in Figure 2 and the non-manual coordinator COORD-SHIFT on the right. The latter involves a slight shift of the location in the signing space as indicated in the two pictures on the right.

In ASL, like in some spoken languages, the same coordinator can be used to express conjunction and disjunction. Consequently, a sentence such as MARY WANT TEA COORD COFFEE containing one of the two general coordinators illustrated in Figure 2 is ambiguous between the conjunctive interpretation ‘Mary wants tea and coffee’ and the disjunctive interpretation ‘Mary wants tea or coffee’.



Fig. 2: Manual and non-manual general coordinators in ASL (cf. Davidson 2013)

The disambiguation between these two interpretations is constrained by various semantic and pragmatic aspects such as the content of the sentence, the context, the conversational environment, discourse particles, and non-manual markings supporting one of the two interpretations. This is illustrated by the following two examples taken from Davidson (2013: 7). The coordinator in the first sentence can only be interpreted as ‘or’ because of the interrogative coda ‘I’m not sure which’. By contrast, the second sentence is only compatible with a conjunctive reading, which is favored by the general initial question and the propositional content.

- (7) a. COORD-L₁ [POSS_a PARENTS WILL BUY POSS_a CAR] COORD-L₂ [IX_a WILL TRAVEL],
DON’T-KNOW WHICH.
‘Her parents will buy her car or she will travel, I’m not sure which.’
- b. HAPPEN? COORD-L₁ [POSS_a PARENTS WILL BUY POSS_a CAR] COORD-L₂ [IX_a WILL TRAVEL].
‘What will happen? Her parents will buy her car, and (then) she will travel.’

Davidson shows that the ambiguity of the coordinators COORD-L and COORD-SHIFT is not a case of lexical ambiguity. Instead, she argues that the conjunctive or disjunctive interpretation can be derived from a single underlying lexical entry for each of the two coordinators, which are interpreted as functions of set union. The specific interpretation of the coordinator is then derived in a second step by a general semantic operation of adding a quantifier (universal or existential) binding the sets of clausal alternatives. While existential quantification yields a disjunctive reading, universal quantification triggers a conjunctive interpretation. Importantly, the operator is not licensed by the coordinator itself but by the external factors mentioned above. Moreover, Davidson provides evidence against the assumption that the ‘stronger’ conjunctive reading is derived from the ‘weaker’ disjunctive one by pragmatic strengthening, that is, according to Davidson (2013), conjunction in ASL is not a case of pragmatic enrichment (i.e. a scalar implicature) but of semantic ambiguity.

3.3 Quantifier scope ambiguities

The visual-gestural modality of sign languages might be a priori assumed to impose overt marking of semantic interactions that often remain covert in spoken ones and can only be derived from underlying syntactic hierarchy. An English sentence such as (8) is taken to ambiguously encode two distinct interpretations

depending on the scope interaction of the two quantified arguments. The ambiguity is roughly represented in (8i) and (8ii):

- (8) Two students have talked with every teacher.
- (i) ‘There are two students such that each has talked with every teacher.’
 - (ii) ‘For every teacher, there are two possibly different students that have talked with him/her.’

Under interpretation (i), the indefinite subject has scope over the universally quantified object, so it describes a situation where the same two students have talked with all the teachers. In contrast, interpretation (ii) reflects a situation where every teacher might have talked to two (possibly) different students, and this is considered the result of the universally quantified object taking scope over the subject. While the former scope relation reflects surface order, the latter does not. This is what prompted an explanation based on covert movement at LF for the object to take scope over the subject (May 1985), namely, quantifier-raising, something that in English is only detectable through the interpretation obtained, not in the form of the sentence.

A comparable sentence in Catalan Sign Language (LSC) such as (9) seems to be unambiguous, though. This is due to the fact that the distribution of the subject set over the object set is marked overtly with the reduplication morpheme, which consists in a short sideward repetition of the form on the horizontal plane. In (9), it appears not only on the numeral ONE associated with the subject and the possessive pronoun of the object, but also in the agreeing verb morphology.

- _____ br
- (9) STUDENT ONE+++ TEACHER POSS+++ ASK+++
 ‘Each student asked his/her teacher.’

However, this does not mean that relative scope is always marked overtly in sign languages. Take for instance (10).

- _____ br
- (10) STUDENT NEW GROUP+++ PROFESSOR TWO GUIDE
- (i) ‘There are two professors such that each has shown all the new groups of students around.’
 - (ii) ‘For every new group of students, there are two (possibly) different professors that have shown them around.’

Here, the scope interaction does not seem to be affected by the surface order of the two quantified DPs. Notice that the object is realized as a topic (marked with

brow raise), but its scope is not frozen, as it can have both wide and narrow scope with respect to the indefinite subject DP.

For ASL, bare nouns have been shown to enter scope interactions with quantified DPs that give rise to different interpretations, as reflected in (11) (Petronio 1995: 607).

- _____t
- (11) BOOK, TWO STUDENT BUY.
- (i) ‘Two students each bought a book.’
 - (ii) ‘Two students together bought a book.’
 - (iii) ‘Two students bought books.’

Without a context, the preferred interpretation is (i), but with added context the other two readings are also possible. Putting aside what the proper analysis of bare nouns in ASL might be, it is clear that scope interactions arise under one and the same overt linear order of the quantified expressions. However, sign languages do differ as to the range of ambiguity they display and thus, a comparable example such as (11) in LSC can only mean (ii). For the readings (i) and (iii), morphological marking on the verb would be required: dual and random reduplication (allocative) morphology, respectively.

3.4 Ellipsis

Ellipsis is a further domain where ambiguity can typically arise. Given the right structural conditions, the ellipsis site can find more than one antecedent, giving rise to two possible interpretations. For an elided bound pronoun, for instance, two possible readings are in principle possible: the sloppy one, where the pronoun is interpreted as bound by its immediate antecedent, and the strict one, where it is interpreted with the reference of the non-elided one. The possibility of strict and sloppy readings in SLs has been identified in SLs such as ASL (Koulidobrova 2011), Finnish SL (Jantunen 2013), LIS (Cecchetto et al. 2013) and LSC (Quer and Rosselló 2013). In particular, LSC allows for argument ellipsis both with plain (12) and uninflected (13) agreement verbs and such ellipsis licenses strict and sloppy interpretations.²

² In sign languages, verb agreement is locus agreement. Discourse referents are linked to loci in the signing space, which are used to express subject and object agreement on verbs by modification of the verb's movement features. However, not all verbs in sign languages can express agreement overtly. Most verbs are so-called plain verbs, which are characterized by the fact that they

- (12) PEDRO_i SON POSS_i LOVE. JUAN_j ALSO LOVE
 ‘Pedro loves his son.
 (i) Juan also loves = Juan loves Pedro’s son.’ [strict]
 (ii) Juan also loves = Juan loves Juan’s son.’ [sloppy]
- (13) PEDRO_i SON POSS_i EDUCATE JUAN_j ALSO EDUCATE
 ‘Pedro educates his son.
 (i) Juan_j also educates = Juan educates Pedro’s son.’ [strict]
 (ii) Juan_j also educates = Juan educates Juan’s son.’ [sloppy]

Nevertheless, if the elliptical conjunct contains a verb with overt agreement morphology, then overt disambiguation is at play. In this sense, the use of morphological resources associated with loci reduces the potential ambiguity, in the same way that a richer feature specification does in spoken languages like English (cf. *Pedro loves his son, and Mary hers too*).

The fact that ellipsis relies on hierarchical constituent structure has been shown for LIS on the basis of the ambiguity of a sentence like (14). The two possible interpretations derive from the identification of the antecedent in the first clause. In one case (i) SAME stands for the highest projection of VP including V, the DP object and the locative adjunct, while in the other case (ii) it does not include the higher projection that hosts the place adjunct (Cecchetto et al. 2013).

- (14) DINING-ROOM GIANNI VASE BREAK MARIO SAME NOT
 ‘Gianni broke a vase in the dining room, while
 (i) Mario broke something in the dining room, but not a vase.’
 (ii) Mario broke a vase, but not in the dining room.’

Schlenker (2013) also shows for ASL and LSF that height features associated to an R-locus because of the properties of its referent (e.g. high locus for giant vs. low locus for dwarf), despite being highly iconic, do not interfere with ellipsis resolution, in the same way that gender features do not in English, thus allowing for their interpretation as phi-features.

On the basis of such examples it becomes clear that the resolution of ambiguity in elliptical structures hinges on structural facts, much as in spoken languages.

are lexically specified for movement features. As a consequence, plain verbs, unlike agreement verbs, cannot modify their movement features to express agreement (for a recent discussion of agreement in sign languages see Lillo-Martin and Meier 2011 and the comments to this target article in the same issue).

4 (Non-)ambiguities in the use of space

4.1 Discourse referents in signing space

In Section 3.1, we have already illustrated the importance of signing space to express grammatical and semantic spatial relations in sign languages. Signing space, that is the space in front of the signer where signed utterances are articulated, has been shown to be used at least in two distinct ways in signed discourse: to establish locations for discourse referents (grammatical use) and to talk about space by projecting properties of the actual spatial arrangement of referents into signing space (topographical use).³

Discourse referents are typically associated with a point (or an area) in signing space when first introduced and until the referent set is refreshed, those locations are used as virtual landmarks for the relevant referents (Onea and Steinbach 2013). Non-present referents are by default placed on the left and right (or contra- and ipsilateral) side of the horizontal plane in front of the signer. This is known as the *grammatical use* of signing space. Anaphoric reference and verb agreement make crucial use of those points. Because of their function, they have been labeled referential loci, *R-loci* for short (Lillo-Martin and Klima 1990). Although in general there is consensus about the fact that such loci encode person distinctions, disagreement exists about which ones (first person coincides with the locus of the signer, but scholars disagree as to whether second and third person locations are distinct forms; for a recent overview, see Lillo-Martin and Meier 2011).

It is often stated that anaphoric expressions such as pronouns or inflected verb forms are less ambiguous in sign languages than in spoken languages. In sign languages, referential expressions and inflected verbs are directly linked to the R-loci associated with the corresponding referents. As a consequence, these referents are said to be transparently identified. By contrast, reference tracking devices in spoken languages need to resort to disambiguating grammatical and discourse mechanisms. However, as argued in Quer (2010), the alleged transparency of sign language pronouns and agreement is only apparent, since disambiguation only happens in a specific discourse context. Strictly speaking, from a grammatical point of view, pronouns or verbs directed to an R-locus linked to a non-present 3rd person referent are even more ambiguous than a singular pronoun in English, for instance, because the only obligatory feature they carry is person (no gender marking, optional number marking). The degree of ambiguity

³ For an overview of the consequences of the distinction, see Emmorey (2002).

of R-loci may be argued to be even higher in sign than in many spoken languages like English: person reference to the speaker and addressee cannot only refer to the actual participants in the context of utterance but also to non-participants when used in reported discourse (in the structures known as ‘role shift’, to which we return below). In addition, signers do not have to use the exact R-locus to identify a discourse referent. Depending on the salience (or accessibility) of a discourse referent, a less specific pointing (with a lax, less directed movement) may suffice to identify this discourse referent (Barberà 2012; Onea and Steinbach 2013). Once these facts are taken into account, it seems clear that ambiguity in reference tracking is also part and parcel of the encoding of reference in signed discourse. The illusion that anaphora to discourse referents is non-ambiguous stems from confounding strict encoding of distinctions and linguistic forms directly interpreted in a rich context: anaphora resolution mechanisms are equally operative in both modalities.

Apart from reference to individuals, R-loci are also used to establish locations arbitrarily in space. Such locations can be used in the same way as R-loci associated with person features when topographic information is irrelevant, as in LSC (15): indexes establish those arbitrary R-loci and refer back to them, and verbs of movement and location inflect for those locative arguments. In this example the actual location of the referents for HOUSE and SCHOOL is irrelevant and the only important aspect is that they are located on contrasting sides in signing space.

(15) SCHOOL INDEX-left HOME INDEX-right CHILD INDEX-3 left-GO-right, STAY-right
 ‘The child went from school to his home and stayed there.’

However, R-locations are also used in a non-arbitrary, *deictic* way when they are linked to referents that are present in or in the vicinity of the actual context of utterance. For example, if reference is made to a non-participant that signer and addressee can see in their surroundings, the pointing identifying the R-location will be directed in his or her direction and not towards the horizontal plane where non-present non-participants are localized by default. Likewise, if the participants refer to the neighbor that lives downstairs, the pointing will be directed downwards when introducing him or her in discourse. In this sense, R-locations related to non-participants that are present or whose absolute location is deemed to be retrievable in the context of utterance are determined by the actual location of the referent. This absolute type of pointing may be considered as totally transparent because of its deictic properties, but it can also involve bridging or associative anaphora. Take for instance a situation where one refers to an absent colleague by pointing to her empty desk: in this case pointing is certainly not deictic,

but it rather requires associative anaphora between the entity pointed at and the intended referent.

There is a second type of non-arbitrary uses of signing space that has been called *topographic*. When the signer maps the distribution and orientation of entities in the real world into signing space, the position of R-locations with respect to each other is meaningful. This typically happens whenever a certain scene is described where spatial relations among referents is significant. In this case classifier constructions are used by default, because that class of predications allows for a more iconic depiction of movements and locations, as well as orientations of entities with respect to each other.⁴ Witness the following example describing a scene where a woman approaches a man sitting on a bench from behind:

- (16) BENCH CL-SaSS: ‘long rectangular object’ MAN CL-legged human: ‘sit on bench’
 WOMAN CL-upright human: ‘move to bench from behind’
 ‘A man was sitting on a bench when a woman approached him from behind.’

Notice that the localization, position and spatial arrangement of the entities is meaningful, and changing one of them would alter the actual meaning of the utterance. Utterances incorporating topographic use of space are very common and very productive in signed discourse and they certainly constitute a characteristic property of visual-gestural languages.

It is interesting to highlight that the topographic use of space takes the signer’s perspective, and consequently the addressee needs to mentally rotate the spatial scene in order to comprehend the mapping of the real scene into signing space. Sometimes, though, the mapped space is shared by both signer and addressee, but then the original signer’s perspective is preserved and the addressee does not perform the usual perspective rotation (Emmorey 2002).

A hybrid case of the topographic use of space is the use of a virtual map where cities or landmarks are virtually placed in an analogous manner to an actual map, so in this case topographic mapping is based on that representational tool.

At least two sets of uses of height in signing space have been found to be meaningful. Higher and lower locations on the vertical plane haven been argued to encode semantic distinctions. The first one has to do with referents that are

⁴ Most sign languages use classifier constructions such as (16), which combine a classifying handshape with a specific movement and/or location to express the movement and/or location of an entity as well as its size and handling. The form of the classifying handshape is determined by semantic or physical properties of the corresponding referent (for classifier constructions in sign languages, see Benedicto and Brentari 2004 and Zwitserlood 2012, among others).

perceived as hierarchically superior, such as governments, corporations, etc. The R-loci they are associated with are articulated on the upper vertical plane. The second case has to do with specificity distinctions: Barberà (2012) has established for LSC that referents that are interpreted non-specifically are placed in that same upper region, which contrasts with location of specific referents on the lower horizontal plane. Verb agreement in LSC with non-specific referents has been shown to be consistent with this pattern as well (Quer 2010).

A note of caution is due here, though. With this description the impression might arise that anaphoric reference is always overtly encoded in the visual-gestural modality. However, this is not the case. Despite the fact that the described mechanisms are very prominent in signed languages, it is also true that in connected discourse pointing can be actually loose if a referent is highly activated. Locations can even be inconsistent in the same stretch of discourse if the intended referent is not competing with other candidates in the same fragment (Barberà 2012; Onea and Steinbach 2013). This is a clear instance of ambiguity in the form of the anaphoric expression. In addition, not all new referents are associated with a distinct R-location in signing space: sometimes they are simply located in neutral signing space in front of the signer or they are not overtly located at all. This is not surprising if we accept that the same anaphora resolution mechanisms are operative in signed and spoken discourse, thus allowing for resolution of potential ambiguities in the recoverability of referents.

4.2 Role shift

Sign languages feature a very powerful mechanism to report utterances and actions of other individuals: *role shift* (also known as constructed dialogue and constructed action, Metzger (1995), or character perspective, Perniss (2007); for an overview, see Lillo-Martin (1995, 2012), Quer (2005, 2011) and Herrmann and Steinbach (2012)). The label refers to the fact that the signer, through an array of non-manual markers (eyegaze, slight upper body rotation, change in facial expression, change in head position, see Quer 2005 and Herrmann and Steinbach 2012), seems to be impersonating or adopting the role of another individual while producing signed utterances or actions. This mechanism is the prototypical means to produce reported discourse and it involves a referential displacement that affects the use of R-loci in signing space. When in a role shift fragment, the basic referential location of the signer is reallocated to one of the reported characters and different locations are established for addressee and reported non-participants. This means that pronominal pointings addressed to the chest of the signer or to the virtual addressee typically refer to different individuals from the

ones present in the actual context of utterance. The potential ambiguity of 1st and 2nd person features is removed by the set of non-manual markers that are coarticulated with the corresponding pronouns and inflections. This special marking in role shift requires anaphora resolution based on the set of referents active in the immediately previous discourse.

All indexicals in the discourse stretch under role shift are expected to refer to the displaced frame of reference, as in indexical shifting in spoken language reported discourse (for discussion, see Zucchi 2004, Quer 2005, 2011, Schlenker 2010). However, interesting cases have been described in LSC and DGS, where some indexicals, despite being part of role shift, are anchored to the main context of utterance. An instance of this in LSC is (17): this sentence, uttered in Barcelona, features two indexicals, the first person pronoun IX_1 and the locative indexical *HERE*. The former behaves as expected under role shift and is linked to Joan, whose thoughts while being in Madrid are reproduced. However, the latter indexical *HERE* is not interpreted in the displaced context, but rather in the actual context of utterance, namely Barcelona (Quer 2005, 2011).

- _____ t _____ RS-i
- (17) IX_a MADRID_m MOMENT JOAN THINK IX_1 STUDY FINISH *HERE*_b
 ‘When he was in Madrid, Joan thought he would finish his study here
 (in Barcelona).’

These facts are certainly intriguing under a simplified view of indexical reference. Hübl and Steinbach (2012) hypothesize that the particular behavior of such indexicals in DGS stems precisely from their indexical pointing to the actual context of utterance. They argue that modality-specific phonological properties of the parameters used in the articulation of the particular indexical signs (i.e. index finger and downward movement) establish a deictic-iconic relation to the actual context of utterance. The interesting additional fact is that the matrix context interpretation disappears when the indexical is appositively modified by an actual NP that disambiguates it (so *HERE MADRID* in (17) could only mean ‘there in Madrid’).

It is interesting to note that combinations of different referential strategies are used to introduce and maintain referents in discourse. Role shift is typically one that is coarticulated with various types of classifiers. In the default case, role and classifier are coreferential, but in other instances they stand for distinct ones. An example of this can be witnessed in Figure 3 below. Figure 3a depicts a coreferential role shift and limb classifier (legs) for a tortoise character. Figure 3b shows coarticulation of role (scared lying individual) and limb classifier (bear’s snout/head sniffing the man’s head) with disjoint referents (for details, see Bar-



3a



3b

Fig. 3: Coarticulation of role shift and classifiers

berà and Quer 2014). Disambiguation can only happen in the discourse context, as a result of establishing the anaphoric chain on the basis of salience and the interpretation of the features expressed in both types of referential elements.⁵

5 Conclusion

On the basis of the data discussed in this paper, it should have become evident that sign languages display different degrees of ambiguity and non-ambiguity in their grammars and lexicons, as it also happens in spoken languages. The impact of the visual-gestural modality does not amount to the total absence of ambiguity, but rather to its emergence in some areas that are specific to sign languages (simultaneous articulations, signing space). However, we have also seen that other types of ambiguities (e.g., coordination, quantifier scope interaction, ellipsis) do not show any significant difference when compared to the same phenomena in spoken languages. In any event, this is a research domain that still remains largely unexplored and this paper has only attempted to highlight the relevant findings so far. Further inquiry into this topic will certainly shed light on the impact of modality on language structure and more broadly on the language faculty.

⁵ To account for the use of space in ASL in all relevant domains, Liddell's work (cf. 2003 for an overview) develops a Cognitive Grammar approach, which crucially relies on blends of mental spaces and real space. Although his analytical assumptions differ in some important respects from those reported in this article, the cases of ambiguity in SL grammar and discourse to be accounted for in his framework are essentially the same.

Acknowledgments: We would like to thank our Deaf colleagues, without whom our research on LSC and DGS would not be possible. For interesting comments and suggestions, we want to thank two anonymous reviewers. This research was partly made possible by a grant awarded by the Spanish Ministry of Economy and Competitiveness (FFI2012-36238), by the Secretaria d'Universitats i Recerca del Departament d'Economia i Coneixement de la Generalitat de Catalunya (2009SGR00763), by SignGram Cost Action IS1006 and by the Courant Research Center 'Textstructures' at the University of Göttingen.

References

- Aronoff, Mark, Irit Meir and Wendy Sandler. 2005. The paradox of sign language morphology. *Language* 81. 301–344.
- Barberà, Gemma. 2012. *The meaning of space in Catalan Sign Language (LSC). Reference, specificity and structure in signed discourse*. Barcelona: University Pompeu Fabra dissertation.
- Barberà, Gemma and Josep Quer. 2014. Nominal referential values of semantic classifiers and role shift in signed narratives. Manuscript, UMR 702-CNRS and Paris 8 and ICREA-Universitat Pompeu Fabra.
- Benedicto, Elena and Diane Brentari. 2004. Where did all the arguments go? Argument-changing properties of classifiers in ASL. *Natural Language and Linguistic Theory* 22. 743–810.
- Boyes Braem, Penny and Rachel Sutton-Spence (eds.). 2001. *The hands are the head of the mouth: The mouth as articulator in sign languages*. Hamburg: Signum.
- Brentari, Diane. 1998. *A prosodic model of sign language phonology*. Cambridge.
- Cecchetto, Carlo et al. 2013. The SAME constituent structure. Manuscript, Università degli Studi di Milano-Bicocca.
- Davidson, Kathryn. 2011. *The nature of the semantic scale: Evidence from sign language research*. San Diego, CA: University of California dissertation.
- Davidson, Kathryn. 2013. 'And' or 'or': General use coordination in ASL. *Semantics and Pragmatics* 6. 1–44.
- Emmorey, Karen. 1999. Do signers gesture? In Lynn S. Messing and Ruth Campbell (eds.), *Gesture, speech, and sign*, 133–159. Oxford: Oxford University Press.
- Emmorey, Karen. 2002. *Language, Cognition, and the Brain. Insights from Sign Language Research*. Mahwah, NJ and London: Lawrence Erlbaum.
- Herrmann, Annika and Markus Steinbach. 2012. Quotation in sign languages. A visible context shift. In Ingrid van Alphen and Ingrid Buchstaller (eds.), *Quotatives: Cross-linguistic and cross disciplinary perspectives*, 203–228. Amsterdam: Benjamins.
- Hübl, Annika and Markus Steinbach. 2012. Quotation across Modalities: Shifting Contexts in Sign and Spoken Languages. Talk presented at the workshop *Quotation: Perspectives from philosophy and linguistics*, Ruhr-University Bochum, September 27–29, 2012.
- Jantunen, Tommi. 2013. Ellipsis in Finnish Sign Language. *Nordic Journal of Linguistics* 36. 303–332.

- Janzen, Terry. 1999. The grammaticization of topics in American Sign Language. *Studies in Language* 23. 271–306.
- Kestner, Karin. 2009. *Das große Wörterbuch der Deutschen Gebärdensprache*. Guxhagen: Verlag Karin Kestner.
- Koulidobrova, Helen. 2011. Null objects in ASL: The case of (indefinite) argument drop. Talk at *Venice FEAST (Formal and Experimental Advances in Sign language Theory)* June 20–22, 2011. Manuscript, University of Connecticut.
- Lichtenberk, Frantisek. 1985. Multiple uses of reciprocal constructions. *Australian Journal of Linguistics* 5. 19–41.
- Lichtenberk, Frantisek. 2000. Reciprocals without reflexives. In Zygmunt Frajzyngier and Traci S. Curl (eds.), *Reciprocals. Forms and functions*, 31–62. Benjamins: Amsterdam.
- Liddell, Scott. 2003. *Grammar, gesture, and meaning in American Sign Language*. Cambridge: Cambridge University Press.
- Lillo-Martin, Diane. 1995. The point of view predicate in American Sign Language. In Karen Emmorey and Judy Reilly (eds.), *Language, gesture, and space*, 155–170. Hillsdale, New Jersey: Lawrence Erlbaum.
- Lillo-Martin, Diane. 2012. Utterance reports and constructed action. In Roland Pfau, Markus Steinbach and Bencie Woll (eds.), *Sign language. An international handbook*, 365–387. Berlin: Mouton de Gruyter.
- Lillo-Martin, Diane and Edward S. Klima. 1990. Pointing Out Differences: ASL Pronouns in Syntactic Theory. In Susan D. Fischer and Patricia Siple (eds.), *theoretical Issues in Sign Language Research*. 191–210. Chicago: The University of Chicago Press.
- Lillo-Martin, Diane and Richard P. Meier. 2011. On the Linguistic Status of ‘Agreement’ in Sign Languages. *Theoretical Linguistics* 37. 95–141.
- Loon, Esther van, Roland Pfau, and Markus Steinbach. 2013. The grammaticalization of gestures in sign languages. In Cornelia Müller et al. (eds.), *Body – language – communication. An international handbook on multimodality in human interaction*. Volume 2, 2131–2147. Berlin: de Gruyter Mouton.
- May, Robert. 1985. *Logical Form. Its Structure and Derivation*. Cambridge, Mass.: MIT Press.
- Meier, Richard P. 2002. Why different why the same? Explaining effects and non-effects of modality upon linguistic structure in sign and speech. In Richard P. Meier, Kearsy Cormier and David Quinto-Pozos (eds.), *Modality and structure in signed and spoken languages*, 1–25. Cambridge: Cambridge University Press.
- Meier, Richard P. 2012. Language and modality. In Roland Pfau, Markus Steinbach, and Benice Woll (eds.), *Sign language. An international handbook*, 574–601. Berlin: Mouton de Gruyter.
- Meir, Irit, Carol A. Padden, Mark Aronoff, and Wendy Sandler. 2007. Body as subject. *Journal of Linguistics* 43. 531–563.
- Metzger, Melanie. 1995. Constructed dialogue and constructed action in ASL. In Ceil Lucas (ed.), *Sociolinguistics in deaf communities*, 255–271. Washington, DC: Gallaudet University Press.
- Nedjalkov, Vladimir P. 2007. Polysemy of reciprocal markers. In Vladimir P. Nedjalkov (ed.), *Reciprocal constructions. Vol. 1*, 231–333. Benjamins: Amsterdam.
- Onea, Edgar and Markus Steinbach. 2013. Discourse referents in sign language. Accepted with revisions by *Journal of Semantics*.
- Perniss, Pamela. 2007. *Space and iconicity in German Sign Language (DGS)*. Nijmegen: Max Planck Institute for Psycholinguistics dissertation.

- Petronio, Karen. 1995. Bare noun phrases, verbs and quantification in ASL. In Emmon Bach et al. (eds.), *Quantification in natural languages*, 603–618. Dordrecht: Kluwer.
- Pfau, Roland. 2010. A point well taken: On the typology and diachrony of pointing. In Donna J. Napoli and Gaurav Mathur (eds.), *Deaf around the world. The impact of language*, 144–163. Oxford: Oxford University Press.
- Pfau, Roland and Markus Steinbach. 2003. Optimal reciprocals in German Sign Language. *Sign Language and Linguistics* 6. 3–42.
- Pfau, Roland and Markus Steinbach. 2006a. *Modality-independent and modality-specific aspects of grammaticalization in sign languages* (Linguistics in Potsdam 24). Potsdam: Universitätsverlag.
- Pfau, Roland and Markus Steinbach. 2006b. Pluralization in sign and in speech: A cross-modal typological study. *Linguistic Typology* 10. 135–182.
- Pfau, Roland and Markus Steinbach. 2011. Grammaticalization in sign languages. In Bernd Heine and Heiko Narrog (eds.), *Handbook of grammaticalization*, 681–693. Oxford: Oxford University Press.
- Pfau, Roland and Markus Steinbach. 2013a. PERSON climbing up a tree (and other adventures in sign language grammaticalization. *Sign Language and Linguistics*. 189–220.
- Pfau, Roland and Markus Steinbach. 2013b. Meaning and modality. Mapping semantics onto morphosyntax in spoken and sign language. Manuscript, University of Amsterdam and University of Göttingen.
- Quer, Josep. 2005. Context shift and indexical variables in sign languages. In Effi Georgala and Jonathan Howell (eds.), *Proceedings of semantics and linguistics theory 15*, 152–168. Ithaca, NY: CLC Publications.
- Quer, Josep. 2010. Signed Agreement: Putting the Arguments Together. Invited talk at the conference *Theoretical Issues in Sign Language Research 10*. Purdue University (USA). 30 September, 1–2 October 2010.
- Quer, Josep. 2011. Reporting and quoting in signed discourse. In Elke Brendel, Jörg Meibauer and Markus Steinbach (eds.), *Understanding Quotation*, 277–302. Berlin: Mouton de Gruyter.
- Quer, Josep. 2012. Quantificational strategies across language modalities. In Maria Aloni (ed.), *Selected papers from 18th Amsterdam Colloquium*, Springer, *Lecture Notes in Computer Science (LNCS)* 7218: 82–91.
- Quer, Josep and Joana Rosselló. 2013. On sloppy readings, ellipsis and pronouns: Missing arguments in Catalan Sign Language (LSC) and other argument-drop languages. In Victoria Camacho-Taboada, Ángel Jiménez-Fernández, Javier Martín-González and Mariano Reyes-Tejedor (eds.), *Information Structure and Agreement*, 337–370. Amsterdam/Philadelphia: John Benjamins.
- Sandler, Wendy and Diane Lillo-Martin. 2006. *Sign language and linguistic universals*. Cambridge: Cambridge University Press.
- Schlenker, Philippe. 2010. Role Shift and Context Shift. Paper presented at *TISLR 10*, Purdue University.
- Schlenker, Philippe. 2011. Donkey anaphora: The view from sign language (ASL and LSF). *Linguistics and Philosophy* 34. 341–395.
- Schlenker, Philippe. 2013. Iconic Features. To appear in *Natural Language Semantics*.
- Schlenker, Philippe, Jonathan Lamberton and Mirko Santoro. 2013. Iconic variables. *Linguistics and Philosophy* 36. 91–149.

- Volodin, Aleksandr P. 2007. Reciprocals in Itelmen (Kamchadal). In Vladimir P. Nedjalkov (ed.), *Reciprocal constructions. Vol. 4*, 1823–1833. Benjamins: Amsterdam.
- Wilbur, Ronnie B. 2010. The semantics-phonology interface. In Diane Brentari (ed.), *Sign languages* (Cambridge Language Surveys), 357–382. Cambridge: Cambridge University Press.
- Wilbur, Ronnie B. 2011. Nonmanuals, semantic operators, domain marking, and the solution to two outstanding puzzles in ASL. *Sign Language and Linguistics* 14. 148–178.
- Wilbur, Ronnie B. and Cynthia Patschke. 1999. Syntactic correlates of brow raise in ASL. *Sign Language and Linguistics* 2, 3–40.
- Zucchi, Alessandro. 2004. Monsters in The Visual Mode? Manuscript, Università degli Studi di Milano.
- Zucchi, Alessandro. 2009. Along the time line: Tense and time adverbs in Italian Sign Language. *Natural Language Semantics*, 17. 99–139.
- Zucchi, Alessandro. 2012. Formal semantics of sign languages. *Language and Linguistics Compass* 6. 719–734.
- Zwitzerlood, Inge. 2012. Classifiers. In Roland Pfau, Markus Steinbach and Bencie Woll (eds.), *Sign language. An international handbook*, 158–186. Berlin: Mouton de Gruyter.