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Indicating verbs in British Sign Language favour motivated use of space

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Abstract: Sign languages have traditionally been described as having a distinction between (1) arbitrary (referential or syntactic) space, considered to be a purely grammatical use of space in which locations arbitrarily represent concrete or abstract subject and/or object arguments using pronouns or indicating verbs, for example, and (2) motivated (topographic or surrogate) space, involving mapping of locations of concrete referents onto the signing space via classifier constructions. Some linguists have suggested that it may be misleading to see the two uses of space as being completely distinct from one another. In this study, we use conversational data from the British Sign Language Corpus (www.bslcorpusproject.org) to look at the use of space with modified indicating verbs – specifically the directions in which these verbs are used as well as the co-occurrence of eyegaze shifts and constructed action. Our findings suggest that indicating verbs are frequently produced in conditions that use space in a motivated way and are rarely modified using arbitrary space. This contrasts with previous claims that indicating verbs in BSL prototypically use arbitrary space. We discuss the implications of this for theories about grammaticalisation and the role of gesture in sign languages and for sign language teaching.

Keywords: agreement, directional, topographic, arbitrary, referential, constructed action, role shift, eye gaze, grammaticalisation

1 Introduction

One of the distinctive characteristics of sign languages is the fact that they make extensive use of the space around the signer for referential purposes, apparently to a greater extent and in different ways than non-signers do when using co-speech gesture (e.g., Perniss and Özyürek 2015). There are thought to be two main types of space used for this purpose which we will refer to here as ‘motivated’ versus ‘arbitrary.’ Motivated uses of space (also known as topographic or descriptive space; see Perniss 2012 for a review) are those in which signers map some element of a real or imagined world onto the signing space. This can be done either on a large scale where signers interact with space as if life-sized people and objects are surrounding them (via constructed action where the signer’s hands, arms and/or body enacts characteristics of a referent, as in Figure 1), or on a small scale where signers use the space in front of them as if it were a map, with people and objects represented within this space used in a locatively meaningful way (e.g. via whole entity

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constructions where the signer's hand depicts a referent such as a person or vehicle, as in Figure 2). Overall there seems to be clear evidence that signers use space in a motivated way with these constructions. Indeed, this is one of the defining features of these constructions.



Figure 1. Constructed action with signer representing a bear about to attack someone (Woll et al. 2004)



Figure 2. Whole entity construction depicting a person walking past

These motivated uses of space contrast with arbitrary use of space, where signers arbitrarily establish a location in the signing space for a referent and these are then used throughout the discourse to refer to that person or entity. Arbitrary use of space, also known as referential or syntactic space (Poizner et al. 1987), token space (Liddell 2003), or non-descriptive space (Barberà 2014), is thought to be associated with the use of indicating verbs (also known as agreement or directional verbs) and pronouns (e.g., Sutton-Spence and Woll 1999). An example of an indicating verb, PAY¹ in British Sign Language (BSL), is shown in Figure 3 in its citation form. Indicating verbs like PAY may move in space (and/or change the orientation of the hand) between locations associated with their arguments.

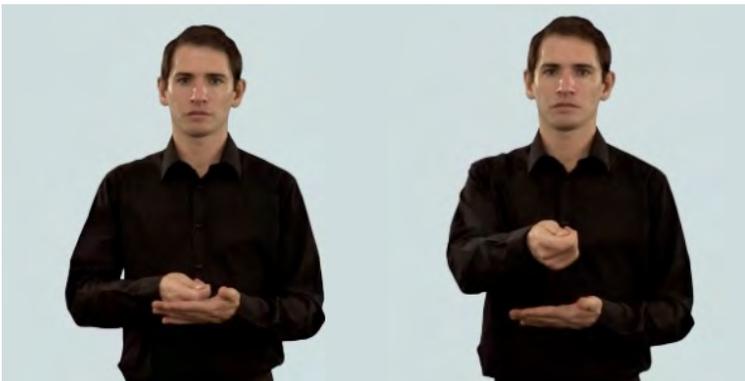


Figure 3. Indicating verb PAY in BSL

¹ As is conventional in the sign language literature, we use English glosses in small caps to represent signs in a sign language. Pointing signs (PT) and indicating verbs are glossed with a superscript indicating the direction of pointing (e.g. '1' to/from the signer him/herself or 'X' and 'Y' locations in space associated with non-addressed participants).

There have been some controversies surrounding the distinction between motivated and arbitrary uses of space. Some have argued for a clear distinction between these two uses of space (e.g., Barberà 2014, Poizner *et al.* 1987). Additionally, Emmorey and colleagues found a dissociation between the use of motivated and arbitrary space with indicating verbs in controlled experiments and argued that this shows the distinction to be psychologically real (Emmorey 1996, Emmorey *et al.* 1995). However, Emmorey *et al.* (along with many others) have argued that it is difficult to distinguish between motivated and arbitrary uses of space, that the two interact with each other and that signers may alternate between them (e.g., Clibbens and Coventry 1996, Engberg-Pedersen 1993, Liddell 2003, Perniss 2012, Taub 2001). Some have taken this further to argue that arbitrary and motivated uses of space are tightly integrated, so much so that they cannot really be distinguished from each other (Janzen 2004, Johnston 1991, Liddell 2003, van Hoek 1992, 1996). The question that remains unanswered is: How often do signers actually use space arbitrarily? In this paper we attempt to answer this question by studying indicating verbs in a large corpus of BSL (Schembri *et al.* 2014). We find that BSL signers often accompany modification of indicating verbs with mimetic elements of constructed action (including but certainly not limited to eyegaze shift). In our data, the use of spatial locations independent of the signer's body is very rare. Together these findings suggest a predominantly motivated rather than arbitrary use of space with indicating verbs in BSL. Additionally this calls into question claims made about arbitrary use of space with indicating verbs in other well-established sign languages.

In the remaining sections, we provide background about indicating verbs in terms of marking participant roles and how they use space and their possible co-occurrence with mimetic devices (i.e. constructed action), before presenting our research questions.

1.1 Indicating verbs

Indicating verbs have been attested in a majority of the documented sign languages of deaf communities (Mathur and Rathmann 2012). As noted above, indicating verbs move between locations associated with agent and/or patient arguments – e.g. BSL *PAY*.² In its citation form, this sign is produced with a movement away from the signer, as in Figure 3. The movement and orientation of the dominant hand may be modified so that its movement is directed at physically present referents in the space around the signer's body, or towards locations associated with absent referents. Thus, the dominant hand in the sign *PAY* can be moved from a location in front of the signer towards the location of the addressee to mean 'I pay you.' To represent 'you pay me', the orientation of the dominant hand and direction of its movement is reversed, moving from the location of the addressee towards the signer's body. *PAY* is an example of a verb which is modified for both agent and patient, which we will refer to as a double indicating verb. Some indicating verbs instead begin on the body and move outward and thus may only be modified for the final argument, usually the patient – we will refer to these as single indicating verbs. An example of a single indicating verb in BSL is *CHECK*, shown in Figure 4.

² In general throughout this paper we refer to verbal arguments with semantic roles, such as agents and patients, following practice in language typology for languages where evidence for grammatical notions of subject and object is unclear (Velupilla 2012). Along with other researchers such as Johnston (1991) and Engberg-Pedersen (2002), we believe this is the case for sign languages. We refer to 'subjects' and 'objects' only when referring to other studies which do so.



Figure 4. Single indicating verb CHECK in BSL

Another type of indicating verb is BSL MOVE, shown in Figure 5. This has been argued to differ from verbs like PAY and CHECK in that it marks locative arguments (source and goal) rather than agents and patients (Padden 1983).



Figure 5. Indicating verb MOVE in BSL

There is considerable variation in the terminology used to refer to these verbs within the sign language literature. This variation in terminology stems, in part, from the differing perspectives that researchers take regarding the nature of these verbs. The two types of indicating verbs mentioned previously (e.g. PAY and MOVE) are widely known as agreement and spatial verbs respectively and form, together with plain verbs,³ a tripartite division of verb types as first proposed by Padden (1983, 1988). This division is motivated by the observation that these verbs appear to mark different types of arguments (animate versus locative) and that agreement verbs can be modified for person and number (Padden 1983). In this paper, and from this point onwards, we focus on the subtype of indicating verbs that are more widely known as agreement verbs – i.e. those verbs that mark a transfer and take animate and/or non-locative inanimate arguments (for details about how such verbs were identified, see Fenlon et al. under review).

In the sign language linguistics literature, it has been proposed that modification of the initial and/or final location and/or orientation of the hand(s) in indicating verbs such as BSL PAY reflects the grammatical person of the verb's arguments (Lillo-Martin and Meier 2011, Padden 1983). The location and/or orientation modifications of the citation form's formational structure have been widely considered to be analogous to the various suffixes that mark person agreement in spoken languages such as Spanish (e.g., *yo habl-o* 'I

³ Plain verbs are verbs that do not move in space to reflect agent/patient or source/goal arguments. These tend to be verbs that are produced on the body.

speak' versus *ella habl-a* 'she speaks'). Under these analyses (first proposed by Padden 1983), first person is associated with the signer's body, second person with the location of the addressee, and third person is either the location of some physically present third person argument, or some locus associated with an absent third person argument. Other analyses distinguish only two persons: first and non-first, conflating reference to addressee and non-addressed participants but reflecting that fact that any number of locations in space around the signer may be associated with second and/or third person arguments (e.g., Lillo-Martin and Meier 2011, Meier 1990).

Others such as Liddell (2000a, b, 2003) and McBurney (2002) have argued that indicating verbs are composed of discrete morphemic elements (e.g., handshape) which combine with deictic gestural elements (e.g., location/direction) rather than person agreement affixes, to indicate participant roles. Liddell (2003) adopts this gestural analysis for non-first person reference (note, however, that this account draws on a cognitive linguistics framework which considers both morphemic and gestural elements to be part of the linguistic system, see Liddell 2011). McBurney (2002) explicitly applies this gestural analysis to argue that person marking is lacking altogether in sign languages such as American Sign Language (ASL). We find these arguments convincing. For ease of exposition in this paper, however, we will refer to first person, second and third person modifications with indicating verbs when describing participant roles.

1.2 Modification of indicating verbs with absent referents

Padden (1983) suggested that the particular form for third person agreement when the referent is absent is dependent on a number of conditions, including that the third person argument is assigned to a location in the space around the signer's body. Under this analysis, for example, in the BSL clause in (1), the object argument WOMAN is followed by a pointing sign that is directed towards a particular locus, and WOMAN is thus associated with this location in space. The 'agreement' is then marked in the verb sign HELP, with its initial location associated with the subject locus, here first person, creating a clause meaning 'I helped the woman'. All subsequent reference to the object argument should use the same locus. In this analysis, directing an indicating verb to a location in this way is treated as analogous to adding a person agreement affix. When there are two third person arguments (e.g. 'the woman helped the man'), it is reported for many sign languages that signers may set up two different locations in space with the verb moving between them, as in (2). This modification of indicating verbs between two locations in space has been assumed to be the prototypical use of space with two third person referents with indicating verbs in sign languages such as ASL and BSL (Cormier *et al.* 1999, Emmorey 1996, Liddell 1995, Neidle *et al.* 2000, Padden 1988, Sandler and Lillo-Martin 2006, Sutton-Spence and Woll 1999). There are two main reasons for this assumption. One is that it has traditionally been assumed that if an indicating verb can be modified, it must – i.e. that modification of the verb for at least the object in examples (1) and (2) is obligatory. Obligatoriness of object modification has been argued explicitly for ASL (Lillo-Martin and Meier 2011, Meier 2002), though it is unclear on what basis this claim has been made, and by extension assumed for other sign languages such as BSL (Morgan *et al.* 2006) and Brazilian Sign Language (Quadros and Lillo-Martin 2007). However, recent corpus evidence from BSL and for a related variety, Auslan (Australian Sign Language), has shown that neither subject or object modification is obligatory in these sign languages (de Beuzeville *et al.* 2009, Fenlon *et al.* under review). The other assumption is that for third person arguments with absent referents, indicating verbs tend to use arbitrary space. This second assumption is what we intend to explore in the current study.

(1) WOMAN PT^{→X} HELP^{1→X}
'I helped the woman.'

(2) WOMAN PT^{→X} MAN PT^{→Y} HELP^{X→Y}
'The woman helped the man.'

1.3 Indicating verbs, shifted use of space and constructed action

As noted above, with two third person referents, one option is that signers establish locations in space arbitrarily for these referents and that pronouns and indicating verbs move to (and in the case of verbs, possibly also from or between) these locations, as in (2). Another option is that signers may shift their perspective such that their own body represents one of the non-present referents and subsequent references via pronouns and indicating verbs use these shifted locations. Poizner et al. (1987) refer to this distinction as *fixed referential space* versus *shifted referential space*, as shown in Figure 6.

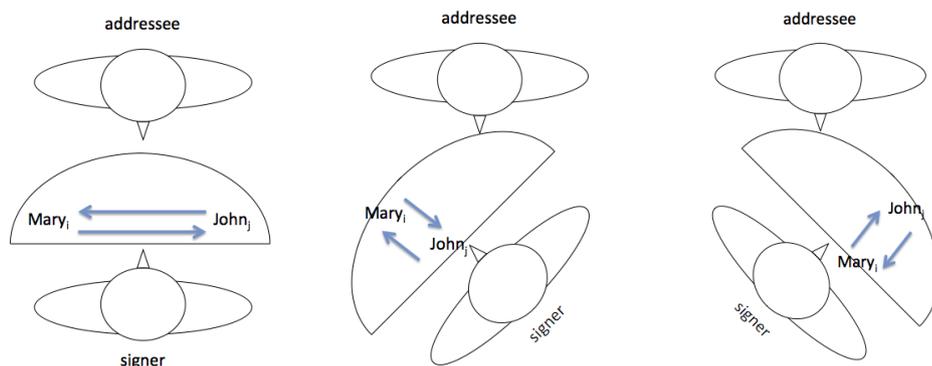


Figure 6. Fixed referential space (left) versus shifted referential space (middle and right) (based on Figure 1.9 in Poizner et al. 1987, p. 20)

The use of shifted referential space for reporting of someone else's actions and/or utterances is also known in the sign language literature variably as role shift (e.g., Hermann and Steinbach 2007, Lee et al. 1997, Quer 2005, 2011), point of view predicate (Lillo-Martin 1995), referential shift (Poulin 1994, Poulin and Miller 1995), and role prominence marker (Kegl 1995). It is often associated with the use of body shift – i.e. lateral rotation of the torso (e.g., Lee et al. 1997, Quer 2005, 2011). However, others have noted that the use of body shift is optional (e.g., Padden 1986), and that signers may simply change the location and directionality of referents within space (Janzen 2004, Smith and Cormier 2014).

One could argue that the use of fixed referential space is the most arbitrary possible use of space. That is, the signer may arbitrarily choose to locate both/all non-present referents anywhere within the signing space. The use of shifted referential space, however, is less arbitrary. The fact that the signer him/herself is occupying one of those locations suggests that there may be some topographic use of space involved, as the signer may be imagining him/herself as one referent and imagining the other referents being present at some location in space.

In addition to a different use of space, when the signer's body represents the body of a referent, the signer may also use various non-manual features such as movements of the face, head, body and/or eyegaze to mimetically represent actions, attitudes or emotions of the referent, also known as constructed action (Metzger 1995). Metzger (1995) borrowed the term *constructed dialogue* from Tannen (1986, 1989a, b) for use with ASL for the representation of the dialogue, or words, of a referent, and coined the term *constructed action* for representing the real or imagined verbal and non-verbal aspects of communication (e.g. actions, thoughts, emotions) of others, including constructed dialogue.

The co-occurrence of these non-manual elements of constructed action with modified indicating verbs appears to provide evidence in support of the claim that uses of space with indicating verbs are not fully arbitrary. Previous studies on modification of indicating verbs have found that the use of constructed action significantly favoured co-occurrence of spatial modification - e.g. Fenlon et al. (2014b, under review) for BSL and de Beuzeville et al. (2009) for Auslan. Specifically, the BSL study found that constructed action significantly favoured co-occurrence of patient modification at least, whilst the Auslan study did not dis-

tinguish between agent and patient modification in their analysis. Both the BSL and Auslan studies considered constructed action to be marked via a range of articulators including eyegaze as well as the head, face and/or body.

Separately, Neidle *et al.* (including Bahan 1996, Lee *et al.* 1997, Neidle *et al.* 2000), Thompson (2006), and Thompson *et al.* (2006, 2009) argued for eyegaze as a grammatical non-manual marker of verb agreement with indicating verbs in ASL. This was based on the observation that signers often look toward the location that a modified indicating verb is moving and/or oriented towards or away from. Considering that a shift in eyegaze alone has been suggested as a possible marker of constructed action by many researchers (e.g., Engberg-Pedersen 1993, 2003, Kegl 1995, Loew 1984, Padden 1986, Quer 2011, Reilly 2000), the observations by Neidle *et al.* and Thompson *et al.* could potentially be explained by the co-occurrence of constructed action with indicating verbs, which is not a possibility that they consider. This is despite the fact that such a possibility has already been raised in the literature: Engberg-Pedersen (2003) specifically addressed this issue for Danish Sign Language by discussing the difference between ‘reference-tracking eye gaze’ which she claims occurs with predicates or pronominal pointing signs and carries an indexical function in contrast to ‘imitative eye gaze’ (i.e., part of constructed action) which occurs with predicates or quotations and is not indexical.

Liddell & Metzger (1998) explicitly argued against eyegaze as an agreement marker. They proposed that during periods of constructed action, the information that is expressed is more than simply spatial loci associated with the subject and object – it also includes information about the overall mental space which the signer is communicating about and which the addressee is constructing.⁴ The main question that can help address this issue is about the nature of the articulators that are involved in constructed action when it co-occurs with indicating verbs. If non-manual articulators including and/or in addition to eyegaze are involved to mark constructed action with indicating verbs, this could be evidence to argue against an analysis of eyegaze as agreement marker and instead for the topographic, motivated use of space with these verbs.

1.4 Is use of space arbitrary?

Liddell (2000b, 2003) argues that indicating verbs always use space meaningfully and that the same can be said for pronouns and classifier/depicting constructions as well. One argument that Liddell uses to support this suggestion is that indicating verbs specified for beginning or ending at particular locations on the body would be directed towards or away from a higher than usual location in space if the referent in question was a tall person. Such behaviour would indicate that signers are pointing to imagined referents (in this case, a very tall referent) as opposed to using space in an arbitrary way. In addition to pointing to imagined referents in space, signers also use their own body to represent absent referents, which is another way in which use of space is motivated rather than arbitrary. In fact, Johnston (1991), van Hoek (1992, 1996) and Janzen (2004) argue that the use of space in sign languages is never truly arbitrary. Additionally, this motivated use of space is not different from non-signers who also use multimodal resources in face-to-face interaction, including space as well as their body, face, head and eyegaze in motivated ways (Sidnell 2006, Stukenbrock 2014). There is no reason to expect that signers would not exploit space and manual/non-manual articulators in similar ways. In order to better understand the use of indicating verbs and the extent to which they use arbitrary versus motivated space in sign languages, empirical evidence from spontaneous data is needed.

⁴ Some researchers (e.g., Hosemann 2011) have attempted to distinguish between eyegaze functioning as agreement versus eyegaze used for constructed action and role shift but with problematic criteria (see Cormier *et al.* in press).

2 Research questions and hypotheses

Our general research question is: Even if spatial loci *can* be established arbitrarily with indicating verbs, how often does this actually happen in spontaneous signing? Given the options, which type of space do signers use with indicating verbs? We answer this question by studying the behaviour of a large set of indicating verbs within a corpus of conversation data. Given the previous studies noted above, our specific research questions and hypotheses are: (1) What is the distribution of directionality and constructed action with double indicating verbs between two third person referents in BSL? If space is used arbitrarily, we would expect to find that two locations in the signing space away from the signer are used and we would not expect constructed action to necessarily co-occur. If space is used topographically, i.e. in a motivated way, then we should find that third-to-third person modification is mostly to and from the body and may be correlated with constructed action; (2) What is the role of eyegaze towards locations associated with modified indicating verbs and how often do such eyegaze patterns co-occur with constructed action? Previously de Beuzeville et al. (2009) and Fenlon et al. (under review) found a high rate of co-occurrence of constructed action with modified indicating verbs in Auslan and BSL respectively; here we explore in more depth the role of eyegaze in relation to constructed action with indicating verbs. If non-manual articulators in addition to eyegaze are used to mark constructed action during modification of indicating verbs, then this would suggest that space is being used in a motivated rather than arbitrary way. This would also indicate that eyegaze tends not to function as ‘reference-tracking eye-gaze’ (i.e. eyegaze which has been argued to be an agreement marker) but instead as a marker of constructed action (i.e., as ‘imitative eye gaze’) (Engberg-Pedersen 2003, Liddell and Metzger 1998).

3 Methods

3.1 BSL Corpus

The study reported in this paper is based on the conversational data component of the BSL Corpus (Schembri et al. 2014). The BSL Corpus consists of 249 deaf signers, most of whom reported to have learnt to sign before the age of seven, from eight cities around the United Kingdom. Participants were carefully selected so as to represent a variety of social factors such as gender, age group, ethnicity, and age of BSL acquisition. Participants were filmed in pairs in conversation for thirty minutes with someone they knew well and/or was similar in age. Given that the conversations were spontaneous, this is likely to be indicative of BSL as it is produced in natural settings. For this study, we focus on a subsection of the BSL Corpus: 101 signers from 4 cities in England (Birmingham, Bristol, London and Manchester); twenty-five signers from each region with one additional signer from Manchester. Participants were filmed with three cameras: one in front of each signer and a third on the pair.

3.2 Coding scheme

The range of data used for this study builds on annotations completed for a separate study on sociolinguistic variation in the modification of indicating verbs (Fenlon et al. 2014b, under review). In that study, we considered linguistic and social factors in 1679 indicating verb tokens from the BSL Corpus. Results revealed that modification is not obligatory and that patient modification is conditioned by several linguistic factors such as constructed action, but not by social factors⁵.

⁵ Of all the social factors considered (including gender, age group, and age of BSL acquisition), only age of BSL acquisition was significant, though only for agent modification and only when congruent tokens were considered to be modified. However, in a second analysis of agent modification when congruent tokens were considered unmodified, no social factors were significant. No social factors were significant for patient modification in any analyses.

In the current study, as in Fenlon *et al.* (under review), we identified approximately the first 500 signs that each participant produced in the conversational data which were annotated and assigned a uniquely identifying gloss (or ID-gloss, see Johnston 2010). All tokens of verbs occurring within these 500 signs were tagged for modification and for person (see below). Each participant produced an average of 80 verbs within this set. From this set of verbs, we identified approximately 17 tokens of indicating verbs per participant that fit our criteria: that is, verbs which may move in space between locations associated with agents and patients for double indicating verbs (or in the case of single indicating verbs, towards or away from patients only). The set of verbs that constituted the final analysis amounted to 1679 tokens – i.e. the same dataset that was analysed in Fenlon, Schembri and Cormier (under review).

For each token, we also made sure to identify the boundaries of the clause in which the verb was located. Clauses were delimited by first identifying a predicating element, and then arguments of the predicate as well as adjuncts associated with the predicating element (following Johnston 2014, Van Valin and LaPolla 1997).

(3) [PT:PRO1SG TEACH^{1→X} PARENTS]
I taught my parents (to sign).

(4) [WHO GIVE^{X→Y} TICKET GIVE^{X→Y}]
Who did you give the ticket to?

(5) [OVER-TIME FATHER MOTHER THINK DISCUSS^{X↔Y}]
Over time, (my) father and mother thought about and discussed (it)

(6) [PT:POSS3SG FATHER ASK^{X→1}][GO-TO WEST-HAM]
His father asked (me) to go to West Ham (with him)

For example, in (3), TEACH has been identified as a predicating element and PT:PRO1SG (a first person singular pronoun) and PARENTS are identified as arguments of the verb. This is marked as a single clause. As a rule, we typically identify one main verb (or predicating element) to a clause. However, in cases of verb doubling as in (4 - GIVE) or serial verbs (5 – THINK and DISCUSS) or embedded clauses (6 – GO-TO WEST-HAM), a clause could contain more than one verb. Following segmentation, we identified the agent and patient of the verb(s) in each clause.

For each indicating verb token, modification was coded for both the agent and the patient. Verbs were judged as unmodified, modified or congruent. Signs judged as unmodified did not differ from citation form (the citation form usually involves movement from a location near the signer towards a location directly in front of the signer). Signs judged as congruent were directed from the location associated with a first person argument towards a location associated with a second person argument, but because this form is often identical to citation form, it was impossible to tell whether such signs were actually modified or not. Signs judged as modified were signs that differed from the citation form. In Figure 7, the three categories with respect to the agent and the patient are illustrated using the BSL sign GIVE: from left to right, unmodified, modified and congruent. Note that the initial location (when considering agent modification) and the final location (when considering patient modification) of the unmodified and congruent versions are identical; they only differ in that, for a sign to be coded as congruent, either the context is between first person and second person or the signer must have explicitly established the argument(s) directly in front of him/herself along the sagittal axis previously in the discourse.

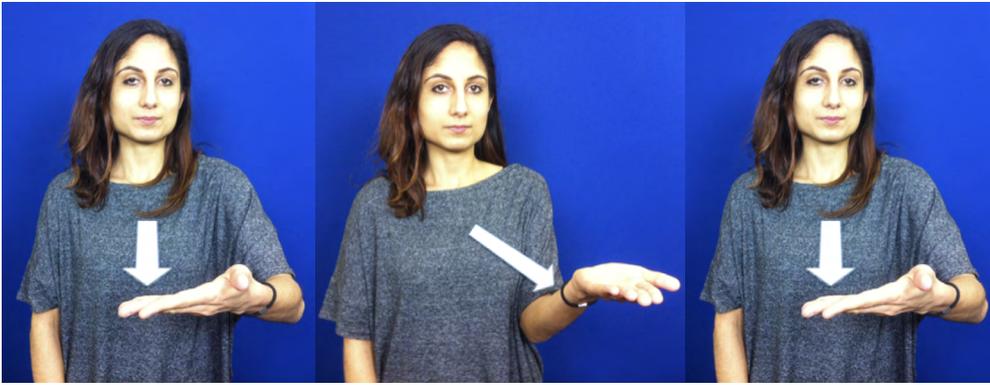


Figure 7. Unmodified, modified and congruent forms of BSL indicating verb GIVE

In addition to modification, we also coded for person, in order to carry out the analyses that involve direction and constructed action specifically within third person to third person contexts (see §4.1). Under this category, arguments were coded for whether they represented first, second, or third person – i.e., self-reference, reference to addressed participants, and reference to and non-addressed participants, respectively. Arguments for which person was difficult to establish were marked as ambiguous.

3.2.1 Direction

For direction of modification, we followed Padden et al. (2010) who studied the use of space with respect to verb direction in two sign languages (Al Sayyid Bedouin Sign Language and Israeli Sign Language). We adopted their three possible categories of verb direction, relabelled for clarity: movement to/from the body straight ahead along the sagittal axis ('body-sagittal'), movement to/from the body diagonally to the left or right ('body-diagonal'), and movement in front of the signer from one location in space to another ('side-to-side'). These correspond to Padden et al.'s (2010) direction categories of Z axis, Z + X axis, and X axis, respectively. All three of these occur within the range of chest-level height and within typical signing space. Examples of all three types of movement are provided in Figure 8 – from left to right: body-sagittal, body-diagonal and side-to-side.



Figure 8. Three types of direction coded for indicating verbs with BSL GIVE

Two further categories were also employed for direction: 'other' and 'ambiguous'. The category of 'other' refers to verbs that moved in a direction not corresponding to those presented in Figure 8. These tended to

be between two atypical locations in neutral space (e.g., at a considerable distance to the signer's left to a location further out and higher up in neutral space). Direction was considered 'ambiguous' when it was difficult to distinguish between the three types of direction. Often this was the case due to the arrangement of our participants within the filming studio. As shown in Figure 10, participants were seated in chairs slightly facing outwards so that they had to turn their torso sideways to face their conversational partner. As a consequence, the body was positioned in such a way that sometimes the video camera angle made it difficult to determine if the hand was moving straight in front (body-sagittal) or along the diagonal (body-diagonal). The issue was further complicated by the fact that participants frequently shifted in their seats making it difficult for us to apply consistent criteria across a conversation. (Similarly, it was sometimes difficult to determine if a sign had been modified or not for exactly the same reason.) Our solution was to determine co-ordinates for each participant on an individual basis. We reviewed all the indicating verbs that the signer produced to determine where a location on the signer's left and right would appear on the screen. Verbs appearing to move to the extreme edges of that particular signer's signing space were then used as a reference point against which all other tokens for that signer were judged. The verb token shown in Figure 10 was coded as 'body diagonal' because although the verb was directed toward the location of the camera, the signer's torso was not.

3.2.2 Eyegaze and constructed action

Fenlon *et al.* (2014b, under review) found that the use of constructed action significantly favoured patient modification of indicating verbs: in fact, it was one of the most important variables in predicting the presence of modification in indicating verbs. The statistical analysis included constructed action as a binary category (i.e. presence versus absence). Eye gaze shift in relation to constructed action in that study was not considered separately in its own right: all instances of eyegaze shift towards the verb (or locations associated with the initial/final verb location) were included in the category of constructed action.

For the current study, one aim is to look at the relationship between eyegaze, constructed action and modification of indicating verbs. Therefore here we make finer distinctions in the constructed action category to determine the role of eyegaze in association with modification. The decision-making process for annotation of eyegaze and constructed action is shown in Figure 9.

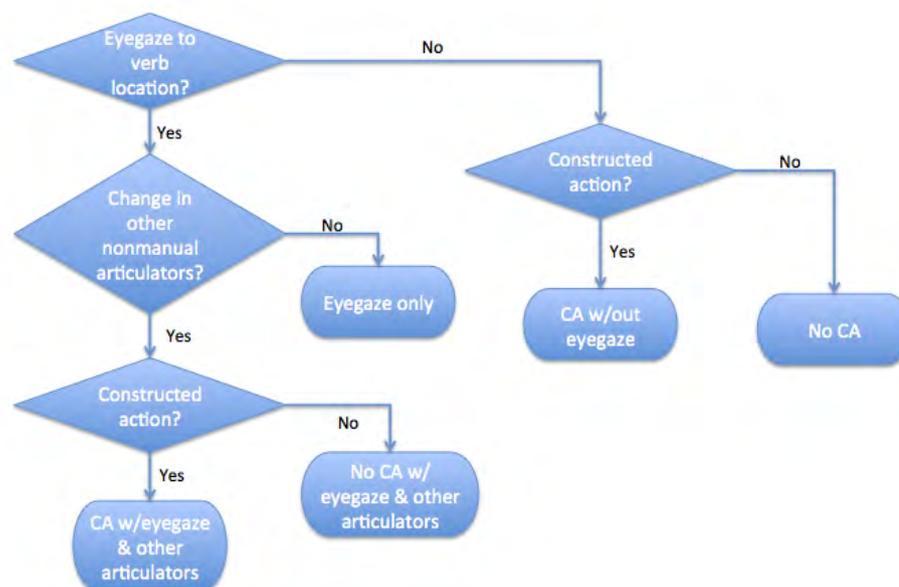


Figure 9. Flowchart showing decision-making process for annotating eyegaze and constructed action

The first question we asked was whether the signer's eyegaze appeared to be associated with the final location of the indicating verb for verbs like BSL PAY (or towards the initial location for so-called "backwards verbs", such as BSL CHOOSE, which move from patient to agent, cf. Thompson et al. 2006). If not, we checked whether there was evidence of constructed action during the indicating verb, i.e. whether there were any manual and/or non-manual articulators which appeared to be imitating the actions of or emotions expressed by some identifiable referent (role) – this followed criteria set out by Cormier, Smith and Zwets (2013) and Cormier, Smith and Sevcikova (in press). However, because the Cormier et al. studies were based on cartoon re-tellings, the identification of the role that the signer was taking on was more straightforward than in the conversation data used in the current study – i.e. roles in the cartoon retelling data were nearly always characters in the cartoons. The identifiable referent in conversation could include anyone other than the signer, or it could even include the signer him/herself at a time period other than the time of utterance, as in Figure 10.



Figure 10. Modified form of BSL LOOK02 used with constructed action ('CA with eyegaze and other articulators'), with signer in role as himself in the past meaning '*I was looking at the subtitles*'

If there was no such evidence of constructed action, the verb was coded as 'no CA' – i.e. no constructed action. If there was such evidence of constructed action, this must have been via manual and/or non-manual articulators other than eyegaze; thus in these cases, the verb was coded as 'CA without eyegaze.'

Returning to the first question we asked – if the eyegaze was associated with the final location of the indicating verb (or in the case of backwards verbs, the initial location), we then asked if there were any other non-manual articulators which appeared to change during the articulation of the verb. If so, we then asked if there was evidence of constructed action during the verb, following criteria noted above. If so, the verb was coded as 'CA eyegaze with other articulators'; if not, the verb was coded as 'no CA with eyegaze and other articulators'. The latter category could include, for example, facial expressions representing the signer's own affect at the current time (rather than that of another referent or the signer at another time). If there were no other non-manual articulators which appeared to change during the articulation of the verb aside from eyegaze, we coded the verb as 'eyegaze only'. We did not want to assume from the outset that use of 'eyegaze only' constituted a type of constructed action, preferring instead to see how this category patterned with the other categories where there was clearer evidence of constructed action.

4 Results

Here we report the results of the analysis of direction of modification and analysis for the co-occurrence of constructed action and eyegaze with verb modification.

4.1 Direction of modification

In this section, we examine the direction of modification within constructions involving a third person agent and patient (e.g., *John* and *Mary* in *John gave Mary a book*). We also present results regarding the extent to which these tokens occur with constructed action, in order to further explore the motivated versus arbitrary use of space with these verbs.

4.1.1 Clauses involving third person agents and patients

From 1679 tokens of indicating verbs in our study, 238 tokens of double indicating verbs involved both a third person agent and third person patient and were analysed for direction of movement.⁶ The distribution of the direction of movement according to the categories provided in Figure 8 is presented in Figure 11.

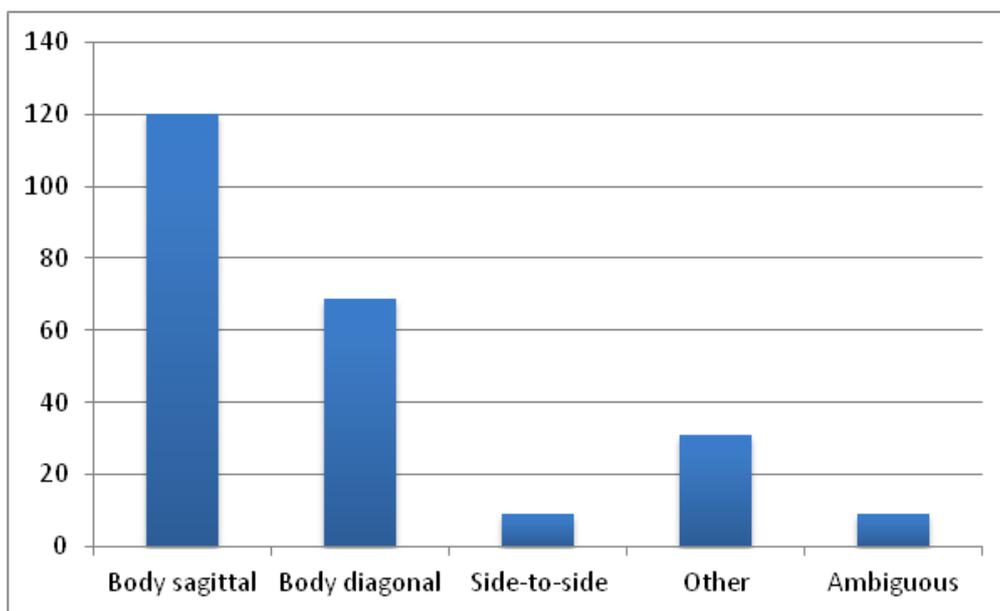


Figure 11. Direction of movement in clauses involving a third to third person referent (number of tokens)

Figure 11 indicates that, for clauses involving third to third person arguments, signers most frequently use movement to and from the body on the sagittal axis ($n = 120$, 50%). The second most frequent category is movement to and from the body diagonally ($n = 69$, 29%). When ‘body-sagittal’ and ‘body-diagonal’ are combined, this results in a total of 189 tokens (79%) which are articulated to or from the body (either sagittally or diagonally). Movement between two locations in space (side-to-side) is least likely to be used in

⁶ In total there were actually 258 tokens of double indicating verbs which had a third person agent and third person patient. However, 20 tokens of verbs like MEET, SWAP, ARGUE, etc. were excluded because these verbs use this axis in their citation form and thus could be considered unmodified. The remaining 238 tokens in this analysis include only indicating verbs which use the body-sagittal axis in their citation form.

spontaneous conversation for clauses involving third to third referents ($n = 9$, 4%). Finally, tokens labelled as ‘other’ account for 13% of the overall data ($n = 31$) and 4% of tokens were determined to be ambiguous in terms of direction ($n = 9$).

A closer examination of the 9 tokens that were modified side-to-side reveals that, even amongst this small number, not all of these tokens can be considered as using arbitrary space. One of the tokens is a modified form of GRAB, shown in Figure 12. In this instance, grab moves from the location representing the porter on the signer’s right towards the location representing the friend on his left. The locations of these referents are represented in space using classifier/depicting constructions (one of which is produced on the signer’s right hand just before GRAB in Figure 12, and the other shown on his non-dominant hand), and then an indicating verb moves between these locations, via motivated use of space.



Figure 12. BSL GRAB using motivated space along side-to-side axis

In another example, the indicating verb GIVE moves from one location on the signer’s right to a lower location on the right to indicate that something was passed on from an adult to a child. The fact that the original location was set up during a sequence of constructed action where the signer recalled talking to someone at a football match further reinforces that the use of space in this instance is motivated. The other 7 tokens appear to be using space arbitrarily (i.e. there is no discernible motivation for the specific locations chosen). Regardless, the number of verb tokens using side-to-side directionality is an extremely small proportion of the set of verb tokens in third person to third person contexts.

The fact that most of the third person to third person tokens used the ‘body-sagittal’ axis ($n = 120$, 50%) could be a reflection of use of constructed action (suggesting use of motivated space) or these tokens could simply be unmodified and identical to citation form (i.e. with no meaningful use of space at all). The use of the ‘body-diagonal’ axis as the second most frequent axis ($n = 69$, 29%) could reflect patient modification with omission of agent modification, given that agent modification is widely reported to be optional, and thus could be an arbitrary use of space for the patient, and unmodified (i.e. with lack of any meaningful use of space) for the agent. But, if it co-occurs with constructed action, this would suggest overall a motivated use of space instead. The following analysis addresses these possibilities.

4.1.2 Type of space associated with each direction

Within the set of 238 indicating verb tokens modified for third to third person reported above, we next examined the distribution of constructed action categories with each type of direction to seek further evidence of whether space is being used in an arbitrary or motivated way. For this analysis, based on the results in §4.1.1, we treated ‘eyegaze only’ as a subcategory of constructed action. Table 1 outlines how all subcategories for presence or absence of constructed action from §4.1.1 were collapsed into the following three categories: ‘With CA’; ‘Without CA’ and ‘Unsure’.

Table 1. Total set of constructed action/eyegaze categories coded

Collapsed constructed action categories	Original constructed action Categories
With CA	CA with eyegaze and other articulators
	CA without eyegaze
	Eyegaze only
Without CA	No CA with eyegaze and other articulators
	No CA
Unsure	Ambiguous
	Total

For the current analysis, we use a mixed effects model with constructed action as the binary dependent variable - i.e. 'With CA' versus 'Without CA', with 13 Unsure tokens excluded – with participant and lexical item as random effects.

Table 2. Results from statistical analysis investigating a relationship between constructed action and direction used

Factor	Number of tokens	Percentage with CA	Log odds	Factor weight
Body-diagonal	65	70.8%	1.111	0.752
Other	30	56.7%	0.158	0.539
Ambiguous	9	44.4%	0.135	0.534
Body-sagittal	112	47.3%	-0.529	0.371
Side-to-side	9	33.3%	-0.875	0.294
Total	225	--	--	--

Table 2 demonstrates that there is a significant relationship between the use of specific axes and the presence and absence of constructed action ($p \leq 0.01$). The 'body-diagonal' axis appears to have the strongest association with constructed action (log odds = 1.111; factor weight 0.752). This axis is followed by 'other' (log odds = 0.158; factor weight 0.539) and 'ambiguous' (log odds = 0.135; factor weight 0.534) although they appear to marginally favour the presence of constructed action in comparison to the 'body-diagonal' axis. Conversely, the 'side-to-side' axis disfavors the presence of constructed action (log odds = -0.875; factor weight 0.294) followed by 'body-sagittal' (log odds = -0.529; factor weight 0.371).

The statistical analysis appears to suggest that when the signer uses the 'body-diagonal' axis, this is likely to reflect motivated use of space as opposed to an arbitrary use of space. The fact that the 'body-diagonal' axis significantly favours the use of constructed action suggests that signers are not using arbitrary space and omitting the agent modification but are instead using motivated space. An example of a verb along the 'body-diagonal' axis used with constructed action is shown in Figure 13. The 'other' category, where signers are using space atypically outside the normal signing space, also favours constructed action, again suggesting motivated use of space. The 'body-sagittal' tokens disfavour the use of constructed action. This is likely to be because many of these are unmodified tokens, consistent with our previous study where constructions involving third person agents and patients disfavoured modification (Fenlon *et al.* under review) and unmodified forms do not use space in a meaningful way. An example of a verb along the 'body-sagittal' axis used without constructed action is shown in Figure 14.



Figure 13. Indicating verb along the ‘body-diagonal’ axis used with constructed action



Figure 14. Indicating verb along the ‘body-sagittal’ axis used without constructed action

4.2 Constructed action, eyegaze and modification of indicating verbs

In this section, we consider the effects of constructed action and eyegaze on modification of indicating verbs. As noted in §1.3, Fenlon et al. (under review) found constructed action to be a significant factor in the modification of indicating verbs in BSL. This was specifically for modification for patient. Person was also found to be significant for both agent and patient modification – for example, first and second person arguments favoured patient modification over third person arguments.⁷ These factors were significant in a mixed effects model using verb modification as the binary dependent variable - i.e. modified (including congruent) versus unmodified – and various factors as independent variables including constructed action, person and others.

For the current analysis, we similarly use a mixed effects model with modification as the binary dependent variable - i.e. modified (including congruent) versus unmodified – with constructed action as a fixed effect and participant and lexical item as random effects. In Fenlon et al. (under review), constructed action

⁷ As noted in Fenlon et al. (under review), we suspect that this represents a distinction between present versus non-present referents (i.e. physically present referents). Given that our data involves conversation between only two participants, a point to a third person patient is very likely to be a point to a non-present referent represented by an ‘empty’ location in space as there is no physical referent present to act as a third person. If we view the person distinction as a distinction between present (i.e. first and second person) and non-present (i.e. third person) referents, then we might say that present referents strongly favour modification while non-present referents disfavour modification.

was found to significantly favour patient modification but not agent modification. Therefore here we focus specifically on modification of patient as the dependent variable. We exclude clauses that have no patient (e.g. ‘many people were looking’, ‘we paid for our house’) and clauses that have a clausal complement (e.g. ‘The book said “...”’) leaving 1450 indicating verb tokens potentially modified for patient.

Table 3 shows the distribution of the constructed action/eyegaze categories that were coded for tokens potentially modified for patient. Examination of Table 3 reveals that the most frequent category is “CA with eyegaze and other articulators”.

Table 3. Total set of constructed action/eyegaze categories coded

Categories	Figures	Percentage
CA with eyegaze and other articulators	550	38%
CA without eyegaze	27	2%
Eyegaze only	300	21%
No CA with eyegaze and other articulators	52	4%
No CA	450	31%
Ambiguous	71	5%
Total	1450	100%

If we firstly consider the role of eyegaze within this set of tokens: Combining the category of “CA with eyegaze and other articulators” with “Eyegaze only” and with “No CA with eyegaze and other articulators” as use of eyegaze shift associated with indicating verbs overall results in a total set of 902 tokens. Thus out of the total set of 1450 tokens, 62% (n = 902) occur with eyegaze towards the verb. This is somewhat lower than the 73-75% of ASL ‘agreeing verbs’ which occurred with eyegaze in an eye-tracking study by Thompson *et al.* (2006), although this may be the result of differences in data collection and analysis.

If we now consider constructed action within these tokens and the relationship with eyegaze: Combining the categories of “CA with eyegaze and other articulators” with “Eyegaze only” and “No CA with eyegaze and other articulators” results in a total set of 902 tokens of indicating verbs produced with some evidence of eyegaze shift with the verb, as shown in Table 4. Of this combined set of 902, the fact that only 300 tokens (33%) occur with “Eyegaze only” means that the majority of tokens (61%) of indicating verbs with eyegaze shift co-occur with some other indicator of constructed action in addition to eyegaze.

Table 4. Constructed action/eyegaze categories coded for tokens with evidence of eyegaze shift towards verb

Categories	Figures	Percentage
CA with eyegaze and other articulators	550	61%
No CA with eyegaze and other articulators	52	6%
Eyegaze only	300	33%
Total	902	--

For the purpose of statistical analyses we combined “CA with eyegaze and other articulators” with “CA without eyegaze” to form a single category for constructed action with multiple articulators that could include eyegaze: “CA with multiple articulators”. We also combined “No CA with eyegaze and other articulators” and “No CA” to form a single category of indicating verbs (‘Without CA’) that occurred clearly without any evidence of constructed action, regardless of eyegaze shift and other articulators that might have been changed for the production of the verb. Additionally, we excluded ambiguous tokens and other tokens where annotators were unsure about the presence of constructed action, resulting in a set of 1379 tokens total for analysis. The results of the mixed effects model analysis with these verb tokens are provided in Table 5.

Table 5. Constructed action and eyegaze correlating with modification of indicating verbs

Factor	Number of tokens	Percentage with modified verbs	Log odds	Factor weight
CA with multiple articulators	577	80.1	0.279	0.569
Eye gaze only	300	77.7	0.225	0.556
Without CA	502	64.5	-0.504	0.377
Total	1379	100%	--	--

With participant and lexical item as random effects, the analysis reveals that the constructed action factor group was a significant fixed effect ($p \leq 0.001$). Both ‘CA with multiple articulators’ (log odds = 0.279; factor weight 0.569) and ‘Eyegaze only’ (log odds = 0.225; factor weight 0.556) significantly favour modification of indicating verbs for patient arguments. An example of a modified indicating verb with ‘CA with multiple articulators’ is shown above in Figure 10. Figure 15 shows an example of a modified indicating verb with ‘Eyegaze only’.

**Figure 15.** Example of ‘eyegaze only’ with modified indicating verb

Thus it appears that gaze direction is strongly correlated with modification generally, both when it is used in conjunction with other articulators for constructed action and when it is used alone. This is consistent with findings from studies of ASL that have looked at eyegaze behaviour with indicating verb modification using eye-trackers (e.g., Thompson et al. 2006). Here we find that the majority of the time when eyegaze is directed towards locations associated with modified verbs, there are other articulators active for constructed action in addition to eyegaze, 61% of the time as noted in Table 4. This calls into question the notion of eyegaze as an agreement marker. If most of the time eyegaze and verb modification occur with other clear indicators of constructed action, then – by Ockham’s razor – it is less clear why all examples of eyegaze alone should be treated as a different phenomenon (i.e., as ‘reference-tracking eye gaze’), particularly given the many previous claims that eyegaze can be used as a sole marker of constructed action (i.e., as ‘imitative eye gaze’) (e.g., Engberg-Pedersen 1993, 2003, among many others – see §1.3 above). If eyegaze were treated as a separate phenomenon – e.g. agreement – then one would need to explain why constructed action favours eyegaze agreement. Alternatively, it appears that eyegaze may be analysed on its own as a subtle type of constructed action, or (when working in conjunction with other articulators) as more overt instances of constructed action that co-occur during the modification of indicating verbs. This suggests a motivated rather than arbitrary use of space with these verbs.

5 Discussion/conclusion

Using a large set of spontaneous conversation data, overall we have seen a clear preference for the use of motivated space with indicating verbs in BSL rather than arbitrary space. This is not to say that signers never produce indicating verbs which use space arbitrarily; we did find a small number of tokens where this was the case (see §4.1.1). But arbitrary use of space with these verbs is rare. The clear tendency is for indicating verbs to use motivated space. The fact that presence of constructed action (via eyegaze and also other articulators) significantly favoured modification of indicating verbs suggests that signers tend to imagine themselves as other referents during production of these verbs in a motivated way (cf. Liddell's (2003) 'surrogate space').

Additionally, the fact that modification was preferred whether there were multiple articulators functioning to mark the constructed action or eye gaze on its own, and the level of preference for modification was the same in both cases suggests that in both situations signers are using motivated space with constructed action. This might be via multiple articulators (including very overt cases of constructed action as in Figure 10) or it could be via eyegaze only which could be considered a subtle use of constructed action. This provides an alternative analysis to the notion of eyegaze used as a grammatical agreement marker in BSL, as argued for ASL by Neidle *et al.* (2000), Thompson (2006), Thompson *et al.* (2006) and Hosemann (2011) for German Sign Language.

One of Thompson *et al.*'s (2006) main arguments for eyegaze as a grammatical agreement marker has to do with how it patterns with different types of verbs. They argue that if eyegaze patterns observed with indicating verbs were marking anything other than agreement (including prosody and/or "point of view", which includes what we are calling constructed action) then one would expect to find the same patterns with other verb types such as plain verbs and spatial verbs. They did find similar eyegaze patterns with indicating and spatial verbs (i.e. those that mark space topographically), but eyegaze was not directed towards locations associated with the verb's argument with plain verbs. This could be explained, however, in part by verb semantics. Indicating verbs are often verbs of transfer to some degree, involving interactions with animates in some way, whether literal or metaphorical. Plain verbs are not limited to, but certainly include, many stative verbs like WANT or HAVE and thus most would not be likely to lead signers to imagine interactions with other animate referents. It may be that the semantic transfer element is higher in indicating verbs than plain verbs and that this is more likely to trigger co-occurrence of constructed action in indicating verbs (including potentially via eyegaze only) than plain verbs (Johnston 1991). This is consistent with Liddell's (2003) claim that the use of indicating verbs, by their very spatial nature, involve a much greater activation of blended mental spaces than plain verbs.

Our second major finding involves direction of modification with indicating verbs modified for third person agent and to third person patient. With two third person arguments, we found that modification is overwhelmingly to or from the body, along either the sagittal or diagonal axis, rather than side-to-side (as also suggested for Danish Sign Language, see Engberg-Pedersen 1993). Modification of verbs between two locations in space was rare, occurring only 9 times (4%) in our data. If indicating verbs with two third person arguments were used with arbitrary space, this would involve arbitrarily setting up two locations in space and thus we would expect a much higher proportion of verb tokens using the side-to-side axis. The fact that the body-sagittal and body-diagonal axes were strongly preferred again suggests a motivated rather than arbitrary use of space for these verbs.

This has important implications for sign language teaching and learning. Side-to-side modification is often taught as prototypical for third person to third person modifications to students learning sign languages such as ASL and BSL (e.g., Miles 1988, Miller 2010, Stewart 1998). Considering that this is very rare emphasises the need for students to be taught about the use of the body with indicating verbs, particularly in relation to constructed action. Thompson *et al.* (2009) make a similar claim about the need for students to be taught where to look when they are learning how to use indicating verbs. We argue that "learning to look" is not enough. Our findings suggest that students learning BSL need to learn how to use space in a motivated way with indicating verbs instead, via not only eyegaze but also via other elements of constructed action.

Another implication of the preference for indicating verbs in BSL to be modified to and from the body in third to third person contexts relates to some claims about grammaticalisation of directionality in the sign language literature. Padden, Meir, Sandler and Aronoff (2010) compare the use of space in two emerging sign languages: Al Sayyid Bedouin Sign Language and Israeli Sign Language (ISL), finding that younger signers in both sign languages use the side-to-side axis for third to third person reference more than older signers who prefer the body-sagittal axis. They argue that this represents a grammaticalisation process in progress, that directionality in both languages is progressing from involving the body to not involving the body. While their findings are interesting and may well point to the some kind of increasing systematicity of the indicating verb system, we question their assumption about the highly grammaticalised nature of side-to-side modification. It may be that this system develops primarily as a result of analogy. Analogy is a common feature of language change, especially morphosyntactic change (Hopper and Traugott 2003). Indeed, analogy is an important mechanism involved in grammaticalisation, but it is not clear that what we see in the development of indicating verb systems is grammaticalisation per se. Padden et al. (2010) assume that side-to-side modification with indicating verbs is typical of older, more established sign languages such as ASL, and their conclusions when studying Al Sayyid Bedouin Sign Language and ISL about direction of grammaticalisation of space are based on this assumption. “The fact that, even after a language has developed such a system (ISL), the signer can still fall back on the body point of view, highlights the centrality of the body in sign language linguistic systems, and maybe in other cognitive systems as well” (Padden et al., 2010, pg. 592). BSL is one of the oldest documented sign languages, with the first deaf school having been established in 1760 and with records of signing going back as early as the sixteenth century (Jackson 2001). Our study suggests that it is not only possible for older sign languages to fall back on to a body point of view system, it is highly frequent. Given the importance of frequency for grammaticalisation processes (e.g., Bybee 2006), this has implications for the notion that side-to-side directional movement is a highly grammaticalised construction – if it is, how did this grammaticalisation occur, if it is so rarely used?

Finally, our third major finding involved both direction and constructed action with third to third person reference. We found that indicating verbs modified for third to third person which move to and from the body diagonally as well as those with atypical use of space (e.g. moving to and from locations very high or low or far to the side) favour co-occurrence of constructed action, suggesting motivated use of space with these tokens. Indicating verbs which move to and from the body sagittally (‘body-sagittal’) as well as those that move between two locations (side-to-side) for third to third person reference, on the other hand, disfavour use of constructed action. Body-sagittal tokens in this context are very likely to be unmodified verbs, lacking any meaningful use of space at all. Side-to-side tokens in third-to-third contexts likely do favour arbitrary space, but they are very infrequent. Overall it appears that even with third to third person reference, signers prefer motivated rather than arbitrary use of space.

The fact that we find arbitrary space used so infrequently suggests that it is not highly grammaticalised. This might lead one to ask: What *would* a highly grammaticalised agreement system in a sign language look like? It would have to have a grammaticalised system of arbitrary morphemes that are used regardless of actual or imagined (i.e. motivated) locations of referents. Geraci (2012) argues that signers by default use space in motivated ways if there is a mapping to the real world available. If there is not, he argues, this is when arbitrary space is used. His proposal is that subjects are established on the signer’s ipsilateral side (on the right for right-handed signers and on the left for left-handed signers) and objects on the contralateral side (vice-versa), and that this is the case regardless of which is signed first. However, testing this theory using spontaneous data would be difficult. Geraci’s evidence for this comes from Italian Sign Language and French Sign Language data elicited in very particular situations (e.g. description of a crime scene where locations of referents are unknown) which are not likely to be frequent in the languages overall. The fact that our data suggest that indicating verbs in BSL *do* use space in a motivated way the vast majority of the time suggests that the potential for arbitrary, grammaticalised use of space in everyday conversation is typically overridden by the tendency to point – a tendency shared by signers and non-signers alike (Kita

2003).⁸ It would be useful to see whether and to what extent these patterns hold for other sign languages.

To conclude, we have provided strong evidence that indicating verbs in BSL prefer motivated over arbitrary uses of space. While this does not mean that this is necessarily the case for other sign languages as well, it certainly calls into question claims about arbitrary uses of space with indicating verbs generally and also highlights the importance of evidence from large spontaneous datasets which can run counter to assumptions from the literature.

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Abbreviations

ASL: American Sign Language
 Auslan: Australian Sign Language
 BSL: British Sign Language
 ISL: Israeli Sign Language
 CA: Constructed action

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⁸ It may well be that certain tasks or genres are likely to elicit production of arbitrary use of space, and/or that signers accept structures using arbitrary space in certain judgement tasks. Our results do not mean that arbitrary use of space with indicating verbs is disallowed – but results do suggest that motivated space with these verbs is strongly favoured.

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