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Modification of indicating verbs in British Sign Language: A corpus-based study

Jordan Fenlon, Adam Schembri, Kearsy Cormier

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MODIFICATION OF INDICATING VERBS IN BRITISH SIGN LANGUAGE: A CORPUS-BASED STUDY

JORDAN FENLON
Heriot-Watt University

ADAM SCHEMBRI
University of Birmingham

KEARSY CORMIER
University College London

Indicating verbs can be directed toward locations in space associated with their arguments. The primary debate about these verbs is whether this directionality is akin to grammatical agreement or whether it represents a fusion of both morphemic and gestural elements. To move the debate forward, more empirical evidence is needed. We consider linguistic and social factors in 1,436 indicating-verb tokens from the BSL Corpus. Results reveal that modification is not obligatory and that patient modification is conditioned by several factors, such as constructed action. We argue that our results provide some support for the claim that indicating verbs represent a fusion of morphemic and gestural elements.*

Keywords: agreement, directional, person, constructed action, role shift, gesture, deixis

1. INTRODUCTION. The use of signing space has been described as where we see 'the most profound modality effects on grammatical organization in sign language' (Meier 2012:587). Signers regularly make use of the space around their bodies in meaningful ways that appear to share some properties with the uses of space seen in co-speech gesture (e.g. Perniss & Özyürek 2015). The use of space in sign languages and the most appropriate theoretical account of this phenomenon have, however, been subject to considerable controversy in the sign language linguistics literature (e.g. Lillo-Martin & Meier 2011 and commentaries in the same issue). Here, we focus our attention on how signers indicate arguments within a clause by modifying the production of a specific class of verb signs (we use the term 'indicating verbs' to refer to this class of verbs).

There are two main theoretical accounts of this aspect of the grammar of sign languages. The first, widely adopted by those working within a generative linguistics framework, analyzes such modification as grammatical agreement. The second, originating within a cognitive/functional linguistics framework, alternatively suggests that these verbs represent a fusion of morphemes with deictic gestural elements (Liddell 2003), in a model built on Langacker's (1987, 1991) notion of COGNITIVE GRAMMAR, which sees speech, sign, and gesture as all part of a broader notion of 'language' (Liddell 2011). Although the debate has moved forward considerably since the latter perspective was introduced by Liddell (2000), the discussion has only recently begun to benefit from empirical insights gained by looking at large data sets such as corpora[1] (e.g. de Beuzeville et al. 2009). Corpus-based studies not only provide a greater understanding of the overall frequency of indicating-verb modification in spontaneous settings but also allow us to statistically verify which factors (whether linguistic or social) may condition the use of space in this subset of verbs. Here we report on data from the

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[1] We use the term 'corpus' in the modern linguistic sense to refer to a large machine-readable resource that is representative and can be consulted to obtain information about the frequency with which a particular phenomenon or construction occurs (see McEnery & Wilson 2001).

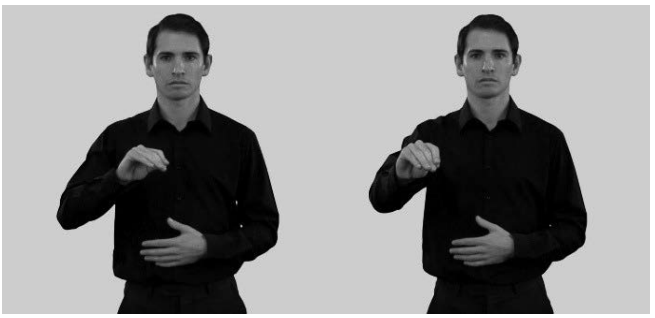
conversational component of the British Sign Language (BSL) Corpus (Schembri et al. 2014) with an examination of social factors involved in modification, something that has not previously been attempted on such a large scale.

In the following section, we first briefly describe indicating verbs in BSL before introducing the debate about the typological nature of the modification of these verbs in sign languages generally (whether this modification can be considered agreement marking or blends of morphemic and deictic gestural elements). We outline the research questions and methodology in §§3 and 4, respectively. The results are presented in §5 and discussed in §6. In §7, we conclude that our data appear to provide more support for a gestural analysis of directionality in indicating verbs (i.e. for the account claiming that these signs contain deictic gestural elements).

2. LITERATURE REVIEW.

2.1. VERBS IN SIGN LANGUAGES. Indicating verbs are a class of verbs that move in space between (and/or are oriented toward/away from) the locations of physically present referents and/or locations associated with absent referents. They have been attested in the vast majority of sign languages documented to date (e.g. Mathur & Rathmann 2010). Examples of two different types of indicating verbs in BSL, glossed here as GIVE and MOVE, are provided in Figure 1.[2]

a. GIVE.



b. MOVE.

FIGURE 1. BSL indicating verbs GIVE and MOVE.

Figure 1 illustrates the citation forms for GIVE and MOVE, which begin at a location near the signer's chest and end in the space immediately in front of the signer. The be-

[2] 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 in examples are glossed with a superscript indicating the direction of pointing (e.g. 1, 2, or 3 for 'person').

ginning and end locations of these signs may, however, be meaningful. For GIVE, these locations can be associated with the agent (i.e. who is giving) and the patient (i.e. who is receiving). In this case, the direction of movement in GIVE in Fig. 1 can be interpreted as meaning 'I give you something' (the location immediately in front of the signer is often, although not always, understood as a reference to second person). Consequently, the direction of movement (or in some cases, the orientation of the hand) can be reversed to convey the opposite meaning—for example, '(You) give (me something)'.[3] MOVE is also classed as a type of indicating verb (Johnston & Schembri 2007, Liddell 2003), although it differs from GIVE in that it appears to mark locative arguments as opposed to animate or nonlocative inanimate arguments. The movement of the hands in MOVE can therefore be interpreted as 'X moved from one location to another location', where the beginning and end points of the movement are understood as representing changes in the spatial location of the referent, from source to goal.

Indicating verbs vary in how they may be directionally modified to reflect agent and patient arguments (although an extensive analysis of these verb types and their modification patterns has yet to be conducted for BSL). For example, some verbs appear to be partly anchored to the body and are modified for only one argument within a clause. One such example is the BSL verb SAY, which begins near the signer's mouth and ends at the location associated with the patient argument (e.g. the person who is being told something). In this sign, the beginning location is fixed, even when the agent argument within a clause is a second- or third-person referent, as in 1. We may refer to these as 'single indicating verbs', as opposed to 'double indicating verbs' like GIVE.

(1) PT$^{\rightarrow 2}$ SAY$^{\rightarrow 3}$ YESTERDAY
'You told him yesterday.'

The two types of indicating verbs mentioned previously (e.g. GIVE and MOVE) are widely known in the sign language linguistics literature as agreement and spatial verbs, respectively, and form, together with plain verbs,[4] a tripartite division of verb types, as first proposed by Padden (1983, 1988).[5] This division is motivated by the observation that these verbs appear to mark different types of arguments (animate vs. locative) and that agreement verbs can be modified for person and number (Padden 1983). In this article, and from this point onward, we focus on the subtype of indicating verbs that are more widely known as agreement verbs. These verbs can be described as verbs that mark transfer and take animate or nonlocative inanimate arguments. Indicating verbs that are modified for purely locative arguments (i.e. arguments that are clearly only locative, e.g. MOVE in Fig. 1) are not included in the analysis reported in this article.

In the following paragraphs, we discuss some of the arguments for the two different analyses of these verbs: the agreement analysis and the morphemic-gestural analysis. For a more detailed description of this debate, we refer the reader to Lillo-Martin & Meier 2011 and commentaries in the same issue.

[3] Many sign languages also have a class of verbs known as 'backwards' verbs, often verbs like TAKE, CHOOSE, INVITE, which move from patient to agent (for more see e.g. Brentari 1988). When giving examples and explaining how indicating verbs work generally, we focus on verbs that move (or are directed) from agent to patient, but our study does include backwards verbs and in those cases the movements/directions are reversed.

[4] Plain verbs are verbs that do not move in space to reflect subject/object or source/goal arguments. These tend to be verbs that are produced on the body.

[5] Note that agreement verbs were referred to as 'inflecting' verbs in Padden 1983. Padden introduced the 'agreeing/agreement verb' terminology in 1988.

2.2. Directional modification as grammatical agreement. The first analysis of indicating verbs was presented for American Sign Language (ASL) by Padden (1983), building on earlier work by Friedman (1975), Fischer and Gough (1978), and Meier (1982). For both Padden (1983) and Meier (1982), directional modification in these verbs is interpreted as marking grammatical agreement for person, similar to what is found in Romance languages such as Italian. For instance, in 2–4, the Italian verb *parlare* 'speak' varies in form depending on whether the subject is first, second, or third person (it also varies according to whether the subject is singular or plural, though we do not focus on number here).

(2) Io parl-**o** Italiano.
'I speak Italian.'
(3) Tu parl-**i** Italiano.
'You speak Italian.'
(4) Lui/lei parl-**a** Italiano.
'He/she speaks Italian.'

Agreement, as defined by Corbett (2006), refers to the presence of covariance between a constituent acting as a controller and a target constituent that serves to express grammatical relationships. In 2–4, the controller is the subject noun phrase and the target is the verb (the form that varies according to the controller). In 2, the controller is a first-person singular pronoun, and the suffix on the verb (*-o*) reflects this property. In other words, the verb takes a suffix in order to agree with formal properties (i.e. person and number) of the subject noun phrase.

In earlier analyses of indicating verbs in sign languages, the spatial loci associated with the beginning and end of the verb (e.g. in BSL GIVE) were analyzed as a type of inflectional morpheme similar to the suffixes we observe in the Italian examples (Padden 1983). These spatial loci, having previously been set up in the discourse, are understood as being associated with the subject and object of the verb. Base forms of agreement verbs are therefore modified to correspond with these loci.[6] Later analyses argue that the directionality (or the path movement) itself is the inflectional morpheme, rather than a location in space (e.g. Aronoff et al. 2005). In these analyses, according to Corbett's (2006) definition, the claim would be that there is a formal property of the controller noun phrase (i.e. person) that is associated with these loci in the signing space (or the path movements toward them), and modifications of the target verb sign thus express agreement for person in the same way as the Italian examples in 2–4.

Various arguments have been made in support of person marking on these verbs. Meier (1990) and Lillo-Martin and Meier (2011) suggest that there are grounds for a distinction between first- and nonfirst-person pronominal forms, but not between second and third person. They argue that this first/nonfirst distinction can also be applied to agreement verbs when one considers that a number of idiosyncratic forms exist only for first-person object (e.g. CONVINCE in ASL, which is produced in neutral space for nonfirst-person object forms but at the signer's neck for first-person object forms). Furthermore, the presence of an indicating verb in a clause appears to have consequences for syntactic structure such as changes in word order (Fischer 1975, Quadros 1999, Quadros & Lillo-Martin 2010) and the licensing of null arguments (Lillo-Martin 1986), which, as argued by Lillo-Martin and Meier (2011), are characteristic of the mor-

[6] Others have moved away from a person analysis entirely and instead analyze the locations associated with pronouns and agreeing verbs as variables ('loci') whose content derives from discourse (Cormier et al. 1999, Lillo-Martin & Klima 1990).

phosyntactic properties of agreement systems in spoken languages (e.g. languages with rich agreement systems also permit null arguments).[7]

However, many researchers (e.g. Lillo-Martin & Meier 2011) acknowledge that some characteristics of sign language agreement systems make them typologically unique. For example, only some verbs are modified spatially—plain verbs are body-anchored and cannot be modified to show direction. Additionally, unlike spoken language agreement systems studied to date where there is a strong tendency for verbs to agree with the subject, subject agreement appears to be optional in sign languages (Meier 1982, Padden 1983). Instead, object agreement appears to take a primary role and is claimed to be obligatory in ASL (Lillo-Martin & Meier 2011, Meier 1982), BSL (Morgan et al. 2006), and Brazilian Sign Language (Quadros & Lillo-Martin 2007). In other sign languages it has been claimed that neither subject nor object agreement is obligatory. For example, Lam (2003, cited in Tang et al. 2008) claims that neither subject nor object agreement is required in Hong Kong Sign Language. Lam additionally claims that verbs may appear unmodified in citation form unless the subject is second person (in which case subject agreement is obligatory) or the object is first person (in which case object agreement is obligatory). In all of these cases, however, it is not clear on what grounds obligatoriness or optionality is claimed.

2.3. DIRECTIONALITY AS A FUSION OF MORPHEMIC AND GESTURAL ELEMENTS. An alternative analysis of these verbs posits that directionality is a fusion of morphemic and deictic gestural elements (Liddell 1990, 1995, 2000, 2003). Within such an analysis, directionality may be analyzed instead as a reference-tracking device through the incorporation of a deictic pointing gesture(s) into the verb. Liddell (2003) argues that this type of behavior is similar to the way a nonsigner might point to location(s) associated with a referent while speaking simultaneously (cf. Kendon 2004), though the construction overall is still of course a grammatical one.

Several arguments have been made in support of this view. One argument is that the location toward which a verb is directed appears to be determined by properties of the referent (Liddell 1990, 2000). In 5 below, the indicating verb ASK moves toward a non-addressed referent on the signer's right who is physically present. In this case, the location toward which the verb is directed does not depend on any semantic or formal property of the controller noun phrase (as per Corbett's (2006) agreement definition) but rather on the physical location of the referent. These characteristics have been used to argue that sign languages do not, in fact, exhibit agreement at all (Corbett 2006).

(5) PT$^{\rightarrow 1}$ ASK$^{\rightarrow 3}$
'I'll ask her.'

Second, some verbs that are directed toward specific parts of the body can vary in height depending on the physical dimensions of the referent. For example, the ASL sign ASK moves toward the head of a physically present referent. Liddell (2003) argues that, if the addressee were very tall, then the height of the verb would be modified to reflect this physical characteristic. This would be true even if the referent were not physically present. Such behavior suggests that signers are pointing to imagined referents as if they were present. Third, Liddell (2000) argues that if we are to analyze the spatial locations associated with the beginning and end of these verbs as inflectional affixes, then

[7] The existence of null arguments is definitely not confined to highly inflecting languages, however, and can be found in languages without rich agreement systems, such as Mandarin Chinese. It is also common in clauses in ASL (and other sign languages) containing only plain verbs, which cannot be modified directionally (McKee et al. 2011, Wulf et al. 2002).

we are confronted with a listability problem. There is an infinite number of locations that a signer can point to with these verbs. Thus, creating a list of these forms would be an impossible task, and no model of sign language morphophonology has as yet successfully addressed this problem (although see Wilbur 2013 for a critique of Liddell's listability problem).

2.4. Weighing the arguments. The arguments put forward about the nature of indicating verbs have been subject to much debate. Some earlier proponents of the agreement analysis have subsequently revised their perspective so as to acknowledge the inherent pointing nature of these verbs. For example, many accept that the actual location a signer may point to is external to the language and that these verbs must interface closely with a system of deictic gesture (Lillo-Martin & Meier 2011, Mathur & Rathmann 2010). Some of these authors argue that the form of the verb contains abstract indices (which they term 'referential loci'), with the actual spatial location being derived from a grammar-gesture interface. Under such a perspective, the listability problem that Liddell (2000) raises is less of an issue. Alternatively, Aronoff and colleagues (2005) have argued that agreement need not refer to grammatical categories and listable morphemes, and that sign language agreement is similar to literal alliterative agreement systems in which the target alliterates features of the controller (in this case, the spatial location associated with the noun or pronoun). Additionally, Lillo-Martin and Meier (2011) and Meier and Lillo-Martin (2013) have revised their analysis, arguing instead that directional modification is 'person-marking' at least, and this is the reason it shares some of the features associated with agreement systems (i.e. person and number) in spoken languages.

The debate about the status of directionality in indicating verbs is far from resolved. One of the major issues here is that those working in different theoretical traditions make different assumptions about the relationship between speech, sign, and gesture. Many who accept an agreement analysis work within a generative framework, where language and gesture are considered separate systems. The morphemic-gestural analysis typically takes a cognitive/functional framework (where gesture may be seen as a part of language) as its starting point. Additional recent work in this tradition includes Ferrara & Johnston 2014 and Rankin 2013 (for an alternative analysis within a cognitive grammar approach that argues that directional verbs do not represent a fusion of morphemic and gestural elements, see Wilcox & Occhino 2016). An additional issue is the apparent lack of naturalistic data upon which these arguments have been based. Both sides thus far appear to draw mainly on observation, native-signer intuitions, or experimental data. Very few studies have been conducted where conclusions are drawn from a large naturalistic language sample. Such studies have the potential to clarify the factors that underlie directionality and to reveal relevant new facts about the use of these verbs.

One such study has been conducted based on 2,448 indicating-verb tokens in narrative data from the Auslan (Australian Sign Language) Corpus (de Beuzeville et al. 2009). This study reported that only 41% of indicating verbs were clearly modified and that high-frequency verbs and verbs cooccurring with constructed action (i.e. the use of articulators such as the head, face, or the body to mimetically represent a referent's actions, utterances, or feelings) were significantly more likely to be modified. The researchers also reported, based on a subset of their data, that object modification was not always present where expected; thus little support was found in the Auslan data for claims that object marking might be obligatory. The authors conclude that their findings appear to support the analysis proposed by Liddell (2000). The fact that verbs favor

modification during periods of constructed action suggests that directionality in indicating verbs may involve some degree of enactment and that signers use them to point to referents, whether present or imagined. The relatively low rate of modification also suggests that directionality is not highly grammaticalized, and this may be linked to the relative youth of sign languages (no contemporary sign language appears to have a documented continuous history of use longer than three centuries; cf. Woll et al. 2001).

Studies based on corpora clearly have the potential to give us a clearer picture of what is happening when a verb is modified. However, a detailed analysis based on a range of both internal and external factors linked to modification has yet to be conducted. Such internal factors would include participant role ('person'),[8] number, animacy, the presence or absence of an argument within a clause, the verb's position in a clause, the type of clause the verb occurs in, and a verb's overall frequency. External factors linked to modification may include social factors such as the signer's age and language background. Although the Auslan study did not look at social factors, factors like age have been suggested to be important. For example, Engberg-Pedersen (1993) claims that younger signers use modified forms more frequently than older signers in Danish Sign Language, and differences in patterns of modification in relation to the body across generations have also been demonstrated using elicited data in a study involving Israeli Sign Language and Al-Sayyid Bedouin Sign Language (Meir 2012, Padden et al. 2010).

3. Research questions. Given previous claims in the sign linguistics literature, we hope to address the following questions: What factors, language-internal and -external, are associated with directional modification in the class of indicating verbs in BSL conversation? Do we find factors similar to those found in the de Beuzeville et al. 2009 study of Auslan narratives, such as the presence of constructed action and lexical frequency, to be of importance in predicting modification in BSL conversation? Additionally, what roles do other linguistic factors not yet studied in corpus data, such as person, number, animacy, and coreference, play in directional modification? Do syntactic factors such as position in clause or clause type play a role? What role do social factors, such as age and language background, play? Importantly, we hope to interpret our findings within the context of the two possible analyses discussed above. If an agreement analysis is appropriate, we might expect to find person to be the primary predictor of modification in these verbs, for example, and marking of arguments to be obligatory or at least highly frequent. However, if we find that other factors, constructed action in particular, play a role, then this may point away from an agreement analysis and toward one based on deictic gesture.

4. Methodology.

4.1. BSL corpus project. The study reported here draws on data collected as part of the BSL Corpus Project (Schembri et al. 2014), a large-scale project aiming to produce the first online, open-access corpus of BSL. The BSL Corpus features digital video data collected from 249 deaf signers from eight urban centers around the United Kingdom and partial annotations of these video data. The design and the methodology of the corpus are outlined in detail in Schembri et al. 2013. For this study, we focus on spontaneous conversation data collected as part of the BSL Corpus Project. The signing produced in this

[8] Although we refer to 'person' here, this is primarily for ease of exposition (e.g. 'first person' refers to the signer him/herself or to the role being assumed by the signer during constructed action), and it should not be taken as reference to grammatical person.

subset of the data is most likely to be indicative of BSL as it is produced in a more naturalistic setting because participants were free to talk to each other about any topic they wished, without the researchers being present. We analyzed a subsection of the BSL Corpus conversation data: 101 signers from four cities in England (twenty-five each from Birmingham, Bristol, and London, and twenty-six from Manchester), as these regions represent the annotation work that was completed at the time of this study. A 500-sign sample from each of these 101 signers was annotated using identifying glosses (or 'ID glosses')[9] (cf. Fenlon, Schembri, et al. 2014). In Table 1, the distribution of participants according to several social categories is provided.

	GENDER		AGE				ETHNICITY		LANGUAGE BACKGROUND		TOTAL
	M	F	18–35	36–50	51–64	65+	WHITE	OTHER	DEAF	HEARING	
Birmingham	16	9	7	9	5	4	22	3	11	14	25
Manchester	12	14	6	5	8	7	24	2	7	19	26
London	13	12	6	8	7	4	21	4	13	12	25
Bristol	12	13	3	9	8	5	23	2	16	9	25
	53	**48**	**22**	**31**	**28**	**20**	**90**	**11**	**47**	**54**	**101**

TABLE 1. Distribution of participants according to social categories.

In the following sections, we discuss the methodology of the current study and our motivations for including the range of internal and external factors that we studied.

4.2. PARTICIPANTS. A total of 101 deaf participants were included in the study, representing a nonrandom (i.e. judgment) sample of the British deaf community, with attention to a number of social factors including language background, age, gender, and social class. In terms of language background, approximately half (46.5%, $n = 47$) were native signers (i.e. they had at least one signing parent who was deaf). Of the remaining number (53.5%, $n = 54$), fifty-one reported having learned to sign before seven years old, and three reported having learned to sign between the ages of eight and twelve. Research has demonstrated that the age of sign language exposure has a considerable effect on sign language proficiency in adulthood (Emmorey 2002, Mayberry 2010); therefore, we might expect to see variation in directional modification reflecting a signer's age of BSL acquisition.

Age-related variation is documented for spoken language at the morphosyntactic level (e.g. Cheshire & Fox 2009). For sign languages, variation according to age has been identified at the lexical level (Stamp et al. 2014) and at the phonological level (Schembri et al. 2009). Since few signers are born to signing parents,[10] large centralized

[9] All signs in this study were assigned an ID gloss, which represents best practice when annotating a sign language corpus (Johnston 2010). An ID gloss is a unique label used to identify a particular lexeme and to represent all of its phonological and morphological variants in the process of lemmatization—the ID glosses used here correspond to those in BSL SignBank (http://bslsignbank.ucl.ac.uk). ID glosses do not reflect the meaning of a sign across all contexts, nor do they give any indication of a token's grammatical function. For example, the ID gloss ACCOMMODATION is used for the sign that can mean 'accommodation', 'accommodate', 'stay', 'reside', 'resident', and so forth, regardless of whether the token in question is functioning as a verb or noun or whether it refers to a place, a person, the act of staying, and so forth. The numbers used in some ID glosses are for lexical variants with the same or similar meaning in BSL SignBank—for example, LOOK vs. LOOK2 (for more on lemmatization principles, see Fenlon et al. 2015). Meaning and grammatical-function information are annotated separately from glosses in a corpus. Glosses for partly lexical signs (e.g. pointing signs, classifier constructions, and buoys) follow conventions described in Cormier, Fenlon, et al. 2015.

[10] The number of native signers in the UK is unknown, but it is largely thought that roughly 5–10% of deaf people are born into signing families, following similar proportions documented in other countries (Mitchell & Karchmer 2004).

deaf schools appear to play a primary role in transmitting the language from generation to generation. Variation in educational policy within such schools therefore has the potential to impact patterns of use. Recruitment in the BSL Corpus Project was designed to reflect this variation by ensuring that participant selection was evenly spread across four age groups (ranging from sixteen to ninety-four years of age). These age groups were partly motivated by changes in language policy in deaf education during the twentieth century (e.g. from education that emphasized the exclusive acquisition of speech and listening skills to increasing acceptance of sign language in the classroom; see Woll & Ladd 2011 for an overview).

Morphosyntactic variation due to region is well reported for spoken languages (e.g. Cheshire 2003, Cornips & Corrigan 2005, Harris 1984), and region has been found to be important at the phonological and lexical levels (Bayley et al. 2002, Eichmann & Rosenstock 2014, Fenlon et al. 2013, Schembri et al. 2009, Stamp et al. 2014) and in fingerspelling (Sutton-Spence et al. 1990) in sign languages. However, very few studies focusing on sign languages have produced evidence for morphosyntactic variation according to region. The participant sample we selected drew from four regions: Birmingham, Bristol, London, and Manchester. Signers from each region were chosen to take part in the corpus because they were believed to be representative of the signing used in that region. Lastly, since both ethnicity (Fought 2002, McCaskill et al. 2011) and gender (e.g. Rickford et al. 1995, Schembri et al. 2009) are also important variables to consider when investigating sociolinguistic variation in spoken and signed languages, these factors were also included in our analysis.

4.3. Data coding. For each of the 101 participants, approximately the first 500 signs produced in the conversational data were annotated and assigned an ID gloss. We identified within this set of 500 signs all tokens that were used as predicating elements in each case, regardless of how they may be used in other contexts. However, not all predicative tokens were indicating verbs (e.g. some were plain verbs or other types of predicates). Only indicating verbs with at least one nonlocative argument were included in the study. This resulted in a set of verbs numbering 1,612 tokens—approximately sixteen tokens of indicating verbs from each participant (although this was later reduced to 1,436 tokens; see below). The data were coded by the first author and two research assistants, all of whom are native/fluent signers of BSL. Since annotation was dependent (to an extent) on the coder's interpretation of the utterance, it was also necessary to assess reliability once coding was completed. Approximately 13% of the data (representing 212 tokens across ten participants) was checked for all of the categories described in this section (e.g. animacy, person, number, modification, etc.) by the third author, a fluent user of BSL, who indicated whether she agreed with the coding assigned. This produced an agreement level of 95% (i.e. only 5% were tokens that the third author would have coded differently).

For each indicating-verb token, we also identified the boundaries of the clause the verb was situated within. Our definition of a clause was taken from the Auslan Corpus annotation guidelines (Johnston 2016). Such a unit is identified with reference to a predicating element (in this case, the verb), arguments of the predicate, and adjuncts associated with the predicating element or its arguments (Johnston 2016, Van Valin & LaPolla 1997). Examples of clauses from the BSL Corpus are provided in 6–10. Note that we also referred to prosodic cues as further justification for grouping signs together as clauses; descriptions of sign languages have outlined how prosodic structure is often closely aligned with syntactic structure (e.g. Sandler 2010).

(6) [PT:PRO1SG TEACH$^{1\rightarrow X}$ PARENTS]
'I taught my parents (to sign).'
(7) [WHO GIVE$^{X\rightarrow Y}$ TICKET GIVE$^{X\rightarrow Y}$]
'Who did you give the ticket to?'
(8) [OVERTIME FATHER MOTHER THINK DISCUSS$^{X\leftrightarrow Y}$]
'Over time, my father and mother thought about it and discussed it.'
(9) [PT:POSS3SG FATHER ASK$^{X\rightarrow 1}$][GO-TO WEST-HAM]
'His father asked me to go to West Ham with him.'
(10) [IF FS:MIDDLESBROUGH TOP][MEAN HARD TAKE]
'If Middlesbrough were at the top, it would be hard for me to get tickets.'

For example, in 6, 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, a clause could contain more than one verb. This was the case if a verb was doubled, as in 7, if the clause contained serial verbs, as in 8, or if there was an embedded clause structure, as in 9. In order to assist with identifying coreference, the clause immediately preceding the clause with the indicating-verb token was also annotated. Following segmentation, we identified the agent and the patient of the clause.[11] For example, in 6, the agent of TEACH is represented by PT:PRO1SG, and PARENTS is the patient. For each clause, the agent, the patient, and other semantic roles were identified. It was also noted whether the agent and patient (or other roles) were overtly expressed as noun phrases within the clause. In 7 above, for example, the agent of the verb GIVE is described as nonovertly expressed.

Once the agent and patient were identified, we also coded each argument for a range of linguistic features. These were person, number, animacy, and coreference. All arguments were coded for whether they represented first, second, or third person—that is, whether they involved reference to the self, addressed participant(s), or nonaddressed participant(s). Arguments for which person was difficult to establish were marked as indeterminate for person. For number, arguments were categorized as singular, plural, or indeterminate. It should be noted that it was frequently difficult to determine whether an argument should be treated as plural because there was often little distinction made in form (e.g. points to plural referents in our data set were often points to a single location). Meaning can be ambiguous as well, particularly with nonspecific referents (e.g. it was often difficult to tell if a sign like WOMAN referred to just one woman or several women or if it was generic). Such tokens were labeled as indeterminate for plurality, whether due to form or meaning or both.

For animacy, arguments were categorized as animate-human, animate-animals/groups, inanimate, or indeterminate. Animate-human arguments are human beings (individuals or multiple people). The category of 'animate-animals/groups' includes nonhuman animates such as animals; it also includes groups/organizations displaying some degree of group identity, such as the deaf community, a school, a football club, and so on. Inanimate arguments are referents that are not an animate being, such as a pen,

[11] Our use of the terms 'agent' and 'patient' should be understood here as generalized semantic roles or proto-roles, corresponding roughly to A and P as described by Haspelmath (2011). These also correspond roughly to Van Valin and La Polla's (1997) 'actor' (which may include agent, experiencer, possessor, etc., depending on the verb) and 'undergoer' (which may include patient, theme recipient, etc., depending on the verb). This approach of using generalized or proto-roles is seen as increasingly important in comparative work in linguistic typology.

table, window, or newspaper. Arguments that could not be placed in any of these categories were labeled as indeterminate for animacy. This included tokens for which it was difficult to determine if the verb indicated an animate/inanimate or locative argument (e.g. LOOK could be modified so that it is oriented toward a specific object situated at a specific location, but it is not always clear whether the looked-at referent was the object ('look at x') or the location ('look there'), as the form in each case would be identical).

We also established if the arguments in the target clause were coreferential with the preceding clause (identified using the criteria set out above). An argument was determined to be coreferential if it matched an argument in the preceding clause; conversely, an argument was considered to be noncoreferential if it did not match an argument in the preceding clause. We also indicated whether the verb's argument was coreferential with a noun, a pronoun, or a null argument in the previous clause. We also considered coreference across conversational partners (e.g. if the preceding clause was produced by the conversational partner, we looked at the clause they produced to determine coreference).

In addition, we created a category 'person:agent/patient' to enable us to inspect the relationship between the agent and the patient with respect to person. This is important because the statistical analysis focuses on the agent and patient separately, without any consideration of the relationship between the two. We wanted to explore, for example, whether we can expect to see modification for the agent when the construction in question involves a first-person agent and a nonfirst-person (i.e. second or third person) patient. Alternatively, can we expect to see modification for the patient when the construction involves a nonfirst-person agent and a first-person patient? To investigate this, each verb token was coded for the following categories: first-person agent to nonfirst-person patient, nonfirst-person agent to first-person patient, and nonfirst-person agent to nonfirst-person patient.

Given previous work that argued for the role of indicating verbs in syntax (Fischer 1975, Quadros 1999, Quadros & Lillo-Martin 2010), we also considered syntactic factors such as clause type, verb position, and whether the agent or patient arguments were overtly expressed as a noun phrase.[12] For clause type, we considered 'simple clauses' vs. 'complex clauses', based in part on the Auslan annotation guidelines (Johnston 2016). A simple clause is one that does not enter into a dependency relationship with other neighboring clauses but stands on its own, as in 6. Complex clauses are clauses that share some kind of relationship with neighboring clauses, such as the matrix and subordinate clauses in 9 and the independent and dependent clauses in 10. In addition to clause type, we also indicated the verb's position in the clause, given previous claims that in clauses involving agreement verbs, the verb occurs in final position after arguments have been established in space (e.g. Fischer 1975). To see if this is reflected in our data, we coded whether the verb token was clause-final, nonfinal, or a verb-only clause. Clauses that were joined with neighboring clauses were considered to be a single unit when deciding verb position (e.g. in 9, the verb ASK would be labeled nonfinal).

For each indicating-verb token, modification was coded for both the agent and the patient. Verbs were judged as unmodified, modified, congruent, or indeterminate. Signs judged as unmodified did not differ from citation form (the citation form typically involves movement from a location near/touching the signer toward a location directly in front of the signer). Signs judged as congruent were signs in which it was impossible to tell whether the sign was modified because the locations associated with the arguments in question were identical to the locations associated with the citation form of the verb.

[12] Other syntactic factors we considered were verb doubling and serial verbs. However, verbs of these types were so infrequent that a meaningful statistical analysis could not be conducted.

Signs judged as modified were signs that differed from the citation form. The three categories with respect to the agent and the patient are illustrated in Figure 2, using the BSL sign GIVE. 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 to each other; they differ only in that, for a sign to be coded as congruent, either the context relates to actions involving a first-person agent and second-person patient, or the signer explicitly established the argument(s) directly in front of him/herself along the sagittal axis previously in discourse. Signs judged as indeterminate were those in which it could not be determined whether the sign was identical to citation form (moving directly forward in front of the signer) or different from citation form (and thus modified). This issue occurred most often due to the seating arrangement of the participants (i.e. participants were filmed from an angle that, at times, slightly obscured whether a sign had shifted in space).

a. Agent of GIVE (typically the starting location of the verb).

unmodified for agent

Verb begins at a location near the signer and either does not correspond to a location set up for the agent or no location was established prior to the verb's articulation.

modified for agent

Verb begins at a location other than near the signer (e.g. away from the signer).

congruent for agent

Verb begins at a location near the signer (as in citation form) that matches the location of the agent (e.g. referent is the signer).

b. Patient of GIVE (typically the end location of the verb).

unmodified for patient

Verb ends at a location in front of/away from the signer on the sagittal axis and either does not correspond to a location set up for the patient or no location was established prior to the verb's articulation.

modified for patient

Verb ends at a location other than the one in front of the signer along the sagittal axis (e.g. to the left).

congruent for patient

Verb ends at a location in front of/away from the signer (as in citation form) that matches the location for the referent (e.g. referent is the addressee).

Figure 2. Citation form of GIVE and three categories of unmodified, modified, and congruent for agent and patient.

Because a systematic study of the modification potential of all BSL indicating-verb signs had not been undertaken at the time the study began, all indicating verbs were coded as potentially modifiable for agent and patient (i.e. we assumed all verbs in our data were lexically specified for modification). This was the case even if the beginning of the verb was a single indicating verb, anchored to the body (e.g. the BSL sign SAY, which begins at the signer's lips). Following coding, signs that were consistently unmodified for either agent or patient were changed from 'unmodified' to 'not applicable' for either agent or patient modification. Verbs that were excluded on the basis of never being modified in our data were CONTROL, OBJECT, OFFER, and DEPEND4. Some verbs, such as LOOK, PUSH, THANK, ACCEPT, and CHECK, were modified only for one argument in our data (these verbs were never modified for agent). In these cases, we changed all of the coded data for agent modification from 'unmodified' to 'not applicable' so that they would be excluded from the analysis. Thus, we determined which forms acted as indicating verbs on the basis of the data from the corpus itself.

Following de Beuzeville and colleagues (2009), we also expected that lexical frequency could be a factor predicting directional modification in BSL (cf. Bybee 2006 for frequency effects in spoken languages). That is, more-frequent indicating verbs may show greater variability in form and allow for more spatial modifications. In order to include lexical frequency as a factor in our analysis, we classed verbs that were within the top ten most frequent signs in our data set of 1,612 tokens as high-frequency verbs, with all others classed as low-frequency verbs. Verbs that were marked as high frequency (SAY, LOOK, LOOK2, MEET, GIVE, PAY, DISCUSS, GIVE-INFORMATION, ASK, TEACH) represented 56% (n = 909 tokens) of 1,612 tokens.

Lastly, we also coded for presence and absence of constructed action (elements of enactment; Metzger 1995). A distinction can also be made between overt displays of constructed action (e.g. involving the whole body) and minimal displays of constructed action (e.g. involving the use of facial expression or eyegaze alone). For the purpose of this study, we define constructed action broadly as the use of one or more articulators (e.g. head, face, eyegaze, body, arms, and/or hands) to mimetically represent a referent's actions, utterances, or feelings (Cormier, Smith, & Sevcikova-Sehyr 2015). Following this definition, we coded constructed action as either present or absent. An example of the use of constructed action with the lexical verb LEARN is provided in Figure 3. In this example, the articulators involved in this use of constructed action are the eyes, facial expression, the head, and the torso, and the signer is representing herself in the past (when she attended school while young and learned to sign from her peers). Her facial expression and mouth action convey the sense of surprise and wonder she experienced as she learned BSL for the first time from her deaf peers at school.

FIGURE 3. Constructed action with the lexical sign LEARN.

For the statistical analysis, we used the variable rule program Rbrul (Johnson 2009) to quantitatively determine the effect of several factors (i.e. the linguistic and social factors) on a binary linguistic variable (i.e. whether the target was modified or unmodified), using a mixed-effects model with participant and lexical item as random effects and all other independent variables as fixed effects. Rbrul reports its results using both factor weights and log odds. A factor weight between 0.50 and 1.00, or a positive log-odd result, means that this particular factor 'favors' the use of the modified indicating verb (i.e. modification is more likely to occur), while a weight between 0 and 0.50, or a negative log-odd result, indicates that it 'disfavors' the modified form (i.e. modification is less likely to occur) (Tagliamonte 2006). Although we discuss results in term of favoring or disfavoring modification, factor weights and log odds should be considered in relation to other factor weights and log odds within each category (e.g. a higher factor weight for first person and a lower factor weight for third person means that first person strongly favors modification when compared to third person). Additionally, although we use a positive/negative log-odd value and a cut-off point of 0.50 to interpret results as either favoring or disfavoring modification, a log odd close to 0 or a factor weight close to 0.50 may be interpreted as being relatively neutral with respect to modification. Again, what is important is its relative position with respect to the other values within a given category.

Rbrul also tests the significance of each factor's effect on the use of modification and the relative strength of the influence of each factor when compared to other factors. Since Rbrul requires a binary dependent variable, we had to reorganize the categories described above for determining modification (modified, unmodified, congruent, indeterminate). Since it is impossible to decide if congruent tokens were either modified or unmodified, we treated all congruent tokens as modified (i.e. modified and congruent were collapsed into a single category) in the first instance. For comparison, we also conducted a second analysis with congruent tokens excluded. It was expected that we could be more confident that a given factor had a significant effect on modification if it appeared to be significant in both analyses. Factors that were significant in only one type of analysis may have a significant effect on modification, but this significance would be dependent on how these congruent tokens are to be interpreted. Finally, since the categories of person and 'person:agent/patient' are closely related with one another, person was run separately from the main analyses each time (since Rbrul assumes that all factors are independent).

Lastly, our statistical analysis was based on a reduced data set of 1,436 of 1,612 tokens. The reduced number reflects the fact that we focus on only those tokens within our data set that could be coded for all of the factors mentioned in this section, so that we can accurately assess how these factors may or may not be competing with one another with regard to these tokens. We therefore excluded from the analysis 176 tokens to which all factors focused on here were not applicable. The majority of these tokens (n = 159) were verbs that took only one argument and for which the category of person: agent/patient was therefore not applicable (i.e. the statistical analysis could not take these tokens into account).

In summary, the following linguistic factors were included in our analysis for agent and patient modification: person, person:agent/patient, number, coreference, animacy, lexical frequency, presence vs. absence of constructed action, overtly expressed (i.e. by means of a noun phrase) vs. nonovertly expressed arguments, verb position in clause, and clause type. The following social factors were included in our analysis for both agent and patient modification: region, gender, age, ethnicity, and language background.

5. RESULTS. Our analysis focuses on 1,436 tokens, representing eighty-one verb types. A table listing all of the indicating verbs in the statistical analysis according to frequency is provided in the appendix, along with information on whether each verb could be modified for the agent and/or the patient.[13] The top ten and top fifty verbs account for a significant proportion of the overall data set: 57.0% and 93.6%, respectively. In the following sections, we provide an overview of the rate of modification for our 1,436 tokens,[14] as well as the results of our statistical analysis.

5.1. RATE OF MODIFICATION FOR AGENT AND PATIENT. In Table 2, the rate of modification for agent and patient is provided according to the following modification categories: modified, unmodified, congruent, and indeterminate. Since some verbs within our set of 1,436 ultimately did not appear to be modified for agent or patient (e.g. LOOK was never modified for the agent in our data and therefore was excluded from the analysis of agent modification), they were excluded from the analysis. This meant that we could analyze agent modification in 1,066 tokens and patient modification in 1,415 tokens. Note, however, that in the final statistical analysis, the tokens listed as 'indeterminate' for modification in Table 2 were also excluded. This left 1,019 tokens for agent modification and 1,278 tokens for patient modification.

	AGENT		PATIENT	
Modified	291	27%	731	52%
Congruent	401	38%	186	13%
Unmodified	327	31%	361	26%
Indeterminate	47	4%	137	10%
TOTAL	1,066	100%	1,415	100%

TABLE 2. Rate of modification for both agent and patient.

Table 2 shows that 27% of our tokens were clearly modified for agent. Tokens classed as congruent represented the largest category, 38%. If one assumes that all of the congruent tokens are actually modified, then grouping these together results in a maximum of 65% of our tokens being modified for agent. Table 2 also shows that more tokens were clearly modified for the patient than for the agent (52% compared to 27%). Verbs classed as congruent for patient came to 13%. Again, if both the modified and congruent categories are combined, adopting a generous definition of modified verbs, then up to 65% of our data set could be considered modified for patient arguments. In the following sections, the factors for agent and patient modification are reported.

5.2. FACTORS INFLUENCING AGENT MODIFICATION.

MODIFIED/CONGRUENT VS. UNMODIFIED. In Table 3, the factors influencing agent modification are shown. Since Rbrul requires a binary dependent variable, we collapsed the subcategories of modified verb and congruent verb into a single category representing all forms of modification. As mentioned above, due to a high degree of interaction with 'person:agent/patient', the results for person, which are also presented in Table 3, were obtained from a separate analysis (indicated by a caret ^).

In Table 3, five factor groups were found to be significant in predicting agent modification: person:agent/patient ($p < 0.001$), coreference ($p < 0.01$), verb position ($p < 0.05$),

[13] The citation form for each of these signs as well as English keywords (translation equivalents) and other information about each sign in BSL SignBank is available upon registration to researchers who request this level of access. Note that because SignBank is constantly growing and changing, some sign entries (including ID gloss and/or citation form) may be different from those shown here.

[14] The rate of modification for 1,612 tokens (our original data set) in percentages is almost identical to that presented in Table 2 based on 1,436 tokens.

	tokens	% modified	log odds	factor weights
Person:agent/patient ($p < 0.001$)				
First to nonfirst	373	95.2	2.304	0.909
Nonfirst to first	278	66.5	0.145	0.536
Indeterminate	61	37.7	−0.872	0.295
Nonfirst to nonfirst	307	42.0	−1.577	0.171
Coreference ($p < 0.01$)				
Indeterminate	36	72.2	0.695	0.667
Coreference (null argument)	218	78.4	0.489	0.620
No coreference	515	65.4	−0.204	0.449
Coreference (pronoun)	192	68.2	−0.486	0.381
Coreference (noun)	58	46.6	−0.494	0.379
Verb position ($p < 0.05$)				
Final	293	79.2	0.314	0.578
Verb-only	138	80.4	0.066	0.517
Nonfinal	588	59.4	−0.380	0.406
Constructed action ($p < 0.05$)				
Constructed action	645	72.7	0.394	0.597
No constructed action	325	61.2	0.198	0.549
Indeterminate	49	49.0	−0.592	0.356
^Person ($p < 0.001$)				
First	380	95.0	2.431	0.919
Third	528	51.9	−0.697	0.332
Second	94	52.1	−0.743	0.322
Indeterminate	17	47.1	−0.992	0.271

Table 3. Significant factors influencing agent modification in indicating verbs (with 'congruent' as 'modified').

constructed action ($p < 0.05$), and person ($p < 0.001$). For person:agent/patient, the strongest factor (moving from a first-person agent to a nonfirst patient) strongly favored agent modification (2.304), while moving from a nonfirst agent to first-person patient slightly favored agent modification (0.145). Indeterminate tokens and moving from a nonfirst agent to a nonfirst patient both disfavored agent modification (−0.872 and −1.577, respectively). The second strongest factor was coreference. Tokens indeterminate for coreference favored agent modification (0.695), followed by tokens that were coreferential with a null argument in the previous clause (0.489). Tokens that were coreferential with a noun or a pronoun in the previous clause were most likely to disfavor agent modification (−0.494 and −0.486, respectively), compared to tokens that were not coreferential at all (−0.204).

The next significant factor was verb position in clause. Here, verb-final favored agent modification (0.314), while verb-only clauses appeared to be neutral (0.066). In contrast, nonfinal verbs disfavored agent modification (−0.380). The next most significant factor was constructed action. Here verbs with constructed action were more likely to occur with modification (0.394) than verbs that did not display any evidence of constructed action (0.198). Verbs that were indeterminate (i.e. we could not determine if there was evidence of constructed action) disfavored agent modification (−0.592).

Finally, in a separate analysis, person was also significant with first-person agents favoring agent modification (2.431), while indeterminate tokens, second-person agents, and third-person agents all disfavored agent modification (−0.697, −0.743, and −0.992, respectively).

Modified vs. unmodified (congruent excluded). An alternative analysis for agent modification was also conducted in which 'congruent' tokens were excluded. The results for this analysis are presented in Table 4.

	TOKENS	% MODIFIED	LOG ODDS	FACTOR WEIGHTS
Person:agent/patient ($p < 0.001$)				
Nonfirst to first	271	65.7	2.192	0.899
First to nonfirst	58	69.0	0.141	0.535
Indeterminate	51	25.5	−0.378	0.407
Nonfirst to nonfirst	238	25.2	−1.955	0.124
Coreference ($p < 0.05$)				
Indeterminate	27	63.0	1.153	0.760
Coreference (null argument)	103	54.4	0.356	0.588
No coreference	345	48.4	0.048	0.512
Coreference (pronoun)	97	37.1	−0.592	0.356
Coreference (noun)	46	32.6	−0.966	0.276
Verb position ($p < 0.05$)				
Final	152	59.9	0.430	0.606
Verb-only	69	60.9	0.022	0.505
Nonfinal	397	39.8	−0.452	0.389

TABLE 4. Significant factors influencing agent modification in indicating verbs (with 'congruent' tokens excluded).

In contrast to the first analysis reported in Table 3, when congruent tokens are excluded as in the second analysis, constructed action and person are no longer significant factors. Coreference and verb position are significant in both analyses in similar ways (e.g. verb-final and verb-only clauses favor agent modification in both analyses). For person:agent/patient (the strongest factor predicting modification), nonfirst agents to first-person patients strongly favor agent modification (2.192). In contrast, first-person agents to nonfirst patients show a tendency toward agent modification (0.141). Additionally, nonfirst agents to nonfirst patients strongly disfavor agent modification (−1.955), as do tokens that are indeterminate (−0.378). The difference in the category of person:agent/patient can be explained with reference to how congruent tokens align with first-person forms (see §6.2). The remaining linguistic categories (number, present/absent agents, clause type, frequency, animacy), as well as all of the social categories (language background, region, age, ethnicity, and gender), did not play a significant role in agent modification in either analysis of our data.

5.3. FACTORS INFLUENCING PATIENT MODIFICATION.

MODIFIED/CONGRUENT VS. UNMODIFIED. In contrast to factors influencing agent modification, more factors appear to be at play when we look at patient modification, when collapsing modified and congruent tokens together vs. unmodified tokens. The relevant factors are outlined in Table 5. Significant factors mentioned in this table are also listed in order of importance.

Table 5 shows five factors found to be significant in predicting patient modification. In order of importance, they are constructed action ($p < 0.001$), person:agent/patient ($p < 0.001$), animacy ($p < 0.001$), coreference ($p < 0.05$), verb position ($p < 0.05$), and (in a separate analysis) person ($p < 0.05$). Within the category of constructed action (the most important factor), we see that tokens indeterminate for constructed action (0.238) and the presence of constructed action (0.228) favor patient modification similarly, while tokens that did not have constructed action disfavored patient modification (−0.466). The next most important factor is person:agent/patient. Clauses with nonfirst-person agents and first-person patients favored modification for the patient (0.461), followed by clauses with first-person agents to nonfirst-person patients (0.213). Conversely, clauses with nonfirst agents and patients were most likely to disfavor patient modification, followed by indeterminate tokens (−0.468 and −0.206, respectively). Animacy is the next most important factor. Here, animates-animals/groups, tokens indeter-

	tokens	% modified	log odds	factor weights
Constructed action ($p < 0.001$)				
Indeterminate	56	78.6	0.238	0.559
Constructed action	785	77.7	0.228	0.557
No constructed action	437	61.8	−0.466	0.386
Person:agent/patient ($p < 0.001$)				
Nonfirst to first	269	80.7	0.461	0.613
First to nonfirst	540	75.9	0.213	0.553
Indeterminate	67	64.2	−0.206	0.449
Nonfirst to nonfirst	402	63.2	−0.468	0.385
Animacy ($p < 0.001$)				
Animates-animals/groups	124	72.6	0.283	0.570
Indeterminate	144	76.4	0.207	0.551
Animates-human	802	75.9	0.183	0.546
Inanimates	208	55.3	−0.673	0.338
Coreference ($p < 0.05$)				
Coreference (null agent/patient)	253	83.0	0.401	0.599
Coreference (noun)	84	77.4	0.397	0.598
Coreference (pronoun)	132	77.3	−0.014	0.497
No coreference	739	67.7	−0.345	0.415
Indeterminate	70	67.1	−0.440	0.392
Verb position ($p < 0.05$)				
Verb-only	184	83.7	0.304	0.575
Final	368	80.7	0.039	0.510
Nonfinal	726	65.2	−0.343	0.415
^Person ($p < 0.05$)				
Second	60	80.0	0.522	0.628
First	269	80.7	0.405	0.600
Third	920	69.9	−0.281	0.430
Indeterminate	29	55.2	−0.646	0.344

Table 5. Significant factors influencing patient modification (with 'congruent' tokens as 'modified').

minate for animacy, and animates-human arguments all favor patient modification, in that order (0.283, 0.207, and 0.183, respectively), while inanimate arguments clearly disfavor patient modification (−0.673).

The next most important factor is coreference: if the patient is coreferential with a null argument in the preceding clause, then it was likely that we would see the verb modified for the patient (0.401). This was also the case (at a similar rate) if the patient was coreferential with a noun in the previous clause (0.397). Conversely, if the patient was coreferential with a pronoun (−0.014), there did not seem to be a tendency to favor or disfavor modification. However, tokens that were not coreferential (−0.345) or were indeterminate (−0.440) disfavored patient modification. Syntactic factors are also important. Verb-only clauses significantly favor patient modification (0.304), while verb-final clauses seem to be neutral with regard to modification (0.039). However, verbs in nonfinal position clearly disfavor patient modification (−0.343). Finally, in a separate analysis, person was also a strong factor. Second-person patients and first-person patients both favored patient modification (0.522 and 0.405, respectively), and third-person patients as well as tokens indeterminate for person both disfavored modification for the patient (−0.281 and −0.646). All other linguistic and social factors (i.e. clause type, frequency, overt vs. nonovert arguments, age, region, gender, language background) were found to not be significant for patient modification.

Modified vs. unmodified (congruent excluded). When 'congruent' tokens are excluded from the analysis for patient, a similar set of results is obtained. These results are presented with factors in order of importance in Table 6.

	TOKENS	% MODIFIED	LOG ODDS	FACTOR WEIGHTS
Person:agent/patient ($p < 0.001$)				
Nonfirst to first	269	78.1	0.736	0.676
First to nonfirst	421	69.1	0.122	0.531
Indeterminate	54	55.6	−0.395	0.402
Nonfirst to nonfirst	348	57.5	−0.463	0.386
Constructed action ($p < 0.001$)				
Constructed action	666	72.8	0.286	0.571
Indeterminate	43	72.1	0.126	0.532
No constructed action	383	56.1	−0.413	0.398
Animacy ($p < 0.001$)				
Animates-animals/groups	98	65.3	0.322	0.580
Animates-human	708	71.9	0.293	0.573
Indeterminate	115	69.6	0.111	0.528
Inanimates	171	45.6	−0.726	0.326
^Person ($p < 0.001$)				
Second	56	78.6	0.824	0.695
First	269	78.1	0.757	0.681
Third	743	62.7	−0.604	0.353
Indeterminate	24	45.8	−0.976	0.274

TABLE 6. Significant factors influencing patient modification (with 'congruent' tokens excluded).

Overall, similar results to Table 5 are observed when congruent tokens are excluded. Person:agent/patient (the strongest factor) and person both pattern in similar ways to Table 5. Some minor differences can be seen within the categories of constructed action and animacy. For constructed action, the presence of constructed action (0.286) now favors modification more than indeterminate tokens (0.126), although both continue to favor modification overall. For animacy, animate-human arguments now favor modification more than tokens indeterminate for animacy (0.293 and 0.111, respectively), although both continue to favor modification overall. In contrast to Table 5, however, coreference and verb position are no longer significant. Additionally, the remaining linguistic factors (clause type, overt vs. nonovert arguments, and frequency), as well as all of the social factors, are not significant regarding modification for patient.

6. DISCUSSION. In this section, we review our results with reference to previous literature on verb modification in sign language. In short, our results reveal that modification is optional and conditioned by a number of factors. Our results also highlight the fact that similar factors are implicated in agent and patient modification. When these results are interpreted in light of the debate referred to in §2 regarding the nature of these verbs, they appear to provide some support for the indicating-verb analysis proposed by Liddell (2003) (i.e. the claim that these verbs involve a fusion of morphemic and deictic gestural elements).

6.1. MODIFICATION APPEARS TO BE OPTIONAL. The results provided in Table 2 indicate that modification for both agent and patient arguments is optional. Depending on what is considered to constitute modification, tokens clearly modified for the agent account for at least 27% of the overall data set, while tokens clearly modified for the patient account for at least 52%. If we combine the categories of modified and congruent, we observe a similar rate of modification for both agent (65%) and patient (65%). However, even when these categories are combined, we do not observe a rate of modification that suggests that this phenomenon is obligatory for either the agent or patient argument. In addition, recall that we determined which forms acted as indicating verbs on the basis of the data from the corpus itself and therefore excluded verbs that were never modified, including some verbs that previously have been assumed to be indicating verbs in BSL (e.g. TO-OBJECT). If we had included such verbs in our analysis (since

it may be that these verbs can be modified but happened to be unmodified consistently within our data set), then the overall rate of modification would have been even lower than what we report here. In Figure 4, we provide an example from our data set demonstrating when agent and patient modification do not occur.

PT:PRO3SG TEASE PT:DETPL DOG

'She (my dog) teases the other dogs.'

Figure 4. Tease unmodified for the agent and patient.

In Fig. 4, agent modification does not occur even when following a pronoun associating the agent with a location in front of the signer. In addition, TEASE is not modified for the patient (PT:DETPL DOG), which is associated with a location on the signer's left following the articulation of the verb. In fact, the location in space associated with the patient noun phrase is at odds with the final location of the verb TEASE. (If it were modified, the dominant hand (and/or the forearm) would be adjusted so that the fingertips were facing the location on the signer's left.) These results appear to differ from claims made in the sign language literature by Morgan and colleagues (2006), who have assumed that modification for the object is obligatory in BSL. These results also have implications for work by Lillo-Martin and Meier (2011) and Quadros and Lillo-Martin (2007), who make the same assumption about obligatory patient modification for indicating verbs in ASL and Brazilian Sign Language, respectively. Interestingly, examples of optionality with regard to agreement marking in spoken languages can be found in the literature. Reid (1997), for example, outlines how gender agreement is optional in the Australian language Ngan'gityermerri. With regard to optionality in grammatical morphology more generally, Minashima (2001) shows how case marking in Japanese is often omitted in colloquial speech and that its omission can be explained with reference to animacy and definiteness. That is, nouns that are low in animacy and low in definiteness frequently omit the accusative case marker in Japanese. Such work suggests that the optionality of agent and patient modification may be explained with reference to similar factors, which we describe in the following sections. Importantly, while the finding that modification is not obligatory is insufficient grounds to conclude that modification is not an agreement phenomenon, it does contradict a widely held assumption about patient modification in the sign language literature and provides empirical evidence of optionality of modification with these verbs (cf. recent calls for such empirical evidence in Emmorey 2017 and Goldin-Meadow & Brentari 2017).

The results in Table 2 suggest that patient modification might play a more important role than agent modification—this has also been suggested previously by Padden (1988) and others. In our data, there are more tokens of verbs clearly modified for patient (excluding the congruent category) when compared to agent (52% compared to 27%). However, there is also a larger proportion of verbs labeled as being congruent with their agent argument (38% compared to 13% with the same category for patient). The large difference between the two can be explained by the high incidence of first-

person agents in our data and the relationship between this form and a verb's citation form. It is generally the case that an indicating-verb citation form begins on the body, which is the same location as first person. Since first-person agents were frequent in our data, this led to a high number of 'congruent' verbs for which it is impossible to determine whether it is modified for agent. However, our findings for agent modification in terms of optionality are generally consistent with what others have claimed about subject agreement for ASL and several other sign languages—that is, agent modification is optional, not obligatory.

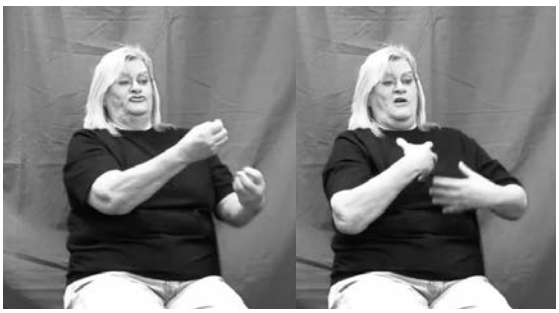
6.2. Linguistic and social factors involved in modification. The statistical analysis revealed that several factors are associated with agent and patient modification in BSL. For agent modification, these factors are person, person:agent/patient, coreference, verb position, and constructed action. In an analysis excluding tokens congruent for agent modification, all of these factors except for constructed action and person remained significant. For patient modification, factors similar to agent modification were important. These were person, person:agent/patient, constructed action, coreference, animacy, and verb position. In a second analysis excluding tokens congruent for patient modification, all of these factors except coreference and verb position remained significant. In the following sections, we discuss these factors in detail and how they contribute to our current understanding about the nature of indicating verbs in sign languages. It should be noted that although we describe several important factors that have an influence on where and when modification occurs, other, more subtle factors may be at play here, which the study was not able to identify. Therefore, the factors we discuss below should not be considered an exhaustive description of patterns of modification in BSL.

Person and person:agent/patient. The results of the statistical analyses conducted for both agent and patient modification regarding the categories of person and person:agent/patient consistently suggest that first-person arguments can predict when a verb will be spatially modified in BSL. Generally, first-person agents favor agent modification, and first-person patients favor patient modification. Second- and third-person agents, by contrast, both disfavor modification. For patient modification, second-person patients also favor patient modification, while third-person patients do not. The strong finding in Table 3 may be argued to reflect the fact that with agent modification, congruent tokens can only have first-person agents (i.e. the citation forms of these verbs align with first-person agents and so cannot be distinguished from modified forms). That these congruent tokens have an effect on the result can be seen when they are excluded from the analysis (Table 4); here, person is no longer significant for agent modification. It thus seems that the relationship between agent modification and person depends heavily on our interpretation of congruent tokens. Our findings concerning agent modification also differ from claims about Hong Kong Sign Language (HKSL; Lam 2003, cited in Tang et al. 2008), where subject agreement is considered obligatory with second-person subjects. However, parallels can be made with the claim by the same authors that modification is obligatory for first-person objects in HKSL (although we did not find modification to be obligatory for any arguments, regardless of person).

For patient modification, we suspect that the tendency for second- and first-person referents to favor modification may represent a distinction between present (i.e. physically present) and nonpresent referents. That is, it is likely that a point to a second-person patient refers to one's conversational partner, and a point to a first-person patient refers to the self. Given that our data involve conversations between just two partici-

pants, a point to a third-person patient is very likely to be a point to a nonpresent referent represented by an 'empty' location in space, since 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 nonpresent (i.e. third person) referents, then we might say that present referents strongly favor modification for the patient, while nonpresent referents disfavor patient modification. It is also interesting to note that while Lam (2003, cited in Tang et al. 2008) observes that overt second-person subjects and first-person objects are obligatory in HKSL, these arguments are also likely to be physically present referents, which is consistent with our conclusions here. For BSL, only first-person agents favor modification, while both first- and second-person patients favor modification. This may reflect a distinction between present vs. nonpresent referents, but only with regard to patient modification in BSL.

The importance of first person (i.e. the signer) is further emphasized in the category of person:agent/patient, which is often the strongest predictor for agent and patient modification. That is, whether either argument is first person predicts when we will see modification for either the agent or the patient. For example, in Table 3, clauses with first-person agents and nonfirst-person patients strongly favor agent modification, and clauses with nonfirst-person agents and first-person patients slightly favor agent modification. Clauses that consist of nonfirst-person agents and nonfirst-person patients strongly disfavor agent modification. In Table 4, when congruent tokens are excluded, clauses with first-person agents and nonfirst-person patients appear to be neutral with respect to agent modification. However, this reduction in strength is expected since congruent tokens can only have first-person agents, so, given that we treat congruent tokens as modified in Table 3, the strong preference for agent modification is therefore reduced substantially once congruent tokens (401 in total) are excluded from the analysis (note that there are 373 clauses with first-person agents to nonfirst patients in Table 3, but only fifty-eight clauses of the same category in Table 4). What is notable, however, is that clauses with nonfirst-person agents and with first-person patients strongly favor agent modification (2.192) in Table 4 in comparison to other categories. This is demonstrated in Figure 5, where the verb GIVE-INFORMATION is modified for a third-person agent and a first-person patient.



GIVE-INFORMATION
FIRST SANDRA GIVE-INFORMATION YESTERDAY PT:PRO3SG
'Sandra told me yesterday.'

Figure 5. GIVE-INFORMATION modified for a third-person agent and first-person patient.

What appears to be an important predictor for agent modification here is whether the patient is first person, since this indicates that the verb will likely be articulated in line

with the signer's perspective. This is supported by the observation that clauses involving nonfirst agents and nonfirst patients (i.e. clauses that do not involve first-person agents or patients) do not favor agent modification, as in Fig. 4. Here, neither argument is linked to the signer's perspective so we see less tendency toward modification. Similar results are reported for patient modification. As with the agent, verbs are more likely to be modified for the patient when the patient is first person, as in Fig. 5.[15] Clauses with first-person agents and nonfirst patients appear to be neutral with respect to patient modification in comparison. When neither the agent nor the patient is first person (as in Figs. 4 and 7), we do not observe a significant tendency toward patient modification. This suggests that modification generally reflects a signer's egocentric perspective of events.

When indicating verbs are described in the context of an agreement system, they are often said to encode grammatical person and syntactic roles (e.g. Meir et al. 2007). Our finding here suggests otherwise. Modification of indicating verbs is strongly associated with the signer's body and whether the signer's body is associated with an agent or patient argument. Second person shows only a tendency toward patient modification, but we argue that this reflects the presence of a conversational partner (and this effect is not apparent with second-person agents). Third person does not appear to favor modification at all. The patterns of modification can be explained with reference to perspective and the strong association of the body with the role of first person. This implies that signers are not simply modifying verbs in space to mark arguments, but that they are imagining how an action is carried out from their perspective. Indicating verbs, therefore, may be best explained with reference to mental spaces (Janzen 2004, Liddell 2003). That is, modification of verbs reflects the signer's egocentric conceptualization of an event. We frequently see modification with first-person arguments because first person is strongly associated with the body and signers frequently conceptualize events from this perspective. The fact that directional modification may be interpreted within an egocentric framework has been suggested for other sign languages such as Auslan (Johnston 1991). The tendency for third-person arguments to disfavor modification may also reflect a general tendency for third person to be the category that is least marked morphologically (e.g. Farrell 1990).

Constructed action. Constructed action is also an important factor associated with both agent and patient modification. For the agent, the presence of constructed action shows a stronger tendency for agent modification than the absence of constructed action, although both favor modification for the agent overall. Note that when congruent tokens are excluded from the agent analysis, constructed action is no longer significant. Therefore, the result regarding constructed action with respect to agent modification should be interpreted with caution since it relies on the interpretation of congruent tokens. Constructed action is, however, important in predicting patient modification. The presence of constructed action slightly favors patient modification, while its absence disfavors modification, whether or not congruent tokens are considered modified. Our results are similar to previous work in Auslan by de Beuzeville and colleagues (2009), who also found that constructed action plays an important role in predicting verb modification. These findings lend support to Liddell's (2000) analysis of these verbs as a fusion of mor-

[15] Verbs that were unmodified for first-person patients include SAY, TEACH, PUSH, HELP, ACCEPT, WARN, RESPONSE, EXPLAIN, INATTENTION, CHOOSE, TOUCH, CHALLENGE, and BORROW. Of these, a few are difficult/awkward to produce with first-person patient marking (one example is PUSH), and the majority of this unmodified set were tokens of the verb SAY (which like most of the other verbs is unproblematic for first-person patients).

phemes and deictic gestures. During periods of constructed action, signers appear to be interacting with absent referents as if they were physically present within the signing space, as in Figure 6 where look2 is produced with constructed action. The fact that we observe an increased likelihood of modification during periods of constructed action suggests that signers may be pointing to imagined referents (see also Cormier, Fenlon, & Schembri 2015).

pt:pro1sg look2

'I looked at her.'

Figure 6. Look2 with constructed action and modified for the patient.

Taken together, the factors of person, person:agent/patient, and constructed action all suggest that signers are frequently conceptualizing referents in signing space and modifying verbs to reflect this conceptualization. It also appears that this tendency toward conceptualization is more common with first-person arguments generally. These factors all align closely with Liddell's (2003) account of indicating verbs. Other factors are also at play, but these factors are consistently among the strongest predictors of verb modification.

Verb position. Verb position is also an important predictor. Generally, verb-final and verb-only clauses favor modification (or seem to be neutral in this respect) for the agent and patient, while nonfinal verbs consistently disfavor modification. Note, however, that verb position is no longer significant for patient modification in Table 6 when congruent tokens are excluded. The fact that verbs in final position and verb-only clauses sometimes favor modification is consistent with similar reports for ASL (Friedman 1976). It may be related to claims for ASL in Fischer 1975 (where modified verbs are also reported to prefer final clause position) that referents often need to be established in signing space prior to the articulation of the modified verb. However, this does not appear to be the case in our data, since clauses frequently omit arguments. An analysis of all verb-final clauses (n = 389) reveals that 62% (n = 241) lack an overt patient, and 28% (n = 107) lack an overt agent and patient. When we consider clauses with a nonfinal verb (n = 852 clauses), 28% (n = 240) lack both an overt agent and an overt patient, 23% (n = 196) lack only an overt agent, and 27% (n = 232) lack only an overt patient. The general picture that emerges is that there is a frequent tendency for clauses to omit at least one argument. Note, however, that our statistical analysis did not find directional modification to be linked to the presence or absence of arguments. The significance of phrase-final position may be linked to the fact that this position plays a special role in many sign languages in both form and function (Crasborn et al. 2012). Wilbur (1999) has claimed that phrase-final position is prosodically heavy and that this phono-

logical fact interacts with the role of prominence. The finding that modified verbs favor phrase-final position may be associated with these claims.

ANIMACY. Animacy was also an important factor in our data, but only for patient arguments. Here, human and other animate patient arguments generally favored modification over inanimate arguments. Animacy is well documented to have a range of effects on grammatical phenomena in many languages, including agreement systems (Corbett 2006), differential object marking (Aissen 2003), the passive construction (Dingare 2001), dative alternations (Bresnan et al. 2007), and in the expression of core syntactic arguments (Øvrelid 2004). Thus, finding an effect of animacy in this study is not unexpected, and it may reflect the salience of humans and other animates in cognition (Yamamoto 1999). At first glance, our finding for BSL appears to support Rathmann and Mathur (2002), who claim that animacy is important for modification of indicating verbs in ASL and German Sign Language (DGS). However, they suggest that it is only verbs that have two animate arguments that may be modified for person at all (e.g. verbs like ASL HELP may be modified, but verbs like ASL BUY cannot). Our results indicate that animacy may only be important in predicting patient modification in BSL. Additionally, our data contain clauses with animate agents and patients where the verb is unmodified for both arguments, as in Figure 7. This suggests that while animate arguments tend to favor modification, verb modification for animate arguments is not obligatory in BSL.

LOOK-AFTER BABY

'She looks after her baby.'

FIGURE 7. LOOK-AFTER unmodified for an animate third-person agent and patient.

COREFERENCE. Coreference is also an important factor for both agent and patient modification. Clauses with agents that are coreferential with a null argument in the previous clause favor agent modification. Clauses with agents that are coreferential with a pronoun or a noun in the previous clause disfavor agent modification. Clauses with an agent that is not coreferential appear to be neutral with respect to agent modification. Slightly different results are seen when we look at patient modification and coreference. While clauses with patients that are coreferential with a null argument favor patient modification, those that are coreferential with a noun in the previous clause slightly favor patient modification, and those coreferential with a pronoun appear to be neutral in this respect. Clauses with patient arguments that are not coreferential disfavor patient modification. Coreference is not an important factor in Table 6, suggesting that the extent to which coreference is an important factor depends on our interpretation of the congruent tokens. Note, however, that we determined coreference by looking only at the preceding clause, so it therefore remains an open question whether an analysis that

includes a wider scope for determining coreference would reveal a stronger relationship for patient modification.

The importance of coreference that we have found overall suggests that the use of directionality in indicating verbs may be indicative of a reference-tracking system (e.g. de Beuzeville et al. 2009, Liddell 1990). Specifically, our findings indicate that modification appears to be more likely in clauses following null arguments and therefore may be a communication strategy used by signers to maintain reference and ensure transparency of meaning. Verbs that are articulated following clauses in which referents are explicitly stated (e.g. via the articulation of a noun or a pronoun) show less tendency toward verb modification. Other studies investigating reference tracking in sign languages have not focused on indicating verbs in detail and report different findings (e.g. Cormier et al. 2013, McKee et al. 2011, Perniss & Özyürek 2015, Wulf et al. 2002). These studies have suggested that more-overt expressions (e.g. modified predicates, overt noun phrases) are generally likely to occur in contexts where the referent is being reintroduced than when they are being maintained in the discourse. Similar claims have been reported for spoken languages (e.g. Ariel 1994). Our study suggests that verb modification generally occurs when reference is being maintained, and this tendency is strongest following clauses with null arguments. Therefore, it may be a referential strategy more likely to be used when referents are not being explicitly stated in the discourse (note that our overview of present vs. absent arguments in §6.2 indicates that many arguments are dropped in spontaneous discourse). A more detailed analysis of how reference tracking works in sign language with respect to indicating verbs would help clarify the role of coreference in verb modification; we leave this for future research.

Nonsignificant factors. The results above indicate similar factors at play with regard to agent and patient modification, with subtle differences. It is much clearer that the remaining linguistic factors do not play a role in agent or patient modification. These factors are clause type, frequency, overt vs. nonovert arguments, and number. It is also clear that none of the social factors in our data—language background, age, gender, and ethnicity—appear to play a role at all in verb modification.

The lack of significant findings for age and frequency is interesting from the point of view of grammaticalization because it indicates that there is little evidence of language change in progress in BSL, unlike what is reported for emerging or younger sign languages (e.g. Padden et al. 2010). In de Beuzeville et al. 2009, it was suggested that the low rate of modification indicated that directionality was not highly grammaticalized in Auslan. But while the Auslan study found high-frequency verbs to be significantly more modified than low-frequency verbs, we did not find frequency to be significant in our analysis.[16] Furthermore, and unlike the Auslan study, we also included social factors in order to investigate this claim further but did not find any to be significant. Studies investigating phonological variation in sign language have found both lexical frequency and social factors to be significant and have used these to argue that there is language change in progress. For example, Schembri and colleagues (2009), in investigating location variation in Auslan, report that the association with frequency and specific social factors (age, gender, and region, specifically) may be indicative of language change at the phonological level, beginning with highly frequent verbs and led by women in urban centers. On the basis of our results for frequency and social factors,

[16] It is not clear why lexical frequency significantly favored modification in Auslan but not BSL. One possible reason may be related to text type—the Auslan data were mostly composed of narratives while the BSL data consist entirely of conversations—but more analysis of both data sets would be needed to confirm this.

there appears to be no indication of any such change at the morphosyntactic level with respect to verb modification.

There are several reasons why we may be seeing little evidence of an ongoing grammaticalization process here. One possible explanation may involve the fact that sign languages (particularly in western urban communities) have an interrupted pattern of language transmission, which is likely to affect the development of morphological redundancy (Trudgill 2011). Deaf children are much more likely to learn to sign later in life when they encounter other deaf individuals than from a deaf signing parent. Even for those born to deaf signing parent(s) (approximately 5–10% of the deaf community), the likelihood that the parent(s) are native signers themselves is low (i.e. deaf children with deaf parent(s) and also deaf grandparent(s) are very rare). Second, sign languages are young languages. It is suggested that BSL is likely to have emerged toward the end of the eighteenth century following the establishment of the first deaf school (and in the subsequent schools that opened across Britain). Given its relatively young age, we might not expect to see a highly grammaticalized system with respect to directional modification of indicating verbs (although see Aronoff et al. 2005 for an alternative view).

6.3. Implications. The findings reported in this study have important implications for the field of sign language research. Modification of these verbs is widely considered to be a highly grammaticalized agreement system (Aronoff et al. 2005, Emmorey 2002, Sandler & Lillo-Martin 2006, Sutton-Spence & Woll 1999). The current study is only the second known attempt to examine the use of directionality in indicating verbs with reference to a large data set of semi-spontaneous signing (the first being a study based on the Auslan Corpus reported in de Beuzeville et al. 2009) and the first to study directionality in conversation. Both studies have indicated that modification of these verbs does not appear to be a highly grammaticalized agreement system. This has some important implications. For example, there is a danger in making assumptions about typical language use in the sign language population when investigating language use in other contexts. Researchers investigating the development of verb modification in native signing deaf children, for instance, have often assumed that object agreement in the adult/target language is obligatory—for example, in studies involving ASL, BSL, and Brazilian Sign Language (Meier 1982, 2002, Morgan et al. 2006, Quadros & Lillo-Martin 2007). In each of these studies, omission of object modification by children was considered an error. Yet the adults interacting with the children and/or consulted for native-signer judgments in these studies also sometimes omitted such supposedly 'obligatory' modifications, using unmodified citation forms instead. Similarly, with second language acquisition, Thompson and colleagues (2009) studied eyegaze patterns with indicating verbs used by hearing learners of ASL but excluded tokens that lacked 'obligatory manual agreement'. The results from our study show that considering unmodified forms to be errors by learners (whether children or adults) is problematic. This is a point also raised by Chen Pichler (2012:668), who notes: 'Counting these [unmodified] forms as target-like not only reduces the number of obligatory contexts, but also calls into question the traditional, strict categorization of agreeing verbs as always requiring inflection'.

7. Conclusion. In summary, our results indicate several factors at play, all of which have an effect on modification of indicating verbs. Some of these factors have been indicated previously by proponents of the agreement analysis and by those who support a gestural/morphemic analysis, although it appears that our results align more closely with the latter viewpoint. First, our results highlight the importance of the signer's perspective

of events when predicting whether modification will occur. Signers frequently modify verbs so that they align with their own perspective (whether in the role of the agent or patient). When the signer's body is associated with neither the agent nor the patient role, there is a significant tendency to disfavor modification. This behavior suggests that signers are conceptualizing events from an egocentric perspective and this is reflected in patterns of modification. This conclusion is further supported by the effect of constructed action on modification. Generally, the presence of constructed action exhibits the strongest tendency toward modification. This suggests that signers are imagining referents to be present in the signing space and will modify verbs so as to point at these imagined referents. These factors are the strongest ones in our analysis and align closely with Liddell's (2000) description of these verbs rather than with an agreement system that requires systematic covariance between a controller and target (Corbett 2006).

That said, some factors are consistent with what is found in agreement systems: the role of animacy is certainly something that agreement systems may share with indicating verbs (Corbett 2006), but this influence is found across a range of grammatical phenomena. Additionally, the effect of verb position on modification appears to reflect previous claims in the literature from those working with an agreement account about interactions between verb modification and syntax (Quadros & Lillo-Martin 2010), although Liddell (2003) does not predict that there should be a lack of interaction. The effect of coreference appears to suggest that modification of indicating verbs in BSL is a reference-tracking system, which also may be something that it shares with agreement systems (Corbett 2006). Finally, we find no evidence of an interaction with social factors or lexical frequency in our data and conclude that there is little to suggest that the use of space is becoming grammaticalized in BSL as part of a language change in progress.

The findings reported here make an important contribution to the ongoing debate about the underlying nature of the modification of these verbs and the importance of corpus data in this debate (as well as in sign language research generally). Previously, both sides of the debate have made claims based on small data sets or elicited judgments. The present study adds to growing evidence from large data sets (e.g. de Beuzeville et al. 2009) to provide some support for Liddell's (2003) analysis of these verbs. That is, rather than an agreement system, these verbs appear to reflect a fusion of morphemic and deictic gestural elements (i.e. signers are pointing to imagined referents) that is closely entwined with the signer's perspective and sequences of constructed action (i.e. when the signer embodies the referent). Finally, the work described here also has implications for the field of linguistics generally. Verb modification and the factors that condition it play an important role in understanding the typological context of indicating verbs and their relationship to agreement systems and reference-tracking devices in spoken languages. In addition, the importance of constructed action and the strong tendency toward an egocentric perspective is of broader relevance to those working within a cognitive linguistic framework, particularly those with an interest in embodied communication. Lastly, the interplay between deictic gesture and sign languages we describe here will be of wider interest to those working in gesture studies and multimodal aspects of language use.

Appendix

Frequency of verb types in the corpus (glosses with an asterisk are signs that were not applicable for agent modification according to our data; glosses followed by a plus sign were not applicable for patient modification according to our data). Note that the cumulative frequency totals in the last column may not directly match a summation of the percentages for individual verbs due to rounding.

	ID-GLOSS	TOTAL	FREQUENCY (%)	CUMULATIVE FREQUENCY (%)
1	SAY	183	12.7	12.7
2	LOOK*	174	12.1	24.9
3	LOOK2	138	9.6	34.5
4	GIVE	56	3.9	38.4
5	MEET	49	3.4	41.8
6	GIVE-INFORMATION	48	3.3	45.1
7	ASK	45	3.1	48.3
8	PAY	45	3.1	51.4
9	TEACH	41	2.9	54.2
10	HELP	40	2.8	57.0
11	TOUCH	38	2.6	59.7
12	GRAB	33	2.3	62.0
13	TAKE	30	2.1	64.1
14	EXPLAIN	28	1.9	66.0
15	LINK	24	1.7	67.7
16	CHOOSE	22	1.5	69.2
17	BORROW	20	1.4	70.6
18	DISCUSS	20	1.4	72.0
19	SUE	20	1.4	73.4
20	ACCOMMODATION* *(e.g. stay, reside)*	16	1.1	74.5
21	LEAVE-IT-BE*	16	1.1	75.6
22	PAYMENT *(e.g. donate, pay)*	15	1.0	76.7
23	INFORM	14	1.0	77.6
24	LOOK-AFTER	14	1.0	78.6
25	PUSH*	14	1.0	79.6
26	VISIT	14	1.0	80.6
27	ACCEPT*	11	0.8	81.3
28	CHECK*	11	0.8	82.1
29	INATTENTION *(e.g. ignore)*	11	0.8	82.9
30	TEXT-TO	11	0.8	83.6
31	THANK*	11	0.8	84.4
32	ATTACK	10	0.7	85.1
33	AWARD*	10	0.7	85.8
34	CONCENTRATE*	9	0.6	86.4
35	SEND2	8	0.6	87.0
36	TEASE	8	0.6	87.5
37	BEAT	7	0.5	88.0
38	CALL	7	0.5	88.5
39	EXTRACT*	7	0.5	89.0
40	PICK-UP*	7	0.5	89.5
41	SHOUT*	7	0.5	90.0
42	FAVOR*	6	0.4	90.4
43	FOLLOW*	6	0.4	90.8
44	HELP2	6	0.4	91.2
45	RENT	6	0.4	91.6
46	SEND	6	0.4	92.1
47	SHOW	6	0.4	92.5
48	UNFAMILIAR* *(e.g. do not recognize)*	6	0.4	92.9
49	COPY	5	0.3	93.2
50	GUN* *(e.g. shoot, shot)*	5	0.3	93.6
51	RECOGNISE	5	0.3	93.9
52	RESEARCH*	5	0.3	94.3
53	SUPPORT*	5	0.3	94.6
54	WARN*	5	0.3	95.0
55	BEAT-UP*	4	0.3	95.3

	ID-GLOSS	TOTAL	FREQUENCY (%)	CUMULATIVE FREQUENCY (%)
56	AGAINST *(e.g. compete, opposed)*	4	0.3	95.5
57	ATTENTION	4	0.3	95.8
58	EXCLUDE	4	0.3	96.1
59	PRAISE*	4	0.3	96.4
60	RESPONSE	4	0.3	96.7
61	SUSPECT	4	0.3	96.9
62	DELIVER	3	0.2	97.1
63	INFLUENCE	3	0.2	97.4
64	LEARN*	3	0.2	97.6
65	LOBBY*	3	0.2	97.8
66	OFFER	3	0.2	98.0
67	PULL*	3	0.2	98.2
68	QUIT*	3	0.2	98.4
69	REPLACE*	3	0.2	98.6
70	RESPECT*	3	0.2	98.8
71	AFFORD^{+}	2	0.1	99.0
72	DEBATE	2	0.1	99.1
73	EXCHANGE	2	0.1	99.2
74	EXPLAIN2*	2	0.1	99.4
75	GIVE-AWAY	2	0.1	99.5
76	SYMPATHY*	2	0.1	99.7
77	ARGUE	1	0.1	99.7
78	CHALLENGE	1	0.1	99.8
79	PLEASE-ONESELF^{+}	1	0.1	99.9
80	SWAP	1	0.1	99.9
81	TALK2^{+}	1	0.1	100.0

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Fenlon
Department of Languages and Intercultural Studies
Heriot-Watt University
Edinburgh, Scotland EH14 4AS
[j.fenlon@hw.ac.uk]

Schembri
Department of English Language and Applied Linguistics
University of Birmingham
Birmingham B152TT, UK
[a.schembri@bham.ac.uk]

Cormier
Deafness, Cognition and Language Research Centre
University College London
London WC1H 0PD, UK
[k.cormier@ucl.ac.uk]

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