Non-Manual Correlates of Syntactic Agreement
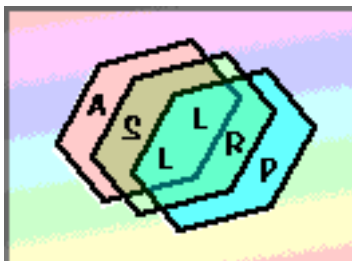# in American Sign Language*

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1. Introduction

American Sign Language is the natural language used by the Deaf community in the United States and parts of Canada. Linguistic research in the past 25 years has revealed that signed languages such as ASL are full-fledged linguistic systems, and that they share the same fundamental structural characteristics as spoken languages.

Signs are produced with the hands, which assume particular handshapes and undergo specific types of movement. In addition, important information is conveyed non-manually, through expressions on the face. These facial markings express fundamental grammatical information. For example, negative sentences are accompanied by a characteristic negative head shake; yes-no questions are accompanied by raised eyebrows; and other kinds of questions are marked by lowered eyebrows. The first part of this article contains example sentences which illustrate the syntactic distribution of these non-manual markings. The second part focuses on new results concerning agreement, where we show that subject and object agreement also have non-manual correlates that had not previously been identified as such.

The article is organized as follows:

- We begin by demonstrating how non-manual markings provide important grammatical information and by showing that these markings have a distribution that can be expressed in terms of a well-defined syntactic domain and a strong preference for non-manual marking to occur simultaneously with manual material. We illustrate this with respect to negation and yes/no questions.

- Then we show how non-manual grammatical marking can provide important evidence for the syntactic structure we propose. We exemplify this with respect to wh-questions.

- Finally, we discuss the agreement system in ASL. We describe both its manual and non-manual expressions. We show that head tilt and eye gaze constitute non-manual correlates of subject and object agreement within the clause. Our findings suggest that this same kind of agreement marking is also found internal to noun phrases, and we discuss some interesting parallels between noun phrases and clauses in this respect.

2. Negation

In ASL, a negative sentence differs from the corresponding affirmative sentence by the presence of a manual sign, meaning NOT. Sentences 1 and 2 illustrate this.

1.   JOHN BUY HOUSE
'John is buying a house.'

 neg
2.   JOHN NOT BUY HOUSE
'John is not buying a house.'

      Notice that these sentences are represented using a conventional gloss notation, which involves the use of capitalized English words to represent ASL signs. This is the standard way of presenting ASL examples in a written form. However, this format has many limitations; it does not convey the complexity of the morphology and phonology of the signs themselves, nor the extensive non-manual information, expressed on the face, that is linguistically significant. That is why the grammatical glossed examples in this article are accompanied by video displaying how the sentences are actually signed. We are also currently developing a database program, called SignStream™, to facilitate the coding and analysis of sign language data captured on videotape.[1]

      In example 2, in addition to the manual sign, there is also a non-manual marking, labeled 'neg', that is associated with the syntactic feature of negation. The line above the manual sign NOT shows the extent of this non-manual marking, which consists of a side-to-side head shake and also a furrowing of the brows.

While the negative head shake may occur simultaneously with the manual sign alone, as in example 2, it may alternatively extend over a very specific syntactic domain, as illustrated in example 3.

3.   <ins>   </ins>neg
      JOHN NOT BUY HOUSE
      'John is not buying a house.'

This is a domain familiar to syntacticians as the c-command domain of the head. The basic idea is that a node c-commands everything below the nearest phrasal projection that dominates it.
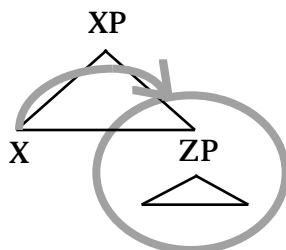

Figure 1: c-command domain of X

Syntacticians have found that c-command relations are relevant to a great variety of syntactic phenomena, including accounts of coreference, movement, negative polarity, and so on. As shown in Figure 2, the c-command domain of NOT includes everything dominated by the maximal projection, NegP, which, in this case, includes the entire VP that follows the negation.
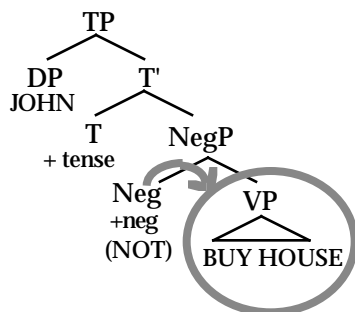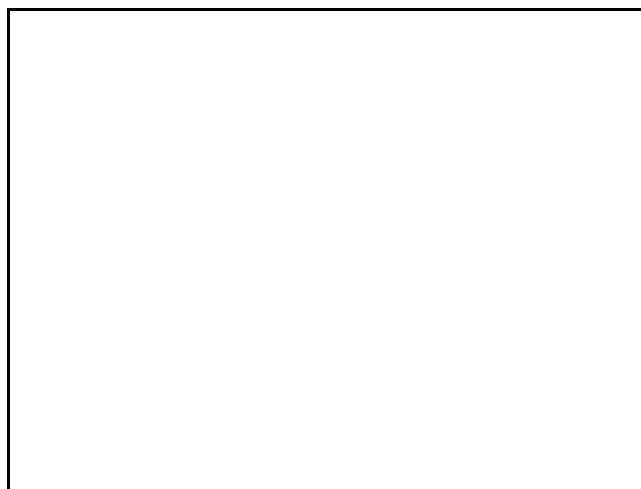

Figure 2: c-command domain of NOT

One aspect of this phenomenon that should be of particular interest to syntacticians is that the spread of non-manual grammatical markings in signed languages actually provides very direct visual evidence of c-command domains. We have found that the non-manual grammatical markings are often associated with abstract features that occur in the heads of what are called functional projections (i.e., nodes that contain important grammatical information). These markings optionally spread over their c-command domain. So in example 3, the non-manual marking occurs not only over the negative sign, but also over the VP that it c-commands.

Examples 2 and 3 show that the non-manual marking may optionally spread over the c-command domain of the node with which it is associated. There is, however, one situation in which the spread becomes obligatory. This occurs if there is otherwise no manual material with which the feature can be associated. In that case, the marking necessarily spreads over the c-command domain so that it can be realized simultaneously with manual material. For example, the manual NOT sign is not required in a negative sentence. The negation can be expressed solely by the non-manual head shake, as in 4. However, notice, in this case, that the non-manual marking obligatorily spreads over the c-command domain of the Negative node, as shown by the ungrammaticality of 5.

<div style="border:1px solid black; width:45%; height:450px; float:right"></div>

                          <u>   neg</u>

4.   JOHN   BUY HOUSE
        'John is not buying a house.'

              <u> neg</u>

5. * JOHN   BUY HOUSE
        'John is not buying a house.'

It is significant to note that in the cases where the non-manual negative marking has spread over the VP (sentences 3 and 4 above), the intensity of the non-manual marking is strongest over the node with which the marking is associated. The intensity of the marking then diminishes as distance from that node increases. For negation, this means that the head turn has its maximum arc while NOT is articulated in 3, and the arc's angle gradually decreases over the rest of the VP. Note that in 4, even when there is no manual sign produced with the negation, the

intensity is still greatest at the beginning of the VP and diminishes as the VP is articulated. Figure 3 illustrates the diminishing angle of head turn used in the marking of negation.
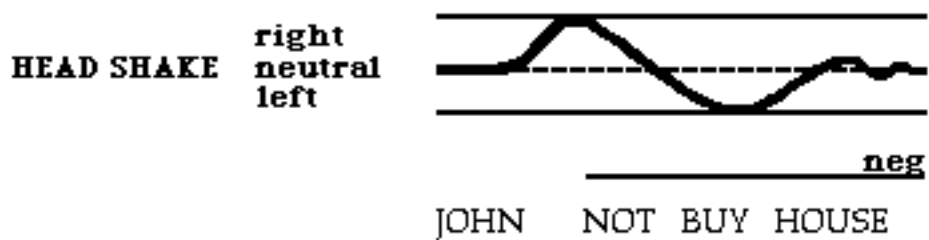

Figure 3: Diminishing intensity of non-manual negative marking

3. Distribution of non-manual grammatical markers

In sum, the following generalizations govern the distribution of non-manual grammatical markings:

- Non-manual markings are frequently associated with the heads of functional projections (containing important grammatical information).
- These markings optionally spread over the c-command domain of the node with which they are associated.
- These markings obligatorily spread over their c-command domain if this is required for the non-manual marking to be realized with manual material.
- The intensity of the non-manual marking is greatest at the node where the associated feature occurs, and diminishes progressively as distance from that node increases.

4. Yes-no questions

The distribution of non-manual marking in yes-no questions is very similar to what we just observed for negation. The marking for yes-no questions includes, most notably, raised eyebrows. There is an optional manual sign, glossed as QMwg, that can signal a yes-no question, although this manual sign is frequently omitted. When it occurs, it normally occurs at the right edge of the sentence. We postulate that QMwg is a question particle that is located in the C position (in the same node as the +y/n question feature). See figure 4. Figure 4 also shows that C c-commands the entire clause (TP, or Tense Phrase).

   If the manual sign is present, then the raised eyebrows associated with the syntactic yes-no question feature may occur solely over the question sign, as in 6, or it may spread over the entire clause, as in 7. That is, the non-manual marking spreads over the c-command domain of C. However, if the manual sign is absent, then the eyebrow raise must occur over the entire clause, as shown in 8. Examples 6, 7 and 8 are presented together on the next page, so that they can be compared easily.
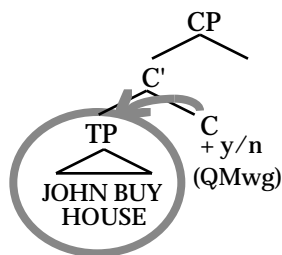

Figure 4: c-command domain of C

6.
        <u>   y/n</u>
        JOHN BUY HOUSE QMwg
        'Is John buying a house?'

7.
        <u>   y/n</u>
        JOHN BUY HOUSE QMwg
        'Is John buying a house?'

8.
        <u>   y/n</u>
        JOHN BUY HOUSE
        'Is John buying a house?'

5. Wh-questions

Syntacticians have described a very general process called wh-movement, which accounts for the fact that in English, question phrases, such as **who, what, when, where,** and **why** (most having an initial "wh" in English), normally occur clause-initially. Compare 9 and 10.

9.   John   will   buy   **<u>a book</u>**.

10.   **<u>What</u>** will John   buy   ?

In some languages, like English, this movement occurs obligatorily in normal questions. In other languages, such as Chinese, this movement does not appear to occur. However, ASL is a language in which the wh-phrase may either remain in its basic position, that is, *in situ,* or else it may move to the edge of the clause.

However, ASL linguists have disagreed over a very fundamental aspect of wh-movement in this language: namely, does the wh-phrase move to the beginning or to the end of the clause? This may seem to be a strange thing to disagree about, since you might think that this should be fairly simple to ascertain.

We have, in fact, found very clear evidence that the place to which these wh-phrases move, when they move, is clause-final. This evidence is based in part on simple word order facts, but is also supported by evidence from the distribution of non-manual marking.

Let's compare a wh-question to the corresponding simple affirmative sentence. In the affirmative sentence, the basic order of phrases is subject-verb-object, as seen in example 11.

11.   MARY LOVE   JOHN
        'Mary loves John.'
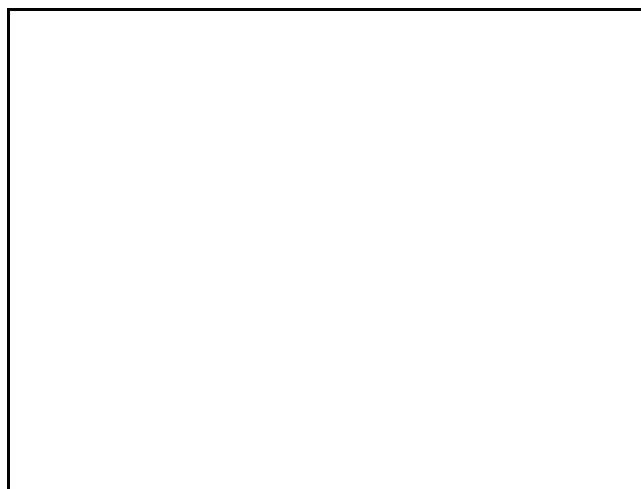
In a wh-question, a question phrase referring to the subject may appear at the end of the clause, in a position where a subject does not normally occur, as in example 12.

‎ wh
12.   t   LOVE JOHN   WHO
   'Who loves John?'
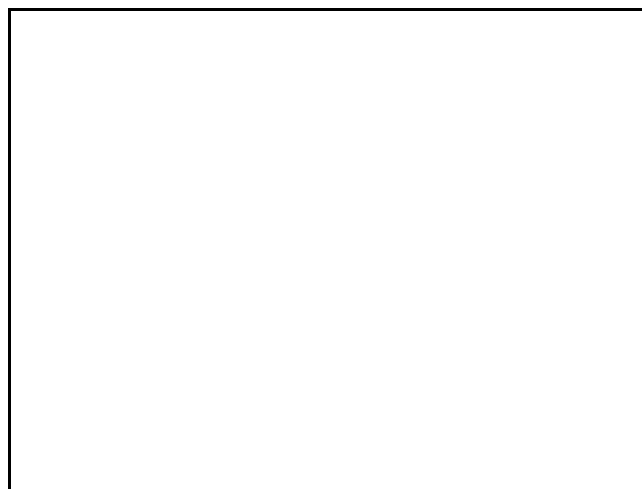
Conversely, a wh-phrase questioning an object cannot occur clause-initially in ASL. (ASL differs, in this respect, from English.) Thus 13 is ungrammatical.

‎ wh
13. * WHO JOHN LOVE   t

However, like wh-phrases in subject position, wh-phrases in object position can also be seen to move rightward to a clause-final position. Consider 14, which has a clause-final adverbial. In such a construction (first presented in Perlmutter (1991)), it is possible to find a wh-phrase questioning the object occurring to the right of the adverb, while normal object phrases cannot occur in this sentence-final position. So, while 14 is grammatical, 15 is not.

‎ wh
14.   [JOHN LIPREAD t YESTERDAY]$_{IP}$ WHO

       'Who did John lipread yesterday?'
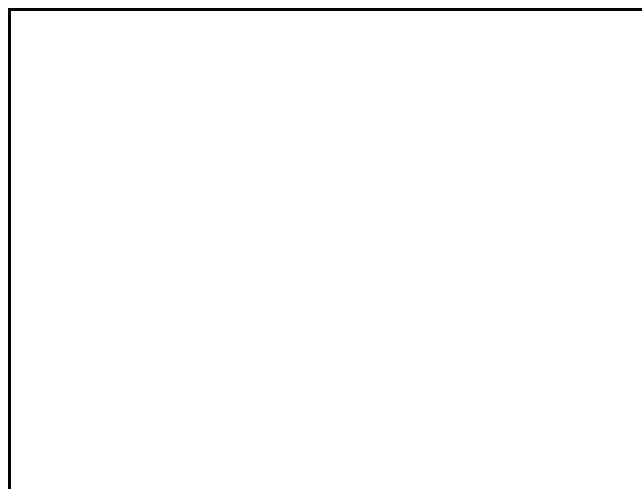
15. *   [JOHN LIPREAD t YESTERDAY]$_{IP}$ MARY

Thus, there is evidence from basic word order facts that wh-phrases, when they move, move to a sentence-final position. We claim that this is essentially the same position to which wh-phrases move in English and other languages, except for the difference in relative order of the wh-phrase and the clause. Compare Figure 5 and Figure 6. Syntacticians believe that clauses are in fact headed by a node that is associated with the crucial grammatical features of a sentence, such as its question status. More specifically, the claim is that the head, C, of a wh-question contains a wh feature, which is associated with the movement of the wh-phrase to its Specifier (Spec) position.
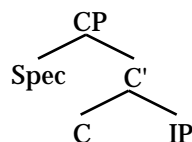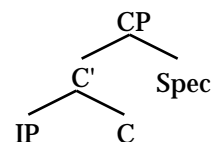
Figure 5: CP structure (English)   **Figure 6: CP structure (ASL)**

This question feature is associated most notably with the lowered brows that mark wh-questions in ASL. There may also be a slight side-to-side head shake that occurs with wh-questions. We will now show that our syntactic analysis of ASL sentences makes it possible to account for the distribution of non-manual wh-marking in terms of the generalizations presented in Section 3.

There is a something interesting about the distribution of non-manual wh-marking in ASL questions. In some contexts, this marking may appear solely over the wh-phrase. However, in other cases, the spread over the entire sentence is obligatory. The distribution of non-manual wh-marking is readily explained given what we have said about the distribution of non-manual marking in general and our analysis of wh-movement just presented.

Let's take a look at the data shown in Table 1 on the next page. To view the grammatical examples in the table, click on the movie icon next to the gloss.

Table 1: Distribution of non-manual wh-marking	
In situ Spread of non-manual material over IP is obligatory	*Rightward movement* Spread of non-manual material over IP is optional
<u> wh</u> 16. [WHO LOVE JOHN]$_{IP}$	<u> wh</u> 20. [t LOVE JOHN]$_{IP}$ WHO
<u> wh</u> 17. * [WHO LOVE JOHN]$_{IP}$	<u> wh</u> 21. [t LOVE JOHN]$_{IP}$ WHO
<u> wh</u> 18. [JOHN LIPREAD WHO YESTERDAY]$_{IP}$	<u> wh</u> 22. [JOHN LIPREAD t YESTERDAY]$_{IP}$ WHO
<u> wh</u> 19. * [JOHN LIPREAD WHO YESTERDAY]$_{IP}$	<u> wh</u> 23. [JOHN LIPREAD t YESTERDAY]$_{IP}$ WHO

In some cases, the wh-marking cannot occur solely over the wh-phrase, but needs to spread over the entire clause. For example, the sentences in column 1 of the table are all grammatical if the marking spreads over the entire clause, but ungrammatical if the marking appears solely over the wh-phrase. However, the sentences in column 2 are grammatical with the wh-marking either just over the wh-phrase or over the entire clause.

Now if you look at the sentences where it is grammatical to find the wh-marking just over the wh-phrase, the sentences in column 2 of the table, it turns out that all these cases have the wh-phrase at the very right edge of the sentence. If the wh-phrase appears in any other position, such as in subject position, or in object position before an adverbial, then the spread over the entire clause is obligatory, as shown by examples 16 through 19. Why should this be? We would suggest that this falls out of the requirement that non-manual marking associated with the wh question feature in C must have manual material with which it can be expressed. If the wh-phrase has moved into a position to the right of the clause, then this requirement is met, and the spread over the c-command domain is optional, but not obligatory. However, if the wh-phrase has not moved, then there is no manual material outside of the clause to bear the non-manual wh-marking associated with C, and thus the marking must spread over its c-command domain, i.e., over the whole clause, in order to find such manual material. Thus, the optional vs. obligatory spreading of non-manual markings provides important evidence of particular syntactic structures.

What we've presented here are the basic cases. There are more complex sentence structures involving wh-phrases that we discuss at greater length in Neidle, Kegl, Bahan, Aarons, and MacLaughlin (in press).

Looking back at the examples where the wh-marking has spread, occurring not only over the final wh-phrase, but also over the rest of the clause, we note that, as with negative marking, the intensity of the non-manual wh-marking is greatest at the syntactic position associated with the corresponding feature. For wh-questions, the +wh feature occurs at the end of the clause, and thus the intensity of the wh-marking is greatest there. The brow furrow and head shake are most intense at the end of the sentence. The intensity of the wh-marking gradually increases as the sentence is articulated. The same increasing intensity is also found with yes/no question marking, since the +y/n question feature is also at the end of the clause. This increasing intensity contrasts with the decreasing intensity found with negation. That is because the +neg feature occurs at the left of its c-command domain, and thus intensity progressively diminishes with time in that case. Careful study of the changing intensity of a non-manual marking thus provides important syntactic information about where the source of that marking is located.

6. Agreement

We now move to the focus of this article: the expression of syntactic agreement. Linguists have suggested that agreement is represented structurally and have postulated that agreement can constitute the head of a syntactic projection. We show here that, like the other syntactic features just discussed, agreement features also have non-manual correlates in ASL, and, furthermore, that the distribution of the non-manual markings of agreement can be explained in terms of the same structural generalizations. For a more detailed discussion of agreement and its non-manual expressions in ASL, see Bahan (1996).

Before proceeding to that analysis, however, we first present some background information about how agreement works in this spatial modality. In ASL, space is used to represent referential elements, such as noun phrases. The spatial modality makes it possible to have a greater range of distinctions in representing individual referents than is found in spoken languages, in which the grammar typically distinguishes among 1st, 2nd, and 3rd person referents (although there is some variation in this respect in spoken languages as well). These person features are part of a cluster of features that have been called "phi-features." Phi-features may also include number and gender (although there are no grammatical gender distinctions in ASL). Phi-features are accessed by the grammar in a variety of ways. Depending on the language, these features may be relevant to the form of a pronoun or possessive marker, to subject-verb agreement, to object-verb agreement, etc..

While most spoken languages have a single feature for 3rd person, in ASL, it is possible to set up points in space that correspond to distinct 3rd person referents. So, for example, if a signer is talking about two people, say John and Mary, the signer can establish a location for John on the right, and one for Mary on the left. These locations can then be pointed to with the index finger, which is how pronominal reference to John or Mary would be accomplished later in the discourse.

Signers also make use of these points in space to indicate possessive relations, as in 'Mary's book.' So, the possessive marker corresponding to Mary would be signed with an open hand pointing to (with palm oriented toward) the location in space associated with Mary.

Similarly, these points in space can serve as affixes on verbs, and thereby serve as markers of subject and object agreement. For example, if John gives Mary a book, the form of the verb GIVE inflects to mark agreement; the verb begins at the point in space associated with the subject referent, John, and ends at the point in space associated with the (goal) object referent, Mary. This is illustrated in example 24, where the subscripts show the argument with which the verb is displaying spatial agreement.

24.   JOHN$_i$ $_i$GIVE$_j$ MARY$_j$ BOOK
       'John is giving Mary a book.'
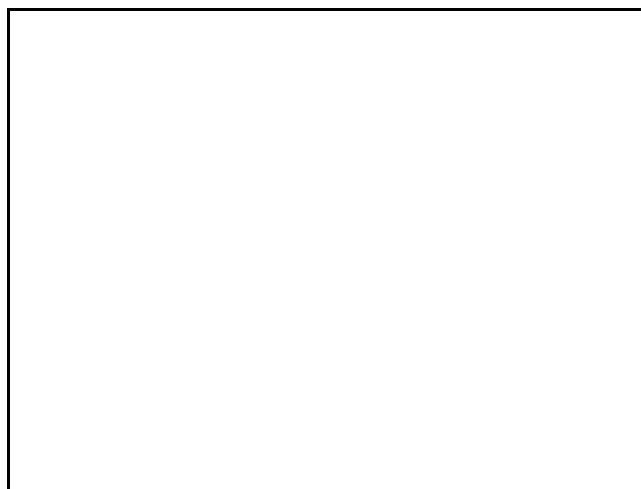
So, the same kinds of grammatical processes that involve phi-features crosslinguistically make use of the points in space associated with referential items in ASL. For this reason, we have interpreted these points in space as spatial realizations of person features.

With respect to verb agreement, however, not all ASL verbs actually display the kind of spatial agreement just described for the verb GIVE. For example, LOVE, which is a body-anchored verb, is not articulated in such a way as to make possible the spatial encoding of subject and object agreement in terms of start and end points of the verb.

25.   JOHN LOVE MARY
        'John loves Mary.'
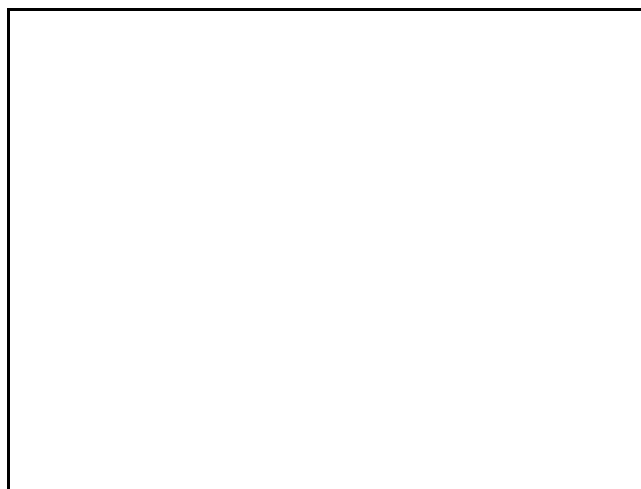
Distinct morphological classes of verbs have been identified (see, for example, Padden (1988)); verbs have been categorized according to whether or not they allow spatial agreement marking. So, some verbs have been labeled "agreeing verbs", while other verbs, like LOVE, have been labeled "plain verbs".

The syntactic significance of the morphological distinction in ASL verbs has been the subject of some disagreement. Lillo-Martin (1986, 1991), for example, has suggested that sentences involving plain verbs are structurally different from sentences involving agreeing verbs. She has claimed that a syntactic agreement node is present only in sentences that contain agreeing verbs.

In many languages, the presence of syntactic subject agreement is sufficient to license null subjects. So, for example, in Italian, unlike English, it is possible to omit a subject pronoun, because the agreement on the verb licenses the null subject. So, if Lillo-Martin's interpretation were correct, we might expect to find a distinction in the distribution of null subjects. We might expect to be able to find agreeing verbs with null subjects, while plain verbs might require overt pronouns in subject position. However, this is not the case. Null subjects can occur with all types of verbs. For this reason, Lillo-Martin proposed that the subjects of plain verbs, which occur in very different syntactic configurations, according to her, are licensed in the same way that Chinese licenses null subjects (following Huang (1982)), namely by topics. We have argued, in Aarons, Bahan, Kegl, and Neidle (1992, 1994), that the licensing of null subjects with ASL plain verbs does not, however, pattern with Chinese. We claim that syntactic agreement is present in main clause sentences regardless of the morphological class to which the main verb belongs, and that null subjects are uniformly licensed by agreement. In the next section, we present additional evidence, based on non-manual agreement marking, in support of this analysis.

7. Non-manual expression of agreement

Since many of the other syntactic features that we have previously examined in ASL have non-manual grammatical correlates, it would be interesting to see whether phi-features also have non-manual expressions. In fact, this is precisely the case. The non-manual expression of agreement was the subject of Bahan's (1996) dissertation, and we refer you to that for a much more complete account of this phenomenon than we present here.

It turns out that just as the index finger can overtly point to locations in the signing space to establish pronominal reference, there are non-manual means of pointing to these locations to signal agreement. For example, the head can tilt toward the same location, or the eyes can gaze to that location. These non-manual expressions of agreement are extremely frequent in the language, and yet had not been previously analyzed in detail, prior to Bahan (1996). (This article discusses one form of non-manual expression of subject agreement. See Bahan (1996) for a discussion of other types of non-manual realization of subject agreement.)

In the remainder of this article, we present some of the findings with respect to non-manual agreement marking. Let's start with transitive clauses. In a sentence like 26, the head tilts toward the location associated with the subject, Bill, and the eyes gaze to the location associated with the object, Bob.

$$\overline{\qquad\qquad\qquad\qquad\qquad\qquad\text{head tilt}_i}$$
$$\overline{\qquad\qquad\qquad\qquad\qquad\text{eye gaze}_j}$$

26.　　BILL IX$_i$ [ ]$_{\text{AGR-S}i}$ [ ]$_{\text{AGR-O}j}$ $_i$HIT$_j$ BOB$_j$

　　　'Bill (there) hit Bob.'

Both of these markings begin immediately after the subject is signed, but before the VP is articulated. This is precisely the position in which linguists have postulated the syntactic nodes associated with subject and object agreement to occur. Furthermore, recent syntactic work has suggested that subject agreement and object agreement are associated with distinct nodes and that the subject agreement node

precedes the object agreement node in the tree. We have argued for ASL that the basic clause structure is as illustrated in Figure 7.[2]
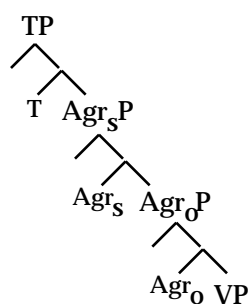
TP
├ T
└ Agr$_S$P
　├ Agr$_S$
　└ Agr$_O$P
　　├ Agr$_O$
　　└ VP

Figure 7: Structural positions of agreement nodes

The relative order of AGR-S and AGR-O corresponds to that of head tilt and eye gaze in the sentence just illustrated. The subject is articulated; the head tilts to the position in space associated with the subject; the eyes gaze to the position associated with the object; and then the VP is signed. Notice, however, that the head tilt and eye gaze remain as the VP is articulated. It turns out that this spread is obligatory.

It is not surprising that the non-manual material should be able to spread over its c-command domain. That is precisely the domain over which the head tilt and eye gaze extend. But why should the spread be obligatory? As with other non-manual grammatical markings, spread occurs obligatorily when there is no other way to associate manual material with the non-manual marking. In this case, there is no manual material occupying the agreement heads. Thus the spread of head tilt and eye gaze occurs in exactly the same way as the spread of non-manual correlates of other syntactic features.

As with other features, the intensity of these markings is greatest at their source, and gradually diminishes as distance from the source increases. So, in sentences like 26, it is possible to see the angle of head tilt gradually decrease and the eye gaze also gradually return to a more neutral position by the end of the articulation of the VP.

This non-manual expression of subject and object agreement is extremely frequent, but is not required. Sentences such as 26 are grammatical even if head tilt and eye gaze are not present.

Let's now look at what happens in intransitive clauses, where there is only one referential argument, namely the subject, with which the verb can agree. In this case, we find that either non-manual device, or both, can be used to signal subject agreement. That is, it is possible to find head tilt, eye gaze, or both. These three possibilities are illustrated in 27, 28, and 29, on the next page.
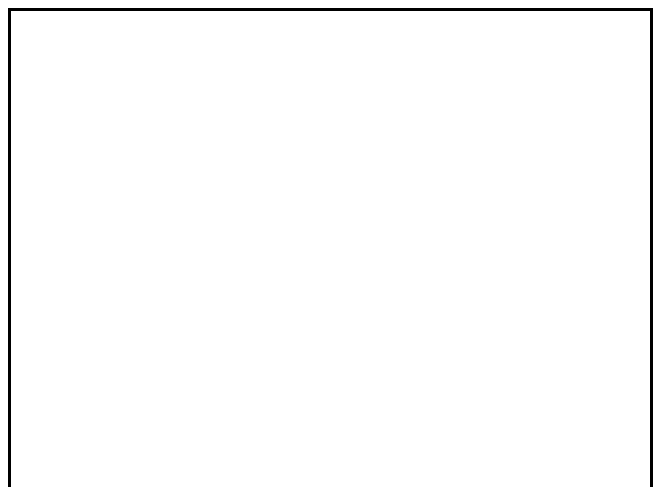
27.
                             _____ head tilt$_i$
JOHN$_i$ [ ]$_{AGR\text{-}Si}$ ARRIVE
'John is arriving.'
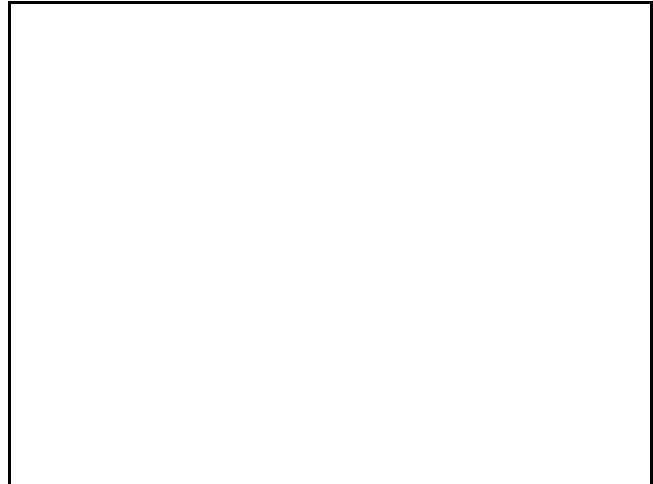
28.
                             _____ eye gaze$_i$
JOHN$_i$ [ ]$_{AGR\text{-}Si}$ ARRIVE
'John is arriving.'
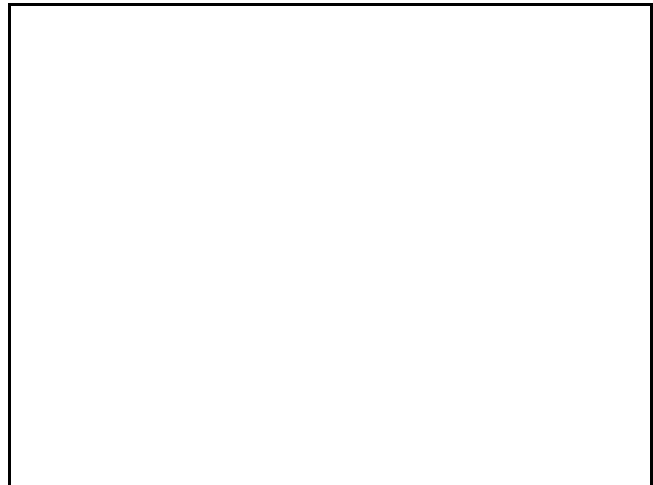
29.
                             _____ head tilt$_i$
   _____ eye gaze$_i$
JOHN$_i$ [ ]$_{AGR\text{-}Si}$ ARRIVE
'John is arriving.'

Notice, however, that the example with both head tilt and eye gaze in 29 is different in one significant respect from the transitive case, in which head tilt and eye gaze mark agreement with two different arguments. In the transitive case, head tilt, marking subject agreement, preceded eye gaze, marking object agreement. Here, however, since both markings are associated with the same argument, they occur simultaneously. Again, however, as before, they occur after articulation of the subject but before articulation of the VP, and they spread obligatorily over the VP.

If we are correct that head tilt and eye gaze are non-manual correlates of syntactic agreement, then we have a way to test whether or not syntactic agreement is present in sentences with plain verbs. Let's look at sentences involving the verb LOVE. Recall that LOVE does not make possible manual encoding of subject and object agreement. Significantly, such examples occur quite frequently with non-manual markings of agreement, as in 30.

$$\frac{\qquad\qquad\qquad\qquad\qquad\qquad\qquad}{\text{head tilt}_i}$$
$$\frac{\qquad\qquad\qquad\qquad\qquad\qquad}{\text{eye gaze}_j}$$

30. JOHN IX$_i$ [ ]$_{\text{AGR-S}_i}$ [ ]$_{\text{AGR-O}_j}$ LOVE MOTHER$_j$

'John loves mother.'
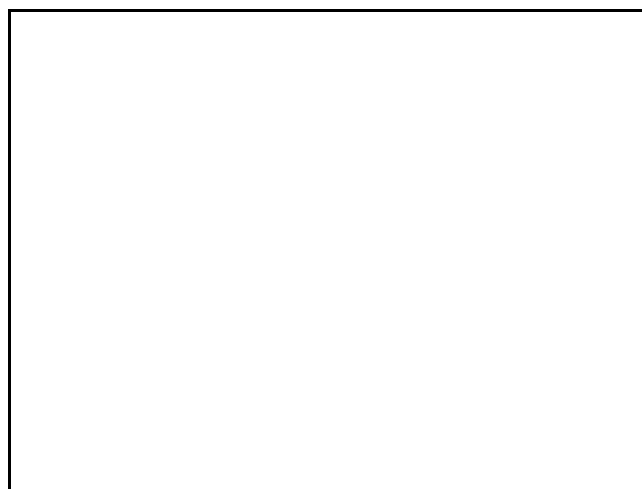
Notice also that the previous set of examples involving the verb ARRIVE illustrate the same point, since, like LOVE, ARRIVE is also a verb that does not overtly display spatial agreement with its subject.

So, sentences like 30 provide evidence that there is no fundamental syntactic difference, of the kind assumed by Lillo-Martin, between sentences containing plain verbs and sentences containing agreeing verbs. Rather, we suggest that the difference is a simple morphological one and that, for articulatory reasons, verbs in one morphological class simply do not express manually the syntactic agreement relations of the sentences in which they occur. However, evidence of syntactic agreement in such sentences is provided by the non-manual expressions of agreement that we have just illustrated.

Furthermore, returning to the issue of the licensing of null subjects, it turns out that null subjects can occur only if there is expression of subject agreement—either manually or non-manually. So, in a sentence with LOVE, a null subject can be omitted only if there is non-manual expression of agreement, by head tilt, since there is no way to express the subject-verb agreement manually in this case. Thus, sentence 31 is ungrammatical, but it becomes grammatical if non-manual agreement marking is present, as in 32.

31. *   pro   LOVE   MOTHER
        '[He/she] loves mother.'

$$\overline{\qquad\qquad\qquad\qquad\qquad\text{head tilt}_i}$$
$$\overline{\qquad\qquad\qquad\text{eye gaze}_j}$$

32. pro_i [ ]$_{\text{AGR-S}_i}$ [ ]$_{\text{AGR-O}_j}$ LOVE MOTHER$_j$
   '[He/she] loves mother.'

Thus, we can account for all null subjects in terms of licensing by agreement.

Similarly, licensing of null objects works in the same way. It is possible to find null objects if object agreement is expressed either manually or non-manually. Thus, contrast the ungrammatical 33 with the grammatical example in 34.

33. *   IX   LOVE   pro
         'He/she loves [him/her].'

                                _____head tilt$_i$
                                           _____eye gaze$_j$

34.   IX$_i$ [ ]$_{AGR\text{-}S_i}$ [ ]$_{AGR\text{-}O_j}$ LOVE   pro$_j$
         'He/she loves [him/her].'
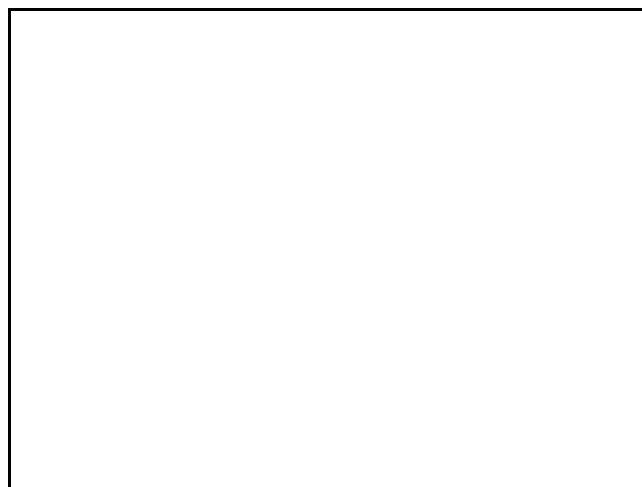
Once the role of head tilt and eye gaze as expressions of syntactic agreement has been recognized, examples such as 31-34 provide additional evidence in favor of a uniform mechanism for licensing null arguments in ASL.

8. DP

We now turn our attention to agreement within the noun phrase. Recent syntactic work on the structure of noun phrases has revealed that there is a great deal in common between nominal projections and clauses, and specifically, that agreement projections are important within this domain as well. Crosslinguistically, within noun phrases, a variety of agreement phenomena has been observed, including case, gender, and number concord, for example.

Just as clauses are analyzed as involving a number of functional projections located above the core verb phrase (VP), noun phrases have also been analyzed as involving similar functional projections located above the core NP. At the clausal level, we have suggested that lexical material, such as a modal or tense marker, may occupy the highest clausal head, the Tense node, interpreting the clause as a projection of Tense, or TP.

Within the noun phrase, the lexical material that has been argued to occupy the highest functional projection has been identified as the determiner, and thus the noun phrase is considered, in fact, to be a Determiner Phrase (DP). As we have said previously, both the noun phrase and the clause have been argued to contain agreement projections. In this section, we look at the manual and non-manual instantiations of agreement within DP. For further details about the structure of DP in ASL, see MacLaughlin (in prep.).

A DP in ASL can contain a pointing sign, made with the index finger pointing to a location in space. This sign is usually called an index, and is glossed as IX in the ASL examples. We have argued in other work (see Bahan, Kegl, MacLaughlin, and Neidle (1995)) that the index sign, occurring before the noun, is a definite determiner. The definite determiner manually instantiates the person phi-features associated with a referential noun phrase. Thus, the definite determiner simultaneously conveys not only the grammatical feature of definiteness, but also agreement features. Therefore, we analyze this index as occupying the head of the DP, consistent with other proposals (see, for example, Abney (1987)).

Linguists have also proposed that pronouns occur in the determiner position, with no additional material within NP. This receives support from ASL, in that the same index sign that functions as a definite determiner is also used as a pronoun. Sentence 35 illustrates the index functioning as a definite determiner, and sentence 36 shows it functioning pronominally.

35.   [IX MAN]_{DP}   ARRIVE
       'The man is arriving.'
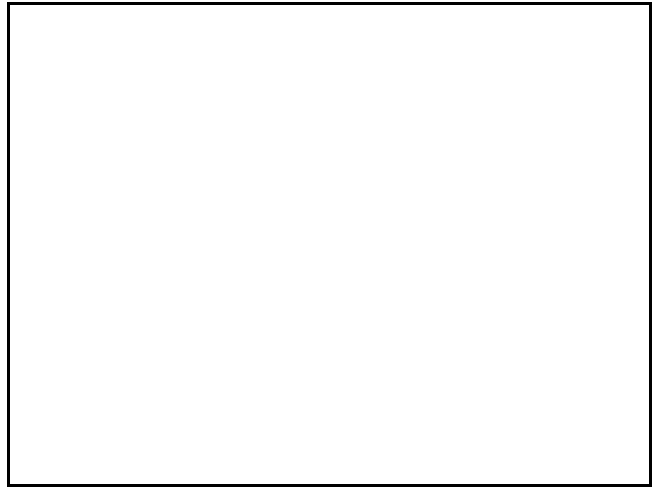
36.   [IX   ]_{DP}   ARRIVE
       'He/she is arriving.'
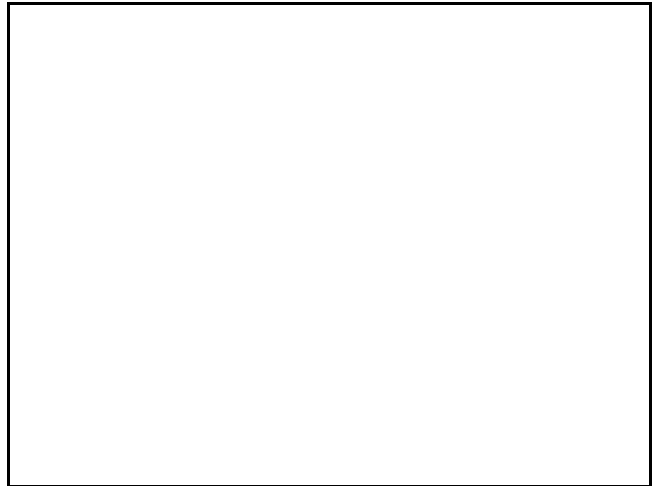
Now, if we are correct that the DP really does contain agreement projections, then we might expect to find non-manual correlates of agreement within DP similar to what we have found within the clause. Let's consider again the simple noun phrase IX MAN. Not only does the index finger point to the location in space associated with the referent, but it is also possible to find the head tilting to that location, the eyes gazing to that location, or both. This is very similar to what we find with intransitive clauses, where there is a single referential phrase with which agreement can be marked. The possibilities for occurrence of head tilt and eye gaze with this noun phrase, IX MAN, are given in Table 2. To view the video for these examples, click on the corresponding movie icon.

• Sentences 37 and 38 show eye gaze. In 37, the eye gaze appears over the determiner; in 38, it has spread over the whole DP.

• Sentences 39 and 40 illustrate head tilt, only over the determiner in 39, and over the whole DP in 40.

• Finally, sentences 41 and 42 show both head tilt and eye gaze occurring together, with the same distributions.

Table 2: Non-manual expression of agreement in DP	
Non-manual material over D only	*Spread of non-manual material over DP*
$\underline{eg}_i$ 37. IX_i MAN	$\underline{\qquad\quad eg}_i$ 38. IX_i MAN
$\underline{ht}_i$ 39. IX_i MAN	$\underline{\qquad\quad ht}_i$ 40. IX_i MAN
$\underline{eg}_i$ $\underline{ht}_i$ 41. IX_i MAN	$\underline{\qquad\quad eg}_i$ $\underline{\qquad\quad ht}_i$ 42. IX_i MAN

As with the non-manual agreement marking in intransitive clauses, the head tilt and eye gaze are articulated simultaneously. However, there are some interesting differences with respect to the distribution of these non-manual agreement markings. First, since there is manual material in the head position associated with agreement, the non-manual marking occurs simultaneously with the articulation of the determiner, while in the clause, the non-manual marking begins before the articulation of the verb phrase.

Second, the spread of the non-manual marking is optional, rather than obligatory, within DP, because, again, there is manual material available to express the non-manual agreement marking. Contrast column 1, in which the agreement marking occurs only over the determiner, with column 2, where the marking occurs both over the determiner and its c-command domain: namely the NP.

Now, let's look at what happens in possessive constructions. Possessive constructions differ from the simple noun phrases that we have looked at so far in that possessives contain an additional referential noun phrase, namely the possessor. We will show that the patterns of agreement marking in possessive constructions parallel what we find in transitive clauses.

Examples of the possessive construction are shown in 43 and 44. The possessive marker, POSS, is signed with an open hand in the spatial location associated with the possessor. Thus, the possessive marker expresses manually the possessor's person phi-features.

The non-manual devices of head tilt and eye gaze can be used to express agreement relations within the possessor DP. When these markings are used, the head tilts toward the direction associated with the possessor, and the eyes gaze to the location associated with the head noun. This is analogous to what we find in transitive clauses, where head tilt marks subject agreement and eye gaze marks object agreement. Within possessive DP's, then, the possessor is the analog of a clausal subject, and the NP is the analog of a clausal object.

So, in 43 and 44, eye gaze is associated with FRIEND and head tilt is associated with the possessor. In 43, head tilt occurs only over the possessor, while in 44, it spreads over its c-command domain.

$$\underline{\qquad\text{ht}_i}$$

$$\underline{\qquad\qquad\qquad\qquad\text{eg}_j}$$

43.　JOHN$_i$　[POSS]$_{\text{AGRi}}$　[ ]$_{\text{AGRj}}$　FRIEND$_j$

　　'John's friend'

$$\underline{\qquad\qquad\qquad\qquad\qquad\text{ht}_i}$$

$$\underline{\qquad\qquad\qquad\qquad\text{eg}_j}$$

44.　JOHN$_i$　[POSS]$_{\text{AGRi}}$　[ ]$_{\text{AGRj}}$　FRIEND$_j$

　　'John's friend'
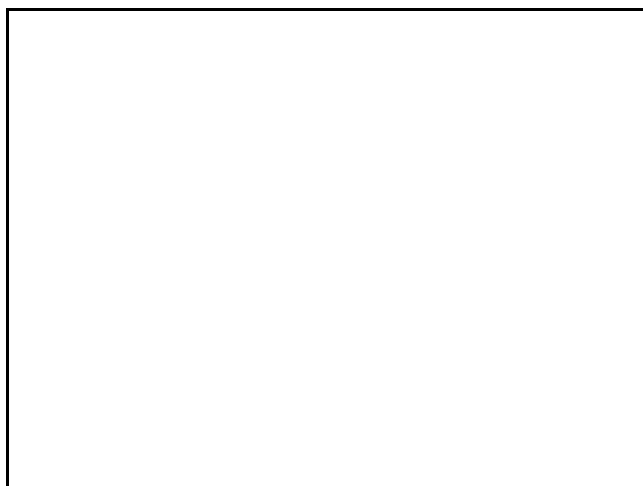
When head tilt and eye gaze appear as non-manual expressions of agreement in transitive DP's and IP's, their distribution differs in the expected way, given what we know about non-manual marking generally. Since, in possessive DP's, the head tilt is associated with manual material, namely the possessive marker (occurring in the same position in which the determiner could otherwise occur), when head tilt appears, its spread is optional in DP, while it is obligatory in IP. However, the status of eye gaze is the same in both cases, since there is no manual material available. Thus eye gaze, when it appears, spreads obligatorily in both DP and IP.

This kind of parallel between DP's containing possessors and transitive clauses, on the one hand, and between DP's without possessors and intransitive clauses, on the other, is actually quite common crosslinguistically. For example, in Aleut, the number agreement marking on nouns with possessors is identical to the object agreement marking on verbs (see Bergsland and Dirks (1981)). On nouns without possessors, the marking is the same as the subject agreement marking on verbs. Abney (1987) notes a similar fact about Yup'ik, namely that possessive noun phrases pattern like transitive clauses and non-possessives with intransitives with respect to agreement morphology. Similar phenomena have been noted in other languages. Bittner and Hale (1996) also report similar parallels between DP and IP with respect to case marking, for a wide variety of languages.

Table 3: Parallels between noun phrase and clause	
Noun phrase with possessor $\overline{\qquad\qquad\qquad\qquad\text{ht}_i}$ $\overline{\qquad\qquad\text{eg}_j}$ 45. DP_i $[POSS]_{AGR_i}$ $[\ ]_{AGR_j}$ NP_j	*Noun phrase without possessor* $\overline{\quad\text{ht}_i\text{ and/or eg}_i}$ 47. $[DET]_{AGR_i}$ NP_i
Transitive clause $\overline{\qquad\qquad\qquad\qquad\text{ht}_i}$ $\overline{\qquad\qquad\text{eg}_j}$ 46. DP_i $[\ ]_{AGR\text{-}S_i}$ $[\ ]_{AGR\text{-}O_j}$ V DP_j	*Intransitive clause* $\overline{\quad\text{ht}_i\text{ and/or eg}_i}$ 48. DP_i $[\ ]_{AGR\text{-}S_i}$ V

9. Conclusion

In this article, we have extended our previous work on non-manual correlates of syntactic features into a new domain, that of syntactic agreement. The existence of non-manual correlates of phi-features suggests that such features have fundamentally the same status as other syntactic features. The presence of non-manual grammatical marking in visual-spatial languages provides evidence about hierarchical relations of a kind not available for spoken languages. Furthermore, the distribution of the non-manual correlates of agreement can provide important evidence about the nature of syntactic agreement, of relevance to a number of current controversies about the proper representation of agreement in language.

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Notes

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[1] Using SignStream, the researcher can identify significant linguistic events and time-align the coding of those events to specific frames of the digitized video. Such a system will make it possible to conduct more careful analysis of the distribution of manual and non-manual components of signing. Further information about SignStream is available at:
        http://web.bu.edu/ASLLRP/SignStream

[2] Arguments in favor of this ordering for ASL are presented in Aarons, Bahan, Kegl, and Neidle (1992) and Bahan (1996). There have been some recent controversies about the existence of agreement projections (see, e.g., Chomsky (1995, chapter 4) or Baker (1996)); the evidence from ASL may be of particular significance in resolving such issues.