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Sign language acquisition and verbal morphology in Brazilian and American Sign Languages[1]

This paper presents some contributions to studies of sign language verbal morphology by looking at the acquisition of Brazilian Sign Language (LSB) and American Sign Language (ASL) in Deaf children with Deaf parents. We observed the verbal production of the children and we verified that, in fact, there is use of different verbal classes from very early ages. We argue that young children have acquired these verb categories, and use them productively, even if infrequently. Our data also support the conclusion that Deaf children acquire a language by *rules*, rather than going through the language acquisition process *piecemeal*.

1. Verbal morphology in sign languages

In Brazilian Sign Language (LSB), American Sign Language (ASL), and every other established sign language investigated, some verbs can be modified in such a way as to indicate information about the people and/or places involved in the event described. This modification is generally known as verb agreement, because it seems that the verb 'agrees' with its arguments (or adjuncts). Agreement is usually indicated by the path of the movement taken by the verb, together with the orientation, or *facing*, of the moving hand. Typically, a verb such as HELP moves from a location which indicates the subject referent, toward a location which indicates the object referent. A verb such as MOVE indicates its source and goal locations.

Verbs which indicate subject and object (such as HELP and GIVE) are generally known as (person) *agreement verbs*. Verbs which indicate source and/or goal locations (such as MOVE and GO) are known as *spatial verbs*. Verbs which are not modified for person or location (such as LIKE or KNOW) are known as *plain verbs*.

There have been a number of approaches to analyzing this system. Questions to address include the following:

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(1) How are the verbs which participate in this system classified? Padden (1983, 1988, 1990) presents the three verb categories of ASL as listed arbitrarily in the lexicon. Then, each verb would simply have some indication as to which category it belongs. Moreover, she points out that plain verbs may have locative markers as well, but these would be considered a kind of clitic rather than agreement. Others have investigated ways in which the classification of a verb might be determined on the basis of semantic/thematic grounds (JANIS, 1992; MEIR, 1998, 2002; RATHMANN; MATHUR, 2008). More recently, Quadros and Quer (2008) have pointed out that the classification of verbs is not static, either listed arbitrarily in the lexicon or determined on the basis of thematic structure. Rather, whether a particular verb will show agreement or not is a function of morpho-syntactic factors of the particular (sentential) context. In the present paper, we provide evidence in favor of this latter position, since we have observed that verb 'categorization' fluctuates both for children and adults.

(2) What is the mechanism of verb agreement? As Casey (2003) points out, some researchers describe the directionality shown in agreement verbs as a syntactic mechanism to establish grammatical relations between the subject and the object (PADDEN, 1990; KLIMA; BELLUGI, 1979). Some focus on the relationship between the verb and referential loci (ARONOFF; MEIR; SANDLER, 2005; LILLO-MARTIN; KLIMA, 1990; MEIER, 1990). Some focus on the semantic aspects of agreement marking (SHEPARD-KEGL, 1985). Still others look at the semantic and syntactic aspects of the agreement controllers (JANIS, 1992). Finally, others deny that this system is part of the grammar at all: Liddell (1995, 2000) argues that what is known as agreement is determined by independent reasons which are essentially gestural, that is, there is no linguistic specification of the points between which the hands move, but what happens is that the hands move to locations which represent mental entities.

In the data from adults as well as from children using LSB and ASL, the systematic use of null arguments licensed in the presence of verbal agreement can be observed (LILLO-MARTIN, 1991; QUADROS, 1995); furthermore, the use of agreement with the object is obligatory (although it is not so with subject agreement) (PADDEN, 1988; BAHAN, 1996; QUADROS; LILLO-MARTIN; MATHUR, 2001). Such restrictions can indicate that agreement is a grammatical phenomenon.

Other important questions related to the classification of verbs are still debated. Among them, we mention the following:

- Is there a consistent form that will be used if a verb belongs to a specific category?
- Are verbs lexically categorized for one or another category or can they change from one classification to another in different syntactic contexts?
- What are the conditions that apply to the expression of verbal morphology?

We believe that sign language acquisition studies can bring some light to this debate. When we analyze early productions of signing children, we observe grammatical and semantic elements being used by children in different syntactic contexts of verbal production. We will present next an overview of previous verbal morphology acquisition studies, then we will go through our studies and the results bearing on these issues.

2. Acquisition of verbal morphology in sign languages

The questions that drive our research are the following:

- How are the categories of 'agreeing', 'spatial', and 'plain' verbs identified?
- Why have recent studies reported different results regarding children's errors in verb agreement?
- Do children learn sign language verb agreement from early on?

Many studies have shown relatively late acquisition of agreement in ASL and other sign languages. Meier (1982) analyzed ASL acquisition and found that there is some verb agreement used in the earliest sessions; there are also errors of omission found until after age 3, and he found as well some occasional errors of commission. Similar patterns have been found in other studies with other sign languages: a few errors of commission, and frequent omission of obligatory agreement until at least age 3 (CASEY, 2003 for ASL; HÄNEL (ms.) for German Sign Language; MORGAN; WOLL, 2006 for British Sign Language).

On the other hand, Quadros, Lillo-Martin and Mathur (2001) found early acquisition of verb agreement by children acquiring LSB and ASL. This project involved longitudinal study of verb agreement acquisition by two children learning ASL (JIL and SAL) and one child learning LSB (ANA), ages 1;08-2;10. They found that children almost always used correctly inflected verbs; overall, plain verbs were used more frequently than inflected verbs; and verbs rarely were missing obligatory agreement Moreover, Berk (2003), analyzed data from one deaf child in later sections (Jill, from 24 to 60 months) and observed agreement acquisition without errors.

These studies lead to some additional questions:

- Why did Quadros, Lillo-Martin and Mathur (2001) and Berk (2003) not find verbal agreement errors (omission and commission), while the previous researchers had found different results?
- Are there differences between the studies in the verbal classification and the contexts considered for obligatory agreement?

Moreover, we have to consider further theoretical questions. Children acquiring some languages (like English) have 'errors' of omission in the verbal agreement for a specific period; while children acquiring other languages (such as Italian) produce a lot fewer errors of this kind. These differences can be related to different morphological systems of each language (HYAMS, 1992; SLOBIN, 1986; WEXLER, 1994). In this sense, some researchers proposed that children acquiring a language like Italian

establish earlier the verbal morphology than the ones acquiring languages like English because of the rule system involved (HYAMS 1992; HOEKSTRA; HYAMS, 1998). On the other hand, some authors have proposed that the low proportion of the frequency of the forms (for example, plural) reflects piecemeal acquisition of the linguistic categories, even if there are few errors produced (PIZZUTO; CASELLI, 1992; RUBINO; PINE, 1998). Then, do the inflectional forms acquired result from piece by piece acquisition, or by a rule system? How can sign language acquisition contribute to this discussion?

3. Our research

Here, we present an analysis of verb agreement acquisition using longitudinal data from two children between the ages of 1;08 and 2;04: one (Leo) acquiring LSB, and one (Aby) acquiring ASL. For the present study, we employed a more detailed separation of verb type and sentence/discourse context, as well as an examination of adult data, in comparison to our previous research.

Each child was filmed with her/his Deaf parents or with a fluent signing experimenter at home or at school in a natural environment, with her/his toys and books, as well as with some sets of toys and books brought by the experimenter for this project. Thirty- to sixty-minute sessions were filmed weekly or biweekly. Only utterances with at least one verb were included in the present analysis. The number of utterances analyzed in each session is given in Table 1.

For each verb, we look at the initial point and the end point (location and/or orientation). If the child's production shows person agreement we categorize it as [+person]; if it shows location agreement we categorize it as [+loc]; if it shows no agreement we categorize it as [plain]. Classifiers (handling, SASS, semantic) were treated separately. Possible errors of omission or commission are marked for further study.

Table 1: Utterances analyzed by session

Age	Aby	Leo
1;8		31
1;9		26
1;10	43	20
1;11		81
2;0	34	
2;1		84
2;2	37	166
2;3		39
2;4	97	36

We split the analysis into three parts. For the first step, we looked at the verbal categories used by the children: plain verbs, agreement verbs, spatial verbs, classifiers and handling verbs[2], gestures (we followed Casey's, 2003 criteria for identification of gestures[3]). To identify agreement, we considered verb transitivity, animacy of the arguments, trajectory of the movement and orientation or facing of the hands. In the second step, we analyzed the morpho-phonological forms of agreement used (location, path, and orientation) and, also, the force of the sentence type (imperative, request, declarative). In the last part, for one session each, we analyzed the verb productions of adults with the child (usually the mother), looking at the verbal morphology following the same criteria established with the children (for Leo, it was the session when he was 2;1, containing 87 adult utterances; and for Aby, the session when she was 2;0, with 78 adult utterances).

In the first step, we observed that the productivity of plain verbs was much higher than that of the other verb types. Agreement verbs were infrequent, but correctly marked. The locative agreement was more productive with spatial verbs than with plain verbs. The overall results are presented in Figures 1 and 2, with data across time in Figures 3 and 4. The results are consistent with those of Quadros, Lillo-Martin and Mathur (2001).

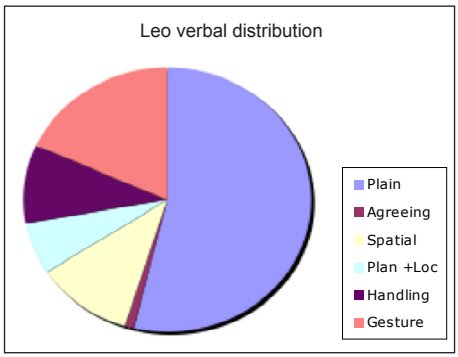

Figure 1: Leo's verb distribution (LSB)

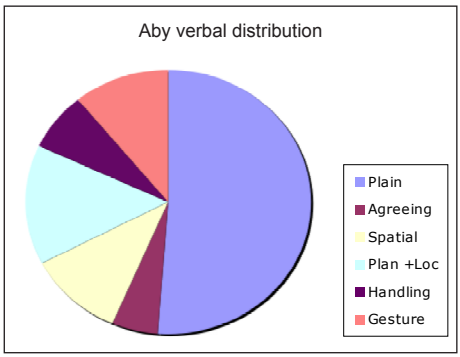

Figure 2: Aby's verb distribution (ASL)

[2] Classifiers are used in LSB and ASL with some specific configurations of hands that can incorporate the noun, the verb and respective inflections. Also, there are other verbs that can be considered as a kind of agreement/spatial verb that also has some properties of classifiers, the *handling verbs*. These verbs can incorporate an instrument or object in the sign; for example, in PUT-CAKE-IN-OVEN, the verb uses the classifier for holding an object that in this case is the cake and makes the movement for putting the cake in the oven, all in one sign. These verbs can also have aspectual inflection.

[3] Casey's criteria for identification of gestures include the following**:** mimics of actions, the use of arms held out straight to ask for something or to reach toward something, native signer judgments.

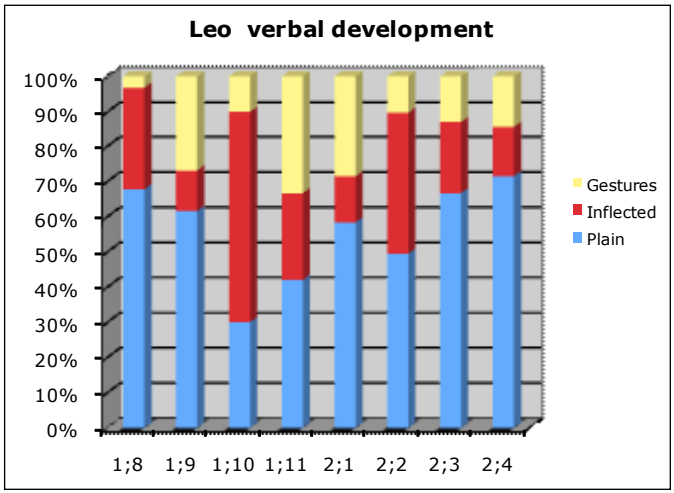

Figure 3: Leo verbal development (LSB)

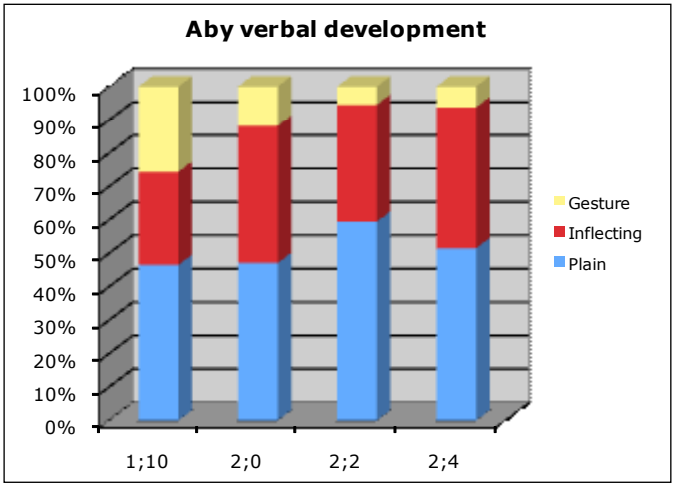

Figure 4: Aby verbal development (ASL)

Examples of verbs used with inflection in child LSB:

Leo: COME, GET, PUT-IN, GIVE, BRING, BITE

(2;1) CAT WANT <it>BITE<me> IX<me>
'The cat wants to bite me'.

(2;1) <you>COME<here> PRAY BLESS PRAY IX<picture>
'Come here to pray to bless (with me with the angel from the picture)'.

Examples of verbs used with inflection in child ASL:

Aby: FEED, GIVE, PICK-UP, PUT, COME, BOTHER, HELP, BRING, GO
(1;10) REMOTE-CONTROL IX<there>…
MOM, <me>GIVE<mom> IX<remote-control>.
MOM <me>DAR<mom> IX<mom>, <me>GIVE<mom>
'I give the remote-control to my mom'.

We examined the children's uses of gestures to see how they compared with the use of verbs having agreement. We found that the children often used both a gesture and a sign in sequence (e.g., SIT/g(sit-here); GIVE/g(gimme)). Signs used with gestures were not missing obligatory agreement (e.g., aGIVE1), although the gestures sometimes added location information to a plain verb (e.g., SIT). We conclude that it is not that the children are using gestures because they do not have a sign as an option. In fact, they are using gestures in the same way that hearing children use them when they are acquiring a spoken language.

In the second step, we looked in more detail at potentially inflecting verbs which were used with a neutral location for agreement (that is, the usual agreement movement was absent or reduced) (21/135=15% for Leo and 4/80=5% for Aby). We found that the facing of the hand is correctly marked in these verbs, indicating that they do not have a complete lack of agreement. Furthermore, these forms were used in imperative or request contexts – contexts in which adults also permit such a reduction in agreement marking.

Examples of imperative/request forms in LSB:

Leo: GET, THROW, GO
(2;1) GET <imp> GET <imp> CANDY
GET <imp> CANDY IX<there>
GET <imp> GET <imp>
'Get the candy there'.

Examples of the imperative/request forms in ASL:

Aby: GET, MOVE, PUSH
(2;2) PUSH<imp> IX<toy>
'Push the toy'.

For the last step, we analyzed the input to the children. We observed that the verbal distribution of the interactor is very similar to that of the children, even if the input shows fewer gestures and more agreement verbs. Moreover, the data indicate that the input shows imperatives and requests with neutral or reduced agreement marked on the verb, exactly what was observed in the children's productions.

Examples of neutral/reduced form in the input:

Aby (2;0)
<Aby>GIVE<Bob> POSS<Bob> DRINK, <Aby>GIVE<Bob> PLEASE.
YOUR DRINK <neutr>GIVE<Aby>.
IX<Bob> <Bob>GIVE<Aby> IX<Aby>.
(Aby) give (to Bob) his drink, please, give (it to him). You give (it) to him.

Leo 2;1
BATATA <cozinha>PEGAR<neutral>
A batata (o garçon) foi pegar (na cozinha).

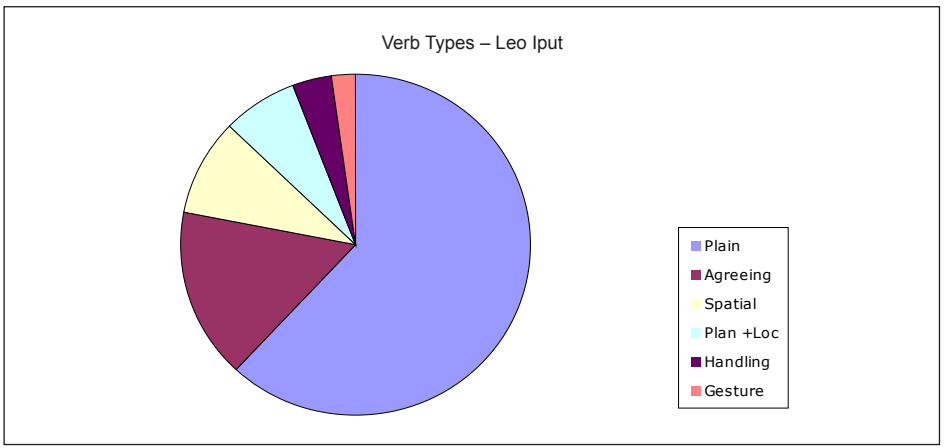

Figure 5: Verbal distribution of the input to Leo (LSB).

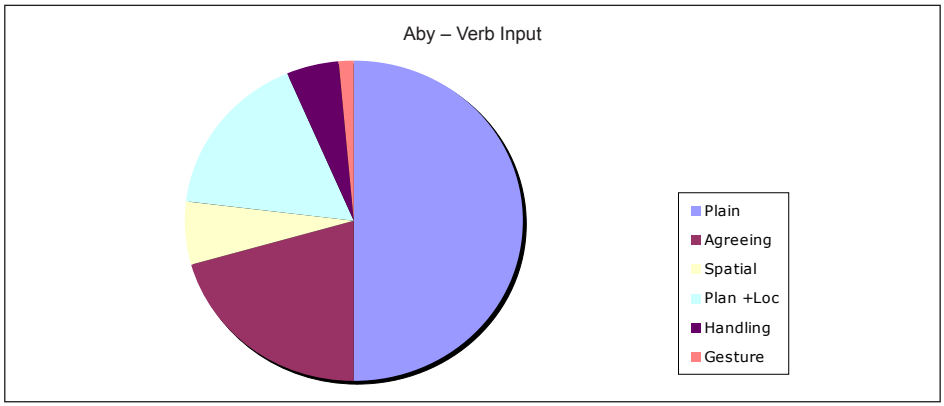

Figure 6: Verbal distribution of the input to Aby (ASL).

4. Discussion

The data from our acquisition study can be applied to the question of verb classification raised earlier. The data from the children offer evidence for a proposal in which the verbs are classified by their morpho-syntactic context, not by a lexical listing, showing that the classification is not rigid, as Quadros and Quer (2008) concluded. For example, some verbs can be used as plain verbs or can be associated with locatives (plain plus loc), such as LEAVE, DROP and STAY in both languages. Other verbs can be used with person agreement, location agreement, or no agreement on the subject, such as COME and GO. Both the children and the adults in this study used verbs in this variable way.

Our current results and the results found by Quadros, Lillo-Martin and Mathur (2001) may have differed from other results found in previous studies because we used these flexible criteria to classify the verbs. In addition, we analyzed the neutral and reduced forms produced by the children and found that they are grammatical instances of imperative forms, used by adults as well. Furthermore, we used facing as well as path and location to identify agreement and we looked at eye gaze as additional information regarding the presence of agreement.

In order to address the question of productivity, we looked at agreement types as well as tokens. We found that the overall pattern of results is very similar using a types analysis as the results presented above by tokens. Multiple types of inflected verbs were used by the children from the earliest ages observed.

The locative agreement (spatial and plain+loc in the graphs) was highly productive. The children used many different verbs with location agreement, and they used this agreement with different referents. Locative agreement on verbs like COME, THROW, PUT, GO, BRING, STAY were common in the children's productions.

The person agreement verbs (such as GIVE, LOOK-AT and HELP) are less frequent than the location agreeing verbs. However, person agreement can also be considered productive, because different appropriate forms are used in different discourse contexts. For example, the sign GIVE was used with first-person subject and second-person object in one context, and with the opposite pattern in another context, as shown in the examples below:

Aby (2;4)
<me>GIVE<you> APPLE
I give you an apple.

DOLL <you>GIVE<me>
You give me the doll.

It is important to recognize that unlike spoken languages, the actual form of a correctly agreeing verb cannot be a memorized, unanalyzed whole. The location toward which the verb moves is determined by the actual physical location in the

current context of the referents involved (abstract locations are used for non-present referents, but the children's early productions are almost all with present referents). In order to use the verb correctly, the child must calculate the form of the verb for the current context. Thus, even a small number of cases can be enough to show productivity of the rule.

If children were to acquire sign language verb agreement piecemeal, they would learn isolated forms, not putting together morphemes as they do under a rule system. Then, they might have memorized a form with movement away from the signer, for example, which is applied in different contexts no matter where the referent is actually located. This is not what we found. The use of different locations for non-first person referents shows evidence of productivity and it offers strong evidence for acquisition following a system of rules.

5. Conclusions

The acquisition of verbal morphology in LSB and ASL supports the proposal that verbs are not classified lexically as 'agreeing' or 'plain', but rather that agreement is used in particular morpho-syntactic contexts. Moreover, it brings support to the grammatical status of agreement in sign languages, bringing some light to this debate, since the realization of the agreement markers depends on the kind of the structure that is being derived following strict rules. Children acquiring LSB and ASL show semantic and grammatical agreement productively and also present neutral and reduced forms licensed in specific grammatical contexts, such as the imperative constructions. Verbal morphology acquisition is ruled by a system of rules very early, independently of the frequency of the verbal production.

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