

**Argument Structure in Nicaraguan Sign Language:
The Emergence of Grammatical Devices**

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1. Introduction

We have had the unprecedented opportunity to observe a young, new language as its grammatical structure emerges. Because the changes taking place in the language are being driven by the children who are learning it, our observations also provide insight into children's biases in learning and organizing linguistic information. The present study examines the emergence of syntactic and morphological devices for indicating argument structure; that is, how subjects and objects are linked to their respective verbs. These devices have recently changed, and are likely to continue to change, as the language develops and evolves.

2. Background

The new language we are studying is a sign language that has emerged spontaneously among a generation of deaf children in Managua, the capital of Nicaragua. Until recent years, deaf children and adults in Nicaragua did not know or interact with each other. In the late 1970s, a small private school for special education was established in Managua, with a few deaf students in attendance. In 1980, this school became public as part of the Sandinista health and literacy campaigns. From that time forward, the school served as a social center for a new community of deaf children. Although the school advocated an oral (rather than signing) approach to deaf education, the children immediately began gesturing and signing with each other on the buses and school grounds.

This first generation of deaf children ranged from 4 years old through the mid-teenage years. They all came from hearing families and hearing neighborhoods, and did not have exposure to signing deaf adults. Susan Goldin-Meadow and her colleagues (Goldin-Meadow & Mylander, 1984) have shown that such children can develop family gestural communication, or *homesign*, systems. Some of the first students in 1980 presumably had such homesign systems, which most likely varied widely in complexity and form (Coppola, Senghas, Newport, & Supalla, 1997). As they started to communicate with each other, the children began to converge on a common system -- an early, rudimentary sign language.

Every year since then, new students have entered the school and proceeded to learn the language from their slightly older peers. Thus, the language is being transmitted from children to children, as is common in sign language communities. What is uncommon is that the language model available to the new children is not a fully-developed language, and also that we have been able to observe the earliest stages of expansion of this language. Our data therefore

bear on understanding the development of signed languages, as well as the nature of creolization of languages more generally.

Today the first generation of children to enter the community are adults in their mid-twenties and early thirties, and the younger, second generation that follows range from adolescents all the way down to preschoolers. The data we present in this paper compare these generations to one another.

3. Previous work on Nicaraguan Sign Language

Earlier work has identified the Nicaraguan situation as an instance of creolization (Kegl & Iwata, 1989); more recent work has observed the emergence of certain grammatical constructions in the language (Senghas, Kegl, Senghas, & Coppola, 1994). Senghas (1995a, 1995b) identified the subpopulations in the community in which these changes were taking place. In that study, signed narratives were elicited from people who entered the signing community at different ages, and in different years of the community's history. The more complex constructions were most prevalent in those subjects who had begun signing at a young age and had entered the community in recent years. This observation provides strong evidence that these constructions are recent developments, contributed by the younger signers. As signers get older, they lose the ability to contribute (or master) new constructions; this finding accords with those on the acquisition of established languages as well (Newport, 1990). Thus, the changes in the language stem from the early-exposed, second generation learners.

In the present study our intention was to examine more closely the nature of the linguistic structures used by the first and second generations, in order to reveal the course by which these structures emerge and change. We focused on the grammatical devices used for expressing basic argument structure. In order to obtain the clearest picture of the historical changes in the language, we observed only the early-exposed signers in each generation; comparing these two groups with one another should reveal most cleanly the changes in the leading edge of grammaticalization of the language, while removing from this picture the variability in grammatical structure that occurs (particularly in the first generation) among those who learned the language late in adolescence or adulthood.

We chose to examine the expression of argument structure because such expressions are so basic to the development of a language, and because the literatures on both spoken creolization and signed linguistics are pertinent to this examination. The literature on spoken pidgins suggests that early languages rely heavily on the consistent use of word order to express basic grammatical relations, and have minimal morphological structure (Kay & Sankoff, 1974; Hymes, 1971). Morphological structure then develops over the subsequent generations of the language. On the other hand, Ted Supalla's cross-linguistic work on sign languages (1995, and in progress) has shown that they tend to develop rich morphological systems, incorporating directional and spatial markers into the verbs to express their grammatical relations. Young sign languages, however, do show less morphological complexity than more well-

developed languages (Supalla, in progress). One therefore might expect that the first generation of Nicaraguan Sign Language might be more heavily word-order based. Nevertheless, since virtually no prior research exists on such early steps in the emergence of a language, our predictions were not entirely clear.

4. Method

The subjects in the present study were eight Nicaraguan signers (four first-generation and four second-generation), all of whom entered the signing community before the age of six. The four first-generation signers entered the community in 1980 or earlier, and had a mean age of 24 years at the time of testing. The four second-generation signers entered in 1985 or later, and had a mean age of 12 years at the time of testing. Each signer watched a set of 32 very brief, videotaped events designed to elicit a single sentence each. For example, they would watch a scene in which a man pushes a woman, and then sign a sentence corresponding to "A man pushes a woman." Responses were videotaped and coded for the arguments expressed, word order, and (given the common tendencies of signed languages) the spatial orientation or direction of movement in the verbs produced. No other types of devices were observed that seemed potentially relevant to expressing argument structure except the orientation and direction of head, shoulders, and eye gaze (what in many analyses of sign languages is called 'body agreement' or 'non-manual agreement'; cf. Bahan, 1996), which are currently under analysis.

The stimuli were designed to elicit verbs from four different verb classes, as shown in Table 1. The first class includes verbs that take only one argument, which was always animate (e.g., "A man cries."). The second class includes verbs that take two arguments, one animate and one inanimate (e.g., "A woman taps a cup."). The third class includes verbs that also take two arguments, but both were animate (e.g., "A man pushes a woman."), and the fourth class includes verbs that take three arguments, two animate and one inanimate (e.g., "A woman gives a cup to a man.").

Class 1	Class 2	Class 3	Class 4
1 argument (animate)	2 arguments (1 animate)	2 arguments (animate)	3 arguments (2 animate)
cry	tap	push	give
faint	look-at	look-at	show
jump	pull	pull	take
sleep	tear	tap	toss

Table 1: Verb classes elicited by the video stimuli.

The 32 videotaped stimuli each showed the same three people (two women and a man) seated at a table. For each stimulus item, one or two of the people would act out an event. The verbs in classes 1 and 2 each appeared in one item, and the verbs in classes 3 and 4 each appeared in three items, which differed in the roles taken by the three participants and in the inanimate objects involved.

The 32 stimuli were randomly ordered, with the constraint that two stimuli involving the same verb or the same agent-patient pair were never immediately adjacent.

5. Results

Our primary question concerned how signers marked the arguments of these verbs to indicate grammatical relations, and how the linguistic structures might have changed from the first to the second generation of use. The following basic pattern emerged: The first generation expresses the relations among elements of the sentence with a small set of basic word orders. Interestingly, this syntax does not permit two animate arguments to be expressed with a single verb, and thus involves two verbs per sentence for some event classes. Furthermore, these verbs include some use of spatial direction, but not consistently or contrastively; it is therefore not yet a morphological device indicating argument structure.

In contrast, the second generation uses the basic word orders of the first generation much less often. Instead, they often produce new word orders not observed in the first generation, which suggests that more complex syntactic structures are beginning to appear. Furthermore, they use spatial direction on verbs quite consistently, and for contrastive purposes, within and across subjects. This device may thus form an early morphological system for marking case and/or agreement.

The following sections will focus on each generation in turn, and describe in more detail how verbs from each class, and their arguments, are produced. (See Table 2 for a summary of the data.)

5.1 Generation 1

For each verb class members of the first generation produced consistent, basic word orders that make an important distinction between animate and inanimate arguments.

5.1.1 Generation 1 syntax

Verb Class 1 (one argument: "A man cries.>"). Events from the first class involved only one person. These events were expressed with a single verb, usually preceded by a noun; they were almost always produced in neutral space, in front of the signer, without any verb-internal directional movement. For example, signers produced MAN CRY, or simply CRY.

Verb Class 2 (two arguments: "A man taps a cup.>"). Events from the second class involved a person acting on an inanimate object. Again, the event was expressed with a single verb, usually preceded by either or both of its arguments. We observed four common word orders: MAN TAP, CUP TAP, MAN CUP TAP, or CUP MAN TAP. These last two word orders occurred with approximately equal frequency, suggesting that two arguments which differ in animacy do not require a particular word order to indicate grammatical relations.

Generation 1				
	Class 1	Class 2	Class 3	Class 4
# Verbs	1.2	1.2	1.7	1.8
# Nouns/Verb	0.7	1.3	0.7	1.0
Direction/Verb	0.1	0.0	0.9	0.9
Common Word Orders	N ₁ V V V N ₁ V	N ₁ V N ₂ V N ₂ N ₁ V N ₁ N ₂ V	N ₁ V ₁ V ₂ N ₁ V ₁ N ₁ V ₁ N ₂ V ₂ V ₁ N ₂ V ₂	N ₁ V ₁ N ₂ V ₂ N ₁ OV ₁ N ₂ V ₂ N ₁ V ₁ V ₂ N ₁ V ₁

Generation 2				
	Class 1	Class 2	Class 3	Class 4
# Verbs	1.1	1.1	1.6	1.8
# Nouns/Verb	0.8	0.8	0.4	0.5
Direction/Verb	0.0	0.1	0.9	0.9
Common Word Orders	N ₁ V V V N ₁	V N ₁ V N ₂ V	V ₁ V ₁ V ₂ N ₁ V ₁ N ₁ V ₁ V ₂ V ₁ V ₂ N ₂ V ₁ V ₂ N ₂ rare: N ₁ V ₁ N ₂ V ₂	V ₁ V ₂ N ₁ V ₁ V ₂ V ₁ N ₁ V ₁ N ₁ V ₁ N ₂ V ₂ OV ₁ V ₂

Table 2: Summary of response data and common word orders produced (ordered by frequency) by each generation for the four verb classes.

Verb Class 3 (two arguments: "A man pushes a woman."). Events from the third class involved two people. Responses to these stimuli differed dramatically from those of the previous two classes. Surprisingly, there were no responses consisting of two nouns and a verb (*N₁N₂V, in any order), which one would expect to be the usual way of expressing a predicate with two arguments. Instead, the events in this class were most often described using two verbs. The two verbs used to describe a single event were thematically the reverse of one another: for example, *push* and *get-pushed*, or *tap* and *recoil*. Each took at most one noun, which was its agent (for the first verb) or experiencer (for the second verb); no verb took both an agent and an animate patient or theme. Typical responses included: MAN PUSH WOMAN FALL, and MAN PUSH FALL. The responses represented three new word orders (N₁V₁V₂; N₁V₁N₂V₂; and V₁N₂V₂), with N₁V₁N₂V₂ apparently the basic order for expressions of this class. It appears that sentences with one verb and two nouns are not allowed if both nouns are animate; a second verb is required to license the

second argument, and often is present when the noun doesn't appear on the surface.

Most of these verbs also incorporated a direction of movement in their production (that is, the verb was articulated toward or from the right or left of the signer), so we can ask if the choice of direction is patterned consistently; if so, it may be a marker of morphological agreement. This question is addressed below.

Verb Class 4 (three arguments: "A man gives a cup to a woman."). Events from the fourth class involved two people and an inanimate object. Responses were quite similar to those of the third class, apparently because both classes involve two animate arguments. Again, signers produced a second verb to carry the second argument. In addition to the word orders observed in the third class, we observed constructions that expressed the inanimate object before the first verb. (Inanimate arguments for this verb class are indicated with an *O* in Table 2, to distinguish them from the animate arguments, indicated with an *N*.) This addition yielded the new construction $N_1OV_1N_2V_2$. Again, we did not observe $*N_1N_2V$ (or $*N_1N_2OV$), in any order ($*MAN WOMAN GIVE$, or $*MAN GIVE WOMAN$). Typical responses included: $MAN GIVE WOMAN RECEIVE$, and $MAN CUP GIVE WOMAN RECEIVE$.

5.1.2 Generation 1 word order summary

Signers from the first generation produce predominantly NV sentences for verbs with one animate argument (e.g., $MAN CRY$), and NV or NNV sentences (e.g., $CUP MAN TAP$) for verbs with one animate and one inanimate argument. While the nouns in these sentences always precede their verbs, there is no contrastive word order used to distinguish the subject (or agent) noun versus the object (or theme) noun, as long as the nouns differ in animacy. In contrast, when there are two animate arguments, a quite different construction appears. Events with two animate arguments require two verbs, one of which carries the agent and the other of which carries the experiencer, and observe a NVNV word order in which the first noun is always the agent (e.g., $MAN PUSH WOMAN FALL$). While the nouns are not obligatory in these sentences, if two animate nouns are expressed, both verbs must be present. No sentences occur in which a single transitive verb has both an animate subject and an animate object. Class 4 events, with two animate arguments plus an inanimate theme, appropriately show the combined syntactic patterns of classes 2 and 3. These events also require two verbs, one of which may take both a subject/agent and theme, and the other taking the recipient. Such sentences are signed NOVNV (e.g., $MAN CUP GIVE WOMAN RECEIVE$).

5.1.3 Generation 1 consistency of direction of movement

Our second set of analyses examined the direction of movement or orientation that frequently appears on the production of the verbs in these last two verb classes. We asked if direction was being used as a morphological device, as it is in many well-developed sign languages.

This type of morphological marking may be unfamiliar to linguists who have studied only spoken languages, but in fact is similar to morphemes common to spoken languages. In many spoken languages, verbs agree in person and number with their subject and/or object nouns. In sign languages, such marking is typically done by using space. Nouns are marked as definite and specific by being indexed to a particular location in space, in front of the signer; verbs then agree with their noun arguments by taking on these same locations. For example, in American Sign Language, an agreeing verb will begin its movement at the location assigned to its subject, and will end its movement at the location assigned to its object. In first generation Nicaraguan Sign Language, some verbs (particularly those in classes 3 and 4) were produced with movements distinctly (or sometimes only slightly) toward the right or left of the signer. We therefore asked whether these movements toward some non-neutral locations might be morphologically marked forms. (If so, of course, it would be surprisingly early in the development of a language for morphological structure to appear; but no previous data are available on an evolving signed language.)

For direction of movement to serve as a morphological marker, it must at minimum be produced consistently, within and across sentences. Generation 1 signers did not typically produce their nouns in a marked location, and also did not indicate any marked location (for example, in a determiner) as part of the NP; we therefore could not ask whether verbs agreed with their associated nouns. Nonetheless, we considered those sentences that included two verbs (in classes 3 and 4), and examined whether the endpoint or direction of one verb was used consistently with respect to the other verb. For example, in a sentence expressing ‘the man pushes the woman’ (typically signed MAN PUSH WOMAN GET-PUSHED), if the verb PUSH moved from right to left, did the verb GET-PUSHED likewise move from right to left?

Figure 1a presents the consistency of directional movement for two verbs within a sentence, for individual subjects. Two of the first-generation subjects used direction consistently within a sentence, but the other two did not. The first two may be using these directional movements as genuine morphemes; we examine this further below. The second two, however, do not appear to be using them morphologically, since consistency of movement direction is not maintained over a sentence.

To further investigate the status of these movements, we analyzed the use of a consistent directional layout, or framework, across the set of sentences as a whole. The videotaped stimuli that the signers watched all involved the same people throughout, sitting in the same positions, engaging in different activities. A signer establishing directions or locations to represent these characters in the signing space could do so in either of two ways. One way matches the perspective of the actors in the video (that is, with the man on the right). The other mirrors the layout on the screen (that is, with the man on the left). We examined whether a signer maintained either of these relative positions across their responses, using one of the two possible layouts consistently.

Figure 1b presents the layout of directional movements used, across sentences, for each of the subjects in the first generation. The first two signers each tend to use a consistent layout, but have selected different strategies from

each other. The second two, again, switch constantly. Taken together, these results do not show a grammaticized use of direction in the first generation language.

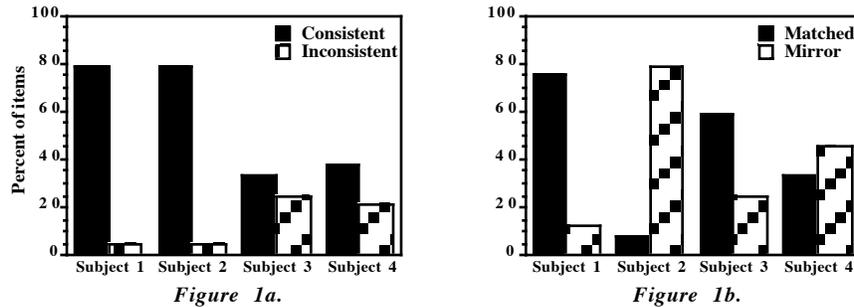


Figure 1. Consistency of use of directional movement in the production of verbs from classes 3 and 4 by the first generation signers. Figure 1a shows the consistency of directional movement within the sentence. Figure 1b shows the directional layout used (relative to the stimulus presented) across the set of sentences.

5.1.4 Summary of generation 1 grammar

The first generation has established a clear syntax, involving a set of basic word orders for expressing simple propositions. These word orders are consistently maintained, but overall the syntax is very constrained.

In addition, spatial direction does not seem to be grammaticized as a morphological device, at least not for all signers (and therefore not for the language as a whole).

5.2 Generation 2

5.2.1 Generation 2 syntax

The word orders produced by the second generation signers overlapped with those produced by the first generation, but differed in important ways that indicate that the language is changing. Again, we will discuss each of the verb classes, and then discuss the consistency of the directional movements.

Verb Class 1 ("A man cries.") and Verb Class 2 ("A man taps a cup."). Like the first-generation signers, the second-generation signers expressed the one-argument events with a single verb, usually preceded by a noun (e.g., MAN CRY). Events that involved a person and an inanimate object were also expressed using only one verb, preceded by either or both arguments (e.g., MAN TAP). The only notable difference in these two classes from the first generation is that the second generation was more apt to produce the verb alone (e.g., CRY, or TAP).

Verb Class 3 ("A man pushes a woman."). More substantial differences between the two generations appear in this class. As before, events

involving two people were expressed with two verbs, each with at most one noun. However, the order of these verbs and the placement of their respective nouns was markedly different. In fact, the basic $N_1V_1N_2V_2$ word order from the first generation was produced in only a few of the responses from the second generation, by a single signer. Instead, several new word orders were produced. This change in word orders is discussed below.

Verb Class 4 ("A man gives a cup to a woman."). Similar changes in the second generation were observed in this verb class. The word orders produced by the first generation were present, but again were much less frequent. Only three $N_1V_1N_2V_2$ sentences were produced, and one $N_1OV_1N_2V_2$ sentence, out of 48 items.

5.2.2 New word orders in generation 2

Two main patterns emerge with regard to word order in the second generation. First, the most common, basic word orders from the first generation are much less frequent, and are replaced by new word orders. For example, as noted above the $N_1V_1N_2V_2$ order has dwindled from 31% of the responses in the first generation to only 5% in the second. Second, the new orders that replace them often have the two verbs adjacent to one another. This new pattern is not merely the consequence of the production of fewer nouns.

Table 3 presents the new word orders produced by generation 2 for verb classes 3 and 4. These new orders account for 28% of the responses in these classes. They are each of quite low frequency, and not all are produced by every signer. In contrast to the original orders, in many of these new word orders (64%) the nouns appear on the periphery of sentences, and related verb pairs (in boldface in Table 3) are adjacent to each other without intervening nouns. Thus we now observe sentences such as MAN WOMAN PUSH FALL, and MAN PUSH FALL WOMAN.

Generation 2: New word orders				
Class 3		Class 4		
$V_2N_1V_1V_2$	V_1N_1	V_1N_1	V_2V_1	$N_1N_2V_2V_1$
$N_2N_1V_1V_2$	$V_1V_2N_2$	V_1O	$N_1N_2V_1V_2$	$N_2ON_1V_1N_2V_2$
$N_2V_2N_1V_1$		OV_1V_2	$ON_1V_1V_2$	$V_2N_1OV_1V_1V_2$
		$N_1V_1V_2O$	$N_1V_1V_2N_2$	$V_1N_1V_1N_2V_2O$

Table 3: New word orders produced by Generation 2 for verb classes 3 and 4.

5.2.3 Consistency of direction of movement in generation 2

Simultaneous with the appearance of new word orders, directional movements seem to converge upon a single pattern. Unlike the first generation signers, all four second generation signers show consistent use of directional movement both within a sentence (see Figure 2a) and across sentences (see Figure 2b). Not only do they use consistent directions for their arguments and

maintain them throughout the task, they also choose the same directional layout (what we have called 'Matched') as each other.

This directional consistency may thus be evidence of an emerging morphological system that allows signers to link verbs with their arguments. The data from the present task do not allow us to declare with certainty whether such a system is fully developed in the second generation. The second-generation signers still do not explicitly index their nouns to locations in space, and so in at least this sense do not show a clear verb agreement system. In addition, we are still in the process of analyzing their use of spatial direction, as well as body orientation, to determine how complex their marking may be. Nonetheless, the fact that direction of movement is now used consistently across verbs, across sentences, and across four different signers suggests that a morphological system underlies this regularity.

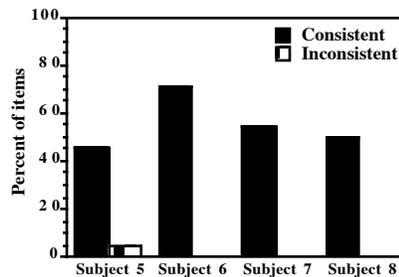


Figure 2a.

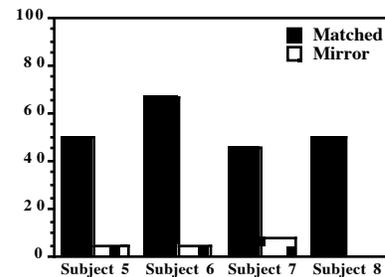


Figure 2b.

Figure 2. Consistency of use of directional movement in the production of verbs from classes 3 and 4 by signers from the second generation. Figure 2a shows the consistency of directional movement within the sentence. Figure 2b shows the directional layout used (relative to the stimulus presented) across the set of sentences.

5.3 Summary of results

We have observed several changes in the grammatical devices used to express argument structure in the early stages of Nicaraguan Sign Language. These changes are occurring at both the syntactic and morphological levels.

In the first generation, most arguments appear as nouns on the surface; the second generation, however, has less required lexical representation.

Both generations allow at most one animate argument per verb, and require two verbs to express two-argument events. These two verbs are thematically related to one another, such that together they express the argument structure of the event in a complementary fashion. In the first generation, the two verbs and their arguments are placed in a rigid order, $N_1V_1N_2V_2$, with the nouns and verbs interleaved. Directional movements on the verbs are not used consistently, and thus do not appear to be morphemes.

In contrast, in the second generation, the $N_1V_1N_2V_2$ pattern has been replaced by new word orders in which there is no interleaving of nouns and

verbs. Two verbs are still required to express a single event involving two animate arguments, but the verbs now occur adjacent to one another. In addition, directional movements on the two verbs have become highly consistent, suggesting that an agreement system is emerging.

6. Discussion

Few research enterprises have had the opportunity to observe such an early language, and none has observed a situation in which an emerging language's users have no other, more well-developed language which they also speak. Under these circumstances we appear to be finding surprising limitations in the grammatical structure of the first generation. Single verbs in such a young language apparently are not able to take a full range of arguments, and more than one verb is required to express rather simple transitive actions.

However, we have also observed the ways in which the children of the second generation are changing the structure of this language as they learn it. This process is still very much underway, and we can only suggest where the current changes are leading. The emerging new word orders, in which the two verbs expressing a single event are adjacent to one another (and the associated nouns appear on the edges of the sentence), indicate new syntactic constructions which will require further analyses, and perhaps another generation of children, to crystallize. One possible interpretation of the new word orders is that the second-generation children have started to topicalize nouns in their sentences (as happens in many older sign languages), moving them to the front and leaving the rest of the proposition in its original position. Another perhaps more interesting possibility is that a change is occurring in the verb phrase, with the two formerly separate and independent verbs moving together like a serial verb. In fact, this verb pair may eventually form a single unit that can license more than one animate argument; that is, it may become a transitive verb. Similar processes occur in spoken creoles, where serial verbs are sometimes used to license oblique arguments (Holm, 1988). In the second generation of Nicaraguan Sign Language, the verbs also each show directional movement; over time these directional movements may become a single agreement system, marking both subject and object, as is found in many older sign languages (Supalla, 1995).

As we continue to follow the development of this new language, we will attend to these kinds of changes. They are the direct consequence of the biases children bring to the task of language learning, and now, language genesis.

Endnotes

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