Children's Contribution to the Birth of Nicaraguan Sign Language

by

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Abstract

The present study examines children's ability to create grammatical structure. A new language has emerged in the hands of a generation of deaf children in Nicaragua. This study examines some of the specific constructions that have emerged in this new signed language in order to determine whether the language is indeed changing over time, and whether the changes in the language originate in older or younger signers.

A nonverbal cartoon was presented to deaf Nicaraguan signers to elicit topic-controlled narratives. Morphological differences between the narratives were examined with respect to the signers' Age at Entry into the signing community, and the signers' Year of Entry into the signing community.

The age at which signers first enter the Nicaraguan signing community predicts their ultimate ability to command some of its more complex structures. Signers who arrived at a young age produce more complex, multi-morphemic signs and use the inflectional and verb agreement system more than signers who entered the community at an older age. These findings are consistent with theories that claim that children's language-learning abilities decrease with age (Newport, 1990).

When the effect of Age at Entry is controlled for, a higher prevalence of these same complex constructions among signers with a later Year of Entry indicates a richer signing environment at the time of learning, thus demonstrating that the language has become more complex over recent years.

This effect of Year of Entry is present only in the signers who entered the community under the age of ten. Thus, the new developments in the language originate in the youngest children in the community. As they apply their natural language acquisition capacity to the nonnativized, incomplete input that surrounds them, they generate a rich and structured grammar, which becomes measurably richer with each passing year.

Thesis Supervisor: Steven Pinker
Title: Professor of Brain and Cognitive Sciences

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I would particularly like to thank Judy Kegl, the director of the Nicaraguan Sign Language Project. Judy welcomed me into her lab six years ago, and first introduced me to the community in Nicaragua. We have been in constant contact ever since, despite our geographical separation. Through our many conversations she has helped me gain insight into the intricacies of sign language structure. She reads my work carefully, and has provided extremely detailed and helpful comments on all of my writing. Judy knows how to make demanding fieldwork a thoroughly enjoyable process, and I have been privileged to participate in this work with her. Thank you, Judy, for these years of collaboration. I look forward to many more.

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Nicaraguans in response had surrounded the US Embassy in Managua; and I was off with a pack on my back and barely a few words of Spanish under my belt. I am sorry she is not here to see this work now. She has always been a model of persistence, determination and accomplishment for me. She would have been proud.

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CHAPTER ONE

1. Introduction

One of the central goals in research on language acquisition is to discover what knowledge and predispositions children bring to the language-learning task. What abilities do people have that enable them to learn language?

Never before in the history of language research has there been a better opportunity to ask this question as the current situation in Nicaragua, where young children deprived of exposure to language are generating a new one. On the basis of work with this group, I will argue that language abilities are an essentially human capacity, a predisposition not only to learn, but ultimately to create language.

Only fifteen years ago, public schools for special education were first established in Nicaragua. Although these schools advocated an oral language approach to deaf education, their establishment led directly to the formation of a new signed language. The schools served as a magnet for a new community of deaf children who had not previously had contact with one another. Consequently, these children created their own indigenous sign language (Kegl & Iwata, 1989). The present study examines how this first generation of signers is imparting grammatical structure to their sign language as it develops.

There are two objects of study that can be considered here. The first is the language that emerges in the community. What kinds of structures are

the first to develop? Does the language evolve abruptly, or gradually over time? Is the development of a grammatical construction contingent on pragmatic necessity? To answer these types of questions, researchers usually examine how current languages are changing over time. In the ideal case, one would like to set the clock all the way back and study a language as it starts from scratch.

The second object of study is the child as language-learner. What capacities do children contribute in order to acquire language? To answer this question, researchers use a logical process of subtraction. By examining the structure evident in children's language production, and subtracting from that the portion present in the language to which they were originally exposed, one can discover the children's contribution. The difference between these two is what comes included in a child's head, the innate learning component. In the ideal case, one would like to reduce children's language input to zero, and observe what kind of language they produce. Of course, any experiment intentionally depriving children of language has been out of the question on ethical grounds.

The current situation of a sign language emerging in Nicaragua provides us with a natural example of the ideal case on both of these counts. This is an extremely rare opportunity; to my knowledge, there has not been another case of linguists and psycholinguists documenting the birth of a language on a community-wide scale. It is not an arbitrary coincidence that the ideal case for both approaches should emerge in one single situation, because language is not separable from the language-learners and the language community they compose. The "language itself" is only the degree

of consensus that the language users have at any one time about how the language is produced and understood (Chomsky, 1986). In this thesis I examine some of the early developments in Nicaraguan signing and empirically examine whether this course of development results from children's language-learning capacities.

1.1. Theoretical considerations

Children's language-learning abilities are not usually called upon to build new languages. Why would children be equipped with a faculty powerful enough to create a language when all they ever need to do is learn an existing one? In fact, normal language acquisition is such an enormous inductive task that many have argued it requires a powerful innate capacity to constrain the possible language systems a child can construct (Chomsky, 1965; Wexler & Culicover, 1980; Pinker, 1979). Researchers differ on the exact content of this capacity, but it seems clear that it should result in universalities across languages (Chomsky 1965; Slobin 1977, 1982, 1985). Furthermore, children learning language should progress through similar stages of development (Brown, 1973), possibly as a result of an innate process of maturation (Borer & Wexler, 1987).

Some theorists studying pidgin and creole languages have argued that these constraints are strong enough to determine the form new languages take when they are learned by children (Bickerton, 1981, 1984; Anderson 1983). Derek Bickerton has proposed that an innate "Language Bioprogram" will result in the abrupt creolization of a new language within a single generation of speakers. He argues that this Bioprogram will kick in whenever the language of the environment is insufficient. However, Goldin-Meadow and

her colleagues (Goldin-Meadow, 1982; Goldin-Meadow & Feldman, 1975; Goldin-Meadow & Mylander, 1984) have documented the gesture systems of deaf children in hearing families, and although these systems exhibit language-like characteristics, they lack many of the features which one might require in order to consider something a full language, such as syntactic movement. This examples might make us wonder if the language-learning capacity is powerful enough to generate new languages. In this thesis I evaluate how abruptly grammatical developments have taken place in Nicaraguan signing, in order to evaluate whether children's language-learning abilities can be considered the primary force driving the changes.

I will also examine the age of the children in which these developments first occur. Newport (1990) has shown that native language-learning capacities are available only at a young age. In this thesis I examine the extent to which the developments in Nicaraguan signing originate in the children during their early, possibly critical, period of development. Evidence that new structures in the language originate in younger children would be consistent with the theory that the same capacities enable language acquisition and language genesis.

Finally, I will consider some of the ways in which the language of the community is being shaped by these language-learning forces. Slobin (1977) has noted that there is a constant tension that underlies language change: language users strive to maximize both understandability and ease of production of language forms. Due to these opposing forces the language is alternatively pulled between highly elaborated forms, which are

unambiguous and clear, and highly reduced ones, which are easier to produce and process. What form do the early Nicaraguan signs take?

One might expect that since the language is produced in the visual-gestural realm, it would lend itself to highly mimetic and iconic forms. Goldin-Meadow (1982; Goldin-Meadow & Feldman, 1975) has found that homesigners make productive use of mimetic gestures. On the other hand, Bernstein (1980) and Meier (1982, 1987) have found that children acquiring American Sign Language (ASL) natively do not make use of the iconicity of morphemes. Frishberg (1975) has shown that highly iconic signs will undergo a reanalysis over the course of succeeding generations, that will eventually reduce signs to a form in which their original iconic cues are unavailable. I will consider whether the early forms developed in Nicaraguan signing display iconic transparency, or whether some other tendencies that are known to guide language acquisition are prevalent in this early stage of the language. Are mimetic signs "easier" for children? Are the types of forms that seem the easiest for young children to acquire the first to appear in the language? If this is the case, does the development of a language resemble language development?

1.2. The Nicaraguan Sign Language Project

The research presented in this thesis was conducted as part of a larger project working with the Nicaraguan Deaf community and their sign language. The Nicaraguan Sign Language Project (NSLP) consists of a small team of linguists, anthropologists, psychologists, and social workers from Nicaragua and the United States. We are working in conjunction with the Nicaraguan Ministry of Education (MED), the National Institute of Social

Services and Welfare (INSSBI), and adult Deaf associations, both in Managua and in smaller Nicaraguan villages.

We have been documenting this emerging sign language since 1985, when Judy Kegl first arrived in Nicaragua. I joined the project in 1989, making my first trip to Nicaragua in early 1990. In addition to documenting the characteristics of the emerging sign language, we are working with Deaf adults to make a dictionary and grammar of their language, and with teachers to develop means of evaluating the linguistic and cognitive skills of incoming students.

We are also observing the new community that has emerged along with the language. This community began as a single-level, horizontal structure, but has developed an intricate hierarchical structure with several subcommunities (Senghas, R. J., & Kegl, 1994).

1.3. The structure of the thesis

The first chapter of the thesis is this introduction.

The second chapter of this thesis reviews previous cases of language acquisition under situations of impoverished input, and considers the type of environment necessary for children to acquire a full language. It then describes the particular situation of language impoverishment in Nicaragua that led to the emergence of a new language.

The third, fourth, and fifth chapters present three experiments that examine some morphological structures that have developed in Nicaraguan signing, and consider the sources of these developments.

Chapter Three compares the signing of older signers to that of younger signers in a narrative production task. The unusual set of circumstances in Nicaragua has led to a generation of younger signers who are more fluent than their older models (Kegl & Iwata, 1989). This initial study examines several specific grammatical structures that the signers have developed, including an inflectional verb morphology system and a classifier system, and compares the prevalence of these forms in the signing of older and younger signers.

In Chapter Four I attempt to identify sources of the morphological developments noted in Chapter Three (and over the course of continued fieldwork). In particular, this study examines the production of certain verbal inflections with respect to two different factors: the child's age at the time of entry into the signing community, and the child's year of entry into the signing community, that is, whether the child began learning the sign language in 1981 or 1990. More complex signing among signers with a later year of entry would provide evidence that the complexities are new to the language. More complex signing among earlier as opposed to late learners would imply that the children are serving as the models of these new forms. This comparison provides a crucial test of whether the developments in the language originate in the children.

Chapter Five presents a comprehension study designed to verify that the inflections examined in Chapters Three and Four are used productively and understood by interlocutors. Subjects were asked to indicate the meanings of some contrastively inflected signs, in order to confirm our interpretation of these forms and to consider whether some forms have a greater breadth of meaning than others.

In Chapter Six, I describe the deverbal anaphor, an unusual construction that uses verb stems in a pronoun-like way.

Chapter Seven considers the order in which certain morphological constructions have emerged in Nicaraguan signing, and discusses how language acquisition constraints might have produced this pattern of development.

Chapter Eight reviews the evidence presented, and argues that the new sign language in Nicaragua has developed directly from children's language-learning capacities.

CHAPTER TWO

2. Evidence of Enrichment

2.1. Cases of language deprivation

In this chapter I will discuss cases in which children have been exposed to different amounts of language in their environment, in order to consider the degree of input necessary for children to acquire a full language. Recall the "subtraction" method mentioned in Chapter One. We are interested in finding instances in which children extend beyond the language input they receive, in order to discover the creative extent of the language-learning endowment.

To that end, we can examine cases of impoverished language exposure and see what kind of enrichment takes place. If this kind of enrichment is innately-driven, the enhancements that originate in the learner should be in the direction of natural language. Furthermore, once the richness of the input passes some threshold, language acquisition should follow a normal course. What kind and degree of stimulation is sufficient to trigger rich language acquisition?

Cases of language deprivation are fortunately rather rare. (Skuse, 1993) provides a summary of several cases of neglect, including a review of physical and mental development). I will consider seven cases of impoverished input in a rough order of increasing richness of linguistic exposure: feral children (Lane, 1976; Skuse, 1993); Genie, who was discovered at the age of thirteen and a half (Curtiss, 1977); deaf children with hearing parents (Goldin-Meadow & Feldman, 1975); Isabelle, who was discovered at the age of six and a half

(Mason, 1942); children exposed to pidgin language (Bickerton, 1981, 1984; Anderson 1983); learners exposed to language after early childhood (Newport, 1990; Emmorey, Bellugi, Friederici, & Horn, 1995); and deaf children who are surrounded by non-native models of American Sign Language (Newport, 1982), including the particular case of Simon (Singleton, 1989; Singleton & Newport, 1987).

2.1.1. Feral children

Feral children are those who grow up in the wild, sometimes raised by animals, without human contact. They therefore have no experience communicating with other humans. Upon discovery, they occasionally exhibit animal-like noises such as growls and snarls, but none have generated their own language (Skuse, 1993).

The fact that such children are languageless is not surprising, given that the children lack not only a language model, but also an interlocutor. Furthermore, one cannot know what kind of treatment or condition such children might have had prior to entering the wild. They may have been severely abused, or they may have had some kind of cognitive or linguistic deficiency, and been abandoned for this reason.

When such children are brought into society they often receive language instruction without much success. The famous case of Victor, the "wild boy of Aveyron" studied by Itard (1806, Lane, 1976), is a classic example. It is likely that a child discovered at a very young age would have a greater chance of success at ultimately acquiring language. The idea that young children are particularly capable of learning language was proposed by

Lenneberg (1967), who believed that this ability is available during the critical period of younger childhood, and is lost in the biological changes that children undergo as they reach puberty.

2.1.2. Genie

The case of Genie (Curtiss, 1977) is often brought forth as evidence in support of Lenneberg's hypothesis. Genie was discovered in California in 1970 at the age of thirteen and a half. From the age of twenty months she had been confined to a small room and was given minimal care and food. She spent her days harnessed to a potty chair, and her nights in a crib. She was punished by her father whenever she made any sound.

Upon discovery, Genie was the size of a six-year-old and made whimpering and spitting noises. She could not stand erect. After being brought into professional care, she made some encouraging progress in cognitive development and word-learning. She eventually could string together short strings of words, but never mastered more than very simple morphology or syntax, and her speech required great effort. Curtiss concluded that since Genie had not acquired language during her critical period of language development, she could not apply language-specific learning and processing mechanisms to language tasks. This is certainly one possibility, although there are other possible explanations. As with the feral children, we have no way of knowing if Genie had previous cognitive or linguistic problems that may even have triggered her abuse. In addition, there is no way of measuring the relative effects of Genie's inhuman treatment on her social, cognitive, and language abilities. Problems in any one of these three

areas could prevent adequate language acquisition, and Genie clearly had problems in all three.

2.1.3. Deaf children with hearing parents

Deaf children who have hearing parents and siblings usually have a healthy and supportive home life, but do not have access to the language spoken around them. 90 to 95% of all deaf children in this country are born to hearing parents, most of whom do not expose their children to a sign language, but instead concentrate on teaching them to speak and read lips (Hoffmeister & Wilbur, 1980). Educational and health care professionals often admonish hearing parents for gesturing to their children, believing it will prevent the children from learning to speak. Few children who are deaf from infancy succeed at learning spoken language, since a great degree of the language signal is not visibly evident (Wilbur, 1979). If permitted to gesture, children in this situation will often develop idiosyncratic gestural systems used with family members. These gestural systems are referred to as *homesign*.

Goldin-Meadow and her colleagues (Goldin-Meadow & Feldman, 1975; Goldin-Meadow, 1982; Goldin-Meadow & Mylander, 1984; Goldin-Meadow, Butcher, Mylander, & Dodge, 1994) have followed the development of some homesign systems to see if they included some of the features of natural language. They found that deaf children can creatively systematize their gestures in ways that resemble linguistic structure. The children exhibited consistent gesture order, and appeared to make a distinction between different semantic roles: transitive verbs were generally followed by a marker for the

patient, and intransitive verbs by a marker for the *recipient* of the action, while the *actor* in both cases was much less frequently indicated.

Furthermore, Singleton, Morford, & Goldin-Meadow (1993) have shown that homesign includes internal standards of well-formedness not found in the communicative gestures that hearing people will generate on the spot when asked to produce a gesture. For example, a homesigner would usually use a consistent handshape when he represents the concept *airplane*, while a hearing person asked to produce a gesture for *airplane* would choose a different gesture each time.

Goldin-Meadow refers to the kind of features the children were able to develop as *resilient* features, and the kind of features that they did not develop (such as productive internal morphology, or syntactic movement) as *fragile*. She notes that Genie acquired only resilient features (Goldin-Meadow, 1982). One might expect that resilient features would be easier to acquire and would be the earliest to appear in normal language acquisition. It is interesting to note in this context that children acquiring American Sign Language naturally as a native language-- those 5% or so who have deaf, signing parents-- do initially use sequential order to mark roles such as actor and patient, and only later develop the internal spatial morphology system of ASL (Newport & Ashbrook, 1977).

Most deaf children with hearing parents in the United States eventually discover a community of Deaf people who sign American Sign Language, and this rich, natural language rapidly replaces their homesign

systems. Without exposure to a rich language such as ASL, however, these children cannot develop a full language on their own.

2.1.4. Isabelle

The case of Isabelle (Mason, 1942; as reviewed in Skuse, 1993) is an interesting one, particularly in comparison with Genie. Isabelle was first exposed to language at the age of six and a half in 1938. Her mother was deaf and did not speak, and because Isabelle was conceived illegitimately, both mother and daughter were shut away in a dark secluded room for nearly seven years. The mother finally managed to escape and brought the child to a hospital. When she first arrived, Isabelle could make a few croaking sounds and exhibited the behavior of a "wild animal". She was otherwise mute, but did use some gestures with her mother. She was initially thought to be deaf, but within two months was singing nursery rhymes, and at 18 months had acquired at vocabulary of 2000 words. At the age of eight, she was evaluated to have normal intelligence and language skills.

Isabelle's success at learning spoken language is clearly due in large part to the fact that she was still quite young at the time of her first exposure. What is less clear is how much she was aided by the gestures she used with her mother, and it is a pity we don't have more details about those gestures. As we have seen, deaf children being raised in hearing families often develop idiosyncratic homesign systems that include some language-like characteristics. It is possible that Isabelle's mother had developed such a system with her own parents while she was growing up. She may have then used this homesign with her daughter. Mayberry (1993) has found that children who already have a first language are better able to learn a new

language at a late age than age-matched children who are encountering the new language as their first language. Something attained in learning the first language evidently assists the learning of the second. Morford, Singleton, & Goldin-Meadow (1995), in their work with one of Goldin-Meadow and Feldman's (1975) original subjects as an adult, have shown that even if this first "language" is a homesign, it can assist learners in learning a full language when they finally encounter one. Perhaps some of Isabelle's success was due to the fact that she had a homesign system that helped her to learn spoken language.

2.1.5. Children exposed to pidgin language

In the case of children whose parents are pidgin speakers, an important factor is added over the previous cases: the children form a community of interacting language users, generating a language together.[1] When adults who speak mutually incomprehensible languages come into contact and need to communicate with each other, they will develop a *pidgin*, a simplified language code. Pidgins can arise in trade situations, or between a servant and master class, for example, in which members of each language group continue to use their own language within the group, and the pidgin with speakers of the other language(s). Pidgins are characterized by a sharp reduction in grammatical complexity, including the dropping of inflectional morphology, a reduced lexicon, and minimal, order-based syntax (Holm, 1988).

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[1] Even the homesigners, who do have interlocutors, do not have this advantage. The members of their families communicate with each other in their spoken language, and it is up to the child to come up with a gesture system on his or her own. Family members rarely use the systematic aspects of the homesign system that the child has established, even with the child (Goldin-Meadow, 1982).

Sometimes pidgin-speakers are put into a situation where the pidgin becomes the primary language of the community. According to some theorists, children born into this situation do not speak the pidgin, but instead, through the process of *nativization*, develop it into a radically restructured, complex language called a *creole* (Bickerton, 1981, 1984). Under a nativization model, the structure comes from children's innate universal language capacities (Bickerton, 1977, 1984; Anderson, 1981, 1983). Bickerton (1991) claims that creolization occurs abruptly, within a single generation of child learners, due to their "Language Bioprogram," a fairly specific, default grammar that is used when the surrounding language input is inadequate. The Bioprogram is hypothesized to account for the similarities that are found in different creoles around the world, and for their similarities with children's early stages of language acquisition. The debate about the source of structure and of language change in the process of creolization is an important one that is discussed further, particularly with respect to Nicaraguan signing, in Kegl, Senghas, & Coppola (1995).

Communities of children whose parents are pidgin speakers have much more success at acquiring a rich language than homesigners and isolated children. If Bickerton is right, these creole-speaking children are clearly surpassing their language models. Two components of their learning situation seem relevant to their success. First, as I mentioned above, they form a group with several interlocutors who may be working together to converge upon a grammar. Second, they are exposed to much more language than any of the previous cases. Although a pidgin is not a complete language, it is substantially richer than the gestures from which a homesigner must

build a communicative system. It contains fragments of whole languages extracted from the framework that ties them together. Presented with this challenge, children do seem capable of constructing a new grammar.

2.1.6. Learners exposed to language after early childhood

Learners exposed to language after early childhood receive the same rich, complete language that successful learners are exposed to, but at a period when they may not be able to use that exposure as effectively. As anyone who has learned a second language in adulthood can tell you, it is very difficult to attain a full command of many of the finer grammatical constructions that children pick up with ease. Lenneberg (1967) hypothesized that there is a *critical period* for language acquisition that ends at puberty, after which time learning language was much more labored and less successful. He based this fact on the observation that young people have better success than older people at recovering from brain damage that causes language loss.

Newport (1990) and Johnson & Newport (1989) provide experimental evidence for a critical period in both first and second language learning. Johnson & Newport (1989) tested the English competence of native speakers of Chinese and Korean who had learned English as a second language. Subjects were asked to judge the grammaticality of 276 English sentences, half of which violated a rule of English morphology or syntax. The subjects' ultimate competence in English was strongly related to their age of arrival in the United States. Those who arrived from birth until the age of seven showed native competence in English; those who arrived from the age of eight on showed a clear steady decline in competence, with those arriving after the age of 16 showing the greatest number of errors.

Newport (1990) conducted a similar study on people's ability to learn ASL as a first language. Recall that only 5 or 10% of deaf children are born into Deaf families. These children are exposed to the ASL of their parents from birth, and therefore acquire it naturally, going through the same stages of language acquisition as hearing children learning spoken language (Newport & Meier, 1985). Of the remaining 90% or so who come from hearing families, most do eventually enter the signing community, but they vary with respect to the age at which this happens. Some are first exposed to ASL upon entry into residential school at the age of six, some upon entering middle school or high school, and some not until adulthood, when they join the local Deaf community or marry a Deaf spouse who signs ASL. At the time that Newport's subjects were in school, all instruction was conducted in spoken English, and signing was not allowed in the classroom. The children rapidly learned to sign from their peers in the dormitories and in recreational activities, where it was the dominant language.[2]

This study confirmed that age of acquisition is a strong predictor of one's eventual fluency in ASL. Newport classified her signers as *native* (who began signing from birth), *early learners* (who began signing between the ages of 4 and 6), and *late learners* (who began signing after the age of 12). Subjects

[2] Instruction in schools for deaf children today often incorporates some American Sign Language or, more commonly, some form of Manually Coded English or Signed English. MCE is an artificial system originally designed to teach deaf children to read English. It uses ASL signs and invented signs with English word order. English morphology is often represented with additional handshapes appended to existing signs. Supalla (1986) shows that children exposed only to MCE are unable to acquire it as a natural language. Instead, they begin to apply a spatial grammatical analysis resembling ASL, possibly because they reanalyze some of the word-internal components that are remnants of ASL found in the MCE lexicon (Kegl & Schley, 1986).

in all three groups scored at ceiling on a test of basic word order, but differed on other tests of ASL morphology and syntax: The native learners had the highest performance, followed by the early learners, and then the late learners. ASL has a highly productive morphological system that consists of several different inflections that can be incorporated into the movement of a sign. Some of these are spatial inflections: different referents in the discourse are mapped to different loci in the signing space. Signs can be inflected to agree with these referents by movement or orientation toward previously established loci. Native signers all learn this system. Late-learners, on the other hand, learn only some of the morphological markers. Furthermore, they tend to overextend them, or leave them out where they are obligatory. They learn much of what is called the "frozen lexicon" of ASL: signs that are learned as unanalyzed wholes. Many of these signs contain morphological features embedded within them, but these features are not separated out, analyzed, or productively extended to other signs (Newport, 1982; Kegl & Schley, 1986).

A study by Emmorey, Bellugi, Friederici, & Horn (1995) shows a similar result. They found that native signers are more sensitive to grammatical errors than late-learners. On a sentence-processing task, native signers showed sensitivity to errors in aspectual morphology and spatial marking of verb agreement, whereas late-learners were sensitive to only the aspectual errors.

In each of these studies there were no differences between subjects in the richness of the language surrounding them. The subjects differed only in

their ability to extract the grammar from this input, with younger learners showing a clear advantage.

Under a critical period model, learners go through sensitive or critical periods in childhood, such that the same linguistic input is processed differently at different ages. This change enables children to acquire language, as particular language-learning constraints are available only at certain times. Under this account, older learners have difficulty acquiring certain features of a language because they have missed crucial early stages. However, Newport (1990) argues that the same pattern of development may result from certain cognitive changes that take place as children mature, such as an ability to analyze progressively larger chunks of the language stream. In this way the younger child has to do a less computationally-demanding analysis in order to make form-to-meaning mappings.

It is clear that the age at which children are first exposed to a language strongly affects their ultimate fluency. Young children are in a sensitive or critical period of maturation that gives them an advantage over older learners in the language-learning task.

2.1.7. Deaf children surrounded by non-native models of ASL

Some non-native signers have children who are also deaf. In these families, the language that serves as a model for the children is the incomplete form of ASL described in the previous section. The parents use signs that contain the handshapes and movements that make up the morphological system of ASL, without combining them into a productive grammatical system. The children, on the other hand, perform a

morphological analysis on this input, and redevelop a complex internal morphology, producing a language closer to ASL than their parents' (Newport, 1982). In this situation, children are clearly surpassing their language model.

Like children exposed to pidgins, these second-generation deaf children reanalyze the isolated units of their input into inflections that can be systematically incorporated into words. The way that these deaf children enrich their language is likely related to the process that underlies creolization. The cycle repeats itself alternate generations as late-learners learn ASL from native signers, and then serve as models for their children and other children entering the Deaf community (Fischer, 1978; Newport, 1982).

2.1.8. Simon

Singleton and Newport (1987; Singleton, 1989) worked closely with one second-generation deaf child named Simon, in order to examine some of the specific mechanisms such children use to supplement their incomplete language input. Simon's parents were deaf, and had learned ASL in late adolescence. Like most late-learners, they had a vocabulary of frozen signs and produced many of the grammatical constructions of ASL unsystematically.

At the age of seven, Simon's ASL already surpassed the input he was receiving, particularly in the movement and spatial inflections on verbs of motion and location. His parents produced these inflections with the inconsistency typical of late-learners (Simon's father had 69% accuracy, his

mother 75%), but Simon's performance was better even than that of children of native signers (Simon- 88% accuracy, native children- 81%). In contrast, in his use of another construction (handshape classifiers, described in Chapter Three), which his parents produced even less consistently (father-45% accuracy, mother- 42%) Simon's performance was nearly two standard deviations below the mean of the native children (Simon- 50%, native children- 69%, S. D. = 10). Both constructions were produced inconsistently by Simon's parents. Simon was able to extract the underlying form of only the more consistent of the two.

Unlike the homesigning children, Simon did not invent new signs. He learned his lexicon from his parents. However, in learning these signs, he took some morphemes that were used inconsistently in his parent's signing, and used them more consistently and systematically in his own signing, producing a form of the language that surpassed theirs.

2.1.9. Language learning in a rich environment

This review of cases of children exposed to impoverished input is not complete without considering the case of normal language acquisition. In fact, all children learning an existing language, signed or spoken, are exposed to impoverished input. They are exposed to only a fraction of the possible sentences of their native language, and yet they still manage to educe its complex rules and use them productively. Noam Chomsky (1965, 1986) calls this phenomenon the "poverty-of-the-stimulus" argument for innateness: children's input is not logically sufficient to lead them to the full grammar of their language unless they are aided by an innate language faculty that limits the hypotheses they can entertain, and steers them only to natural human

languages. There are always an infinite number of possible grammars that are logically compatible with a given set of sentences, but children never consider most of those grammars. Once they receive more than some very low threshold of linguistic input, they will converge on a natural, full, human grammar.

2.1.10. Discussion

It is interesting to review the cases of different degrees of language deprivation and consider what this "very low threshold" consists of. Isolated children and deaf children without a signing model do not pass this threshold unless their situation changes while they are still young. They may develop some vocabulary, and some basic rules of word order, but not much more. Children learning from pidgin speakers and late-learners, on the other hand, have much more success at building grammatical structure into their language. These children have two advantages over the other children: a community of interlocutors, and fragments of nativized language to work with.

In the case of the Nicaraguan deaf community, the children do not have fragments of a nativized language from which to draw structure. They do have a community of interlocutors, however, and are a generation of children learning language while still young. The following section describes the details of the Nicaraguan social situation that led to the emergence of Nicaraguan signing. This description will be followed by three chapters in which some of the specific constructions the children have developed will be examined more closely.

2.2. The emergence of Nicaraguan Sign Language

2.2.1. History of the community

After their victory in the Nicaraguan Revolution in 1979, the Sandinista party came into office with a new emphasis on literacy, health care, and social programs. The literacy and health campaigns led to the establishment of the first public schools for special education. These day schools included classrooms for deaf children, in which students were taught using oral methods of instruction. The schools brought deaf children together in large numbers for the first time, and immediately the children began to sign with each other. They didn't sign in the classroom (at least not when the teacher was looking), but they signed on the buses, in the play yard, and in their neighborhoods, now that they knew how to find each other (Kegl, 1994; Senghas & Kegl, 1994).

2.2.2. The development of the language

Kegl & Iwata (1989) describe some of the earliest stages of Nicaraguan signing, comparing it to ASL and evaluating its status as a creole. So far, two distinct forms of the sign language have emerged. These sign systems are independent from Spanish, the spoken language of the region, and are unrelated to American Sign Language (ASL), the sign language used in most of North America.

The oldest members of the Managuan deaf community, who are now in their mid-twenties to early thirties, entered the schools primarily in 1980, each with a different, highly idiosyncratic homesign or gesture system.[3]

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[3] Before the Sandinistas came to power there was a private school for special education at the site of the current public school for special education in Managua. A few deaf students

Upon contact they developed a now partially-crystallized pidgin called Lenguaje de Signos Nicaragüense (LSN) which they continue to use today.

Younger deaf children (many as young as four years old) who entered the schools since that time were exposed to the pidgin LSN used by the older children. Kegl & Iwata (1989) propose that although LSN was non-optimal in natural language terms, and quite variable, it was rich enough to be sufficient to trigger nativization in this next generation of young children that were exposed to it. In order to highlight the distinctness of the signing of the two groups, Kegl & Iwata gave this new form a different name: Idioma de Signos Nicaragüense (ISN).

All together these children and young adults make up a large, vibrant community of over five hundred members (with more entering the schools every year), most of whom live in Managua, the capital city.

Kegl (1994) discusses how the nativization process reverberates throughout the entire community as the younger ISN signers reach adulthood and begin to influence the signing of their older LSN peers. The creole ISN has become the target language of the community, and many of its features are now being incorporated into LSN. This situation certainly complicates the researcher's task of teasing apart the different effects of the age

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entered this school in 1977. These students report that they were aware of each other, but were not signing at the time. Nevertheless, the youngest among them, who would have been 4 to 7 years old upon entry into the school, currently exhibit ISN signing. The older students do not (Kegl, Senghas, & Coppola, 1995).

children are first exposed to signing, and the richness of the language that has surrounded them.

A complication of the present study is that there is no way of knowing the ultimate target grammar that our language-learners are approaching. We therefore cannot classify any productions as errors, or ungrammatical utterances. We can only follow the progression of the language, year by year, and try to capture and identify the germs of structure as they emerge. This is not an easy task in a language undergoing rapid change. Fortunately, as we turn to the younger children, we find a dramatically more stable and regular language.

Furthermore, all of the work on Nicaraguan signing must be done in the sign language itself. Hearing children of deaf signers, the most natural group to turn to for sign-to-spoken-language translation, currently include just a few infants and very young children. Until only a few years ago, there were no interpreters. Now there are a handful in the early stages of training by deaf adults.

2.3. Comparison to the earlier cases

The case of this new language emerging in Nicaragua provides an interesting combination of characteristics of the cases of impoverished language input we have reviewed. Like the children of pidgin signers, the young ISN signers form a community, converging on a grammar together. Like Simon, they are learning language from unsystematic, often late-learning signers.

The earlier studies of cases of impoverished input have begun to characterize an important mechanism of language acquisition. A child who is given a few scattered pieces of a language puzzle will abstract and to systematize, drawing together a full picture. If we take this resultant picture, and subtract the structure evident in the original pieces, the remainder is undeniably the child's contribution. However, it is the contribution of only this one child. The *innate* contribution is more than that. The pieces these children were given, in the case of Simon and the children of pidgin speakers, were initially taken from a completed picture, from a full rich language, which had been already organized by innate principles through generations of nativization. If it is these principles we seek, we need to minimize the confound of innate language properties already encoded in the input. We need to examine how the mechanism operates when it is given a few pieces which are not drawn from a rich, natural language, pieces that lack systematic internal structure of their own. Do children in such a situation converge on a grammar that includes the more complex linguistic structures of natural languages?

Unlike pidgin parents and late-learner parents, the older Nicaraguan signers who are serving as language models did not bring fragments of a developed, nativized language to the community; they each came with their own different sparse, idiosyncratic homesign system. In the following three chapters I will characterize some of the components of the sign system of the older children, and empirically examine some of the ways in which the signing may have changed in the hands of the younger generation.

CHAPTER THREE

3. Study I: A Comparison of Older and Younger Signers

3.1. Introduction

The differences between older and younger Nicaraguan signers are quite striking, even to a non-native signer. The language of the younger signers seems tighter, more rapid, and more structured than that of the older signers. We conducted these first two experiments in order to capture some of that difference systematically. As part of a larger project to document and analyze the development of Nicaraguan signing over the years (Kegl & Senghas, 1991), we have been eliciting the same narratives from every Nicaraguan signer we encounter. In Experiment One and Experiment Two we observe the prevalence of the use of several different grammatical devices by different subgroups of the community. The data on thirty of the narratives are presented in this first experiment; these data (in a slightly different form) are also discussed in Kegl, Senghas & Coppola (1995); and earlier portions of this study (on an initial ten subjects) have been published previously in Senghas (1994) and presented in Senghas, Kegl, Senghas, and Coppola (1994).

3.2. Measures

In the previous chapter, I referred to two forms of Nicaraguan signing: LSN and ISN. The categorization into LSN and ISN is intended to highlight the abrupt shift that has taken place in many aspects of the language. There are consistent differences between the signers who use each of these two forms with respect to when they entered the schools, how old they were at the time, and how many years they have been in the community. The most immediately salient difference between the two groups is the age of the

signers. LSN signers are in their mid-twenties to early thirties, and ISN signers predominantly range from seven to the early twenties. For this reason, this first study tries to capture the shift that has taken place in the language by comparing older to younger signers. (Study Two will examine the effect of the age and year that a signer entered the community, in more detail.) I will move away from a comparison of the characteristics of LSN and ISN, and instead examine what particular constructions and signing styles are characteristic of signers of different ages.

In our comparisons of the narratives of the two groups, we expected to find more efficient signing in the younger children, and a greater use of some of the more complex grammatical constructions that we have observed in our fieldwork. We coded the narratives with respect to some general measures of fluency, as well as the prevalence of mimetic signing, the use of spatial inflection, and the use of a system of abstract specifiers and classifiers. In this section I will describe each of these measures in more detail.

3.2.1. General measures of fluency

It has often been noted that native users of a language speak more rapidly and more efficiently than non-native users. An ability to produce language without hesitations and pauses shows an instinctual command of the language. In our measures of general fluency, we tried to quantify this intuition.

The total number of several different types of morphemes were coded, as described below. In order to get a composite picture of the signers' use of these morphemes, we computed the total number of morphemes in each

narrative by adding up all of the basic stems, all spatial and movement inflections, and all classifiers and specifiers. With this total, we computed the ratio of *morphemes per minute* for each signer. Morphemes per minute serves as a general measure of signing density, that is, how many basic units of meaning the signer produces in a minute.

We also computed the ratio of *morphemes per sign* to determine the overall level of complexity of each sign, that is, how much the signers produced multiple inflections on their signs.

We computed these ratios for each signer, in order to compare the general fluency of the older group to the younger group.

3.2.2. Mimetic signing

Because Nicaraguan signing is produced with gestures and movements, it has available to it certain visually iconic representations and "acting-out," mime-like behaviors in order to convey meaning. Goldin-Meadow has found that homesigners frequently develop signs that imitate the behavior used with an object in order to represent that object, such as a beating movement to represent a drum (Goldin-Meadow, 1982). Slobin (1977) discusses the need for language to be semantically transparent, and it is possible that in the early stages of Nicaraguan signing this need for semantic transparency might result in the use of many such mime-like forms if a large vocabulary is not yet established.

Mimetic signing and iconicity are delicate topics in the sign language literature. Because some signs seem to have a clear iconic mapping to their

meaning, people often fail to recognize the grammatical role of these forms in their use. Throughout their history sign languages have been perceived as "mere" miming, or "drawing pictures in the air," rather than as rule-governed languages. This perception has resulted in sign languages having very low status, and subsequently, many deaf children are prohibited from learning to sign. For this reason, discussions about the structure of sign languages often steers clear of references to mimetic signs.

However, as we learn more about the structure and organization of the grammars of sign languages, it becomes interesting and important to consider the roles iconicity and mimetic signing play in the acquisition of sign languages by children, and in the changes that take place in sign languages over time. Recall that Meier (1982, 1987) has shown that young deaf children often ignore transparent iconicity in favor of other, grammatical, factors. Petitto has shown that even a sign as transparent as the point will be misinterpreted by children who are learning to give it a grammatical interpretation. Like hearing children who at first confuse the meaning of the pronouns "me" and "you," two-year-old ASL signers go through an early stage of reversing the same words in ASL, despite the fact that they are indicated with a point to one's chest or a point towards one's interlocutor, respectively (Petitto, 1987).

As the Nicaraguan children develop their grammar, will they take advantage of its mimetic potential, or will signs evolve away from their more mimetic form? In our examination of the Nicaraguan narratives, we were interested in the prevalence of mimetic signing and how its use may be changing as the language passes from older to younger signers.

3.2.3. Verbal spatial inflection

Like many other sign languages, Nicaraguan signing takes advantage of its spatial component to inflect verbs for *person* or *location*. This system is similar in many ways to the spatial agreement system described in the literature on ASL (Padden, 1983; Newport & Meier, 1985; Shepard-Kegl, 1985; and many others). As nouns are introduced, they can be associated with specific spaces (or referential *loci*) in the signing area. Verbs are then spatially inflected with respect to these loci in order to indicate their arguments. This spatial inflection occurs simultaneously with the production of the sign. A verb can be produced with a movement toward a specific locus to indicate third person, for example, or the shoulders can be shifted toward that locus and the sign produced in the first person. As an example of *person* inflection, in the sentence "He gave a headdress to the child," the verb GIVE is produced with a movement that ends at the locus associated with the child. In this example, the verb is inflected to indicate its object.

Sometimes the arguments in Nicaraguan signing are indicated by a point following the verb to indicate the loci of the verb's arguments (Kegl & Iwata, 1989). This point is smoothly produced immediately following the verb, without any intervening signs. For example, in the sentence "The man saw the bird," the sign SEE (produced by pressing the index finger immediately below one eye and pulling down gently) is immediately followed by a point toward the locus associated with the bird. This second type of argument reference is one of the few cases in Nicaraguan signing of agglutinative morphology; otherwise the inflections are fully embedded into the shape and movement of the stem, altering its surface form.

The most commonly marked argument is the direct or indirect object. The subject is marked less often. In ASL, for the verbs which take this kind of inflection, object marking is obligatory and subject marking is optional (Padden, 1983; Meier, 1987). This may turn out to be the case in Nicaraguan signing as well. Supalla (under review) has examined this pattern across several unrelated sign languages, and concludes that there is an inflectional hierarchy in verb agreement such that the subject can be marked only if the object is also marked. It is interesting to note in this context that the homesigners studied by Goldin-Meadow typically displaced their signs toward the item or person playing the patient or recipient role in the action (Goldin-Meadow & Feldman, 1975).

Location inflection in Nicaraguan signing is similar to person inflection, with the exception that the spatial loci are used to indicate the endpoints of certain intransitive verbs of motion or location. For example, in the sentence "The man went to the restaurant," the verb GO is produced with a movement that ends at the locus associated with the restaurant.

Verbs can also incorporate movements to indicate *number*. A reduplication of a sign in the direction of a single locus indicates that the object of the verb is plural. This inflection is marked on the verb even if the noun (or classifier, as discussed below) has been independently given a plural inflection. For example, in the sign "The man took feathers from many chickens," the sign TAKE-FROM includes a movement beginning at the locus associated with the chickens, and is reduplicated at least three times. Another way of inflecting for number is number incorporation, which involves

including the handshape indicating number in the sign. For example, one child incorporated the numbers one through seven into the movement of the sign GROW-UP to indicate that he was seven years old. This type of incorporation is like the incorporation of classifiers for other semantic classes, explained below.

There are several movement inflections for indicating *manner* or *aspect*. The meanings of these inflections tend to be indicated by adverbs and prepositional phrases in English. These include meanings such as *constantly, repeatedly,* or *randomly*. Like the other verbal inflections, these are incorporated into the movement of the verb. For example, the circular reduplicative inflection that indicates repetition or iteration was often included within the sign FALL to give it a meaning somewhat like "tumble" or "fall head over heels repeatedly."

Verbs can be multiply inflected, simultaneously incorporating two or more inflections.

3.2.4. Classifiers and specifiers

Another feature that Nicaraguan signing shares with other sign languages of the world, including ASL (Supalla, 1982; MacDonald, 1982), is a rich classifier system. Neither English nor Spanish is a classifier language, but many other spoken languages are, including Chinese, Japanese, Thai, and Navajo. Allen (1977) gives a detailed description of classifiers across several language groups. Much of the following discussion is drawn from this source.

Classifiers are morphemes that are associated with different noun classes, similar to the gender marking in languages like French, but with more semantic content, indicating the form or semantic class of the noun. Like gender markers, they are usually obligatory affixes which must be indicated on the noun and often its verbs and adjectives, depending on the language. Classifiers indicate the *units* associated with the nouns, that is, what it is one would count if one were to count the occurrences of the referent of the noun. In many languages (including sign languages) the classifier is marked with nominal inflections (such as plural) instead of the noun itself.

English has a few classifiers, but they are full lexical items that are used to mark the units of collective, uncountable, or pluralia tantum nouns. Some examples of English classifiers are given below in italics in (1)-(9).

1) five *heads* of lettuce
2) fifty *head* of cattle
3) two *grains* of sand
4) two *pairs* of scissors
5) a *blob* of jello
6) a *coil* of rope
7) a *strand* of rope
8) a *stalk* of celery
9) four *pieces* of furniture

For mass nouns, the English classifiers will indicate the form (as in *coil* or *mound*); otherwise they give information about the semantic class of the

noun (as in *herd, stalk,* or *grain*). Note that it is the classifier that determines the unit associated with the noun, and it is the classifier that takes the number modifiers and the plural inflection. Because the classifiers in English do not productively permeate the morphological system, English is not considered a classifier language.

In Thai, which is a classifier language, even nouns like *dog* need to have a classifier to express the unit, as in examples (10) through (12) (examples originally from Haas, 1942, as cited in Allen, 1977):

10) khru· lâ·j khon 'teacher three person' "three teachers"

11) mâ· sì· tua 'dog four body' "four dogs"

12) mâ· tua nán 'dog body that' "that dog"

Across languages, classifier classes seem to be drawn from the same small set of semantic classes. These include classes like animate, human, animal, male, female, vehicle, long narrow object (or salient upon one dimension, such as *stick* or *strand*), wide flat object (or salient along two dimensions, such as *plank* or *sheet*), or round or bulky object (or salient along three dimensions, such as *blob* or *body*). There are often classifiers to indicate large or small objects. These are semantically similar to the augmentatives and diminutives found in Romance languages. Color, however, is never used as a basis for classifier class.

These classifiers can be required to affix to not only the nouns, but also their modifiers, predicates, and proforms. Consider the following sentence from the Bantu language Tonga (Collins, 1962, as cited in Allen, 1977):

13) ba-sika ba-ntu bo-bile *'ba*+have-arrived *ba*+man *ba*+two' "Two men have arrived"

In Tonga, *ba-* is the plural human classifier.

When one uses a sentence with a classified noun, it is often impossible to be neutral with respect to the semantic classification of that noun, since the morphology will require the classifier marking. This is similar to the way that one cannot be neutral with respect to number in English, or the way one cannot be neutral with respect to humanness in the sentence "I saw someone/something." By being required to choose between "one" and "thing" in English, we necessarily assign the object to a semantic class with respect to humanness. Some languages have default classifiers that are neutral, or that are neutral with respect to certain semantic distinctions. For example, "something" here is neutral with respect to the count/mass distinction (although "some things" would not be).

In ASL, classifiers are used quite extensively (Frishberg, 1975; Kegl & Wilbur, 1976; MacDonald, 1982; Supalla, 1982; Shepard-Kegl 1985; Kegl, 1985; and many others). There are a small set of specific handshapes used to indicate classes such as human, animal, and vehicle. These handshapes, known as *semantic* or *object classifiers*, are incorporated into the predicates of the noun, and are produced simultaneously with the movement of a sign. There are also handshapes (often combined with outlining movements) that indicate the size and shape of objects (such as small-flat-round, long-narrow, tall-cylindrical). These are referred to as *size and shape specifiers*, or *SASSes*

(Newport & Bellugi, 1979). Finally, there are handshapes known as *handling classifiers* (Forman & MacDonald, 1978), which are used to identify objects by the way they are held or interacted with, such as a gripped hand representing a hammer, or the fingers brought together with the thumb to one side to represent a pencil. Kegl (1985) has shown that the use of a handling classifier (as opposed to an object classifier) is an indicator of causative marking.

In the ASL examples in (14) and (15) below, VEHICLE is an object classifier:

14) CAR VEHICLE-reduplicated "many cars"
15) BUS VEHICLE-CRASH "the bus crashed"

In Nicaraguan signing, a classifier system has emerged which is similar to the system in ASL, although it does not use all of the same handshapes or indicate exactly the same classes. The most common object classifier is produced with an open, flat hand, known as the B-hand in the sign language literature. This is the handshape used in the citation form of many signs of movement, such as GO, ENTER, and FALL. This classifier is also used consistently either palm-down or palm to the side to indicate the vehicle class. An extended thumb and index finger, oriented downward (inverted-L) indicate the small animal class. A handshape with index and middle fingers pointing downward (inverted-V) is one of the human classifiers. An index finger extended (closed-D) indicates long narrow objects (such as feathers and pencils, but not humans). The SASSes in Nicaraguan sign include a loosely cupped hand (C-hand) for a tall cylindrical objects (such as cups and bottles), a handshape with thumbs and index fingers extended and curved, palms

toward each other, to indicate flat round objects (such as tortillas and plates) and many more handshapes that differ relatively to describe the size and shapes of objects. The signs for most of the fruits and vegetables, for example, involve complex compounding of several size and shape specifiers (for examples see Kegl, Senghas, & Coppola, 1995).

Classifiers and specifiers can combine with verb stems simultaneously with the spatial verbal inflections discussed above, to produce multiply inflected verbs. For example, to produce the sign for "the man fell (tumbled) head over heels," the sign FALL would be produced with a downward path, incorporating an iterative inflection and a human classifier.

3.2.5. The prevalence of forms

In this first experiment we compared the prevalence of all of these different inflections and grammatical markers by older and younger signers in order to capture some of the ways in which the sign language is changing. By looking at the prevalence of different forms in the signing of different age groups of the community we can identify those elements that are new, and the subgroup among whom the form first emerges. There is information lost, however, in counting the occurrence of forms over all signs or all verbs, information that has to do with the grammatical contexts in which the forms are produced and their intended meanings. As I mentioned earlier, in a changing language, it is difficult to define the "correct" or "obligatory" use of a sign, particularly when one is not a native user of the language. Where signs appear to be used in systematically different ways by different groups of signers I have discussed their use in further detail. The most prominent difference, however, is the mere presence of the different inflections as

opposed to series of independent lexical items. The measures of the prevalence of different morphemes, such as inflections per verb, captures much of this difference.

3.3. Method

3.3.1. Subjects

The subjects of the present study are 30 deaf Nicaraguan signers whose ages at the time of testing ranged from 7;6 to 32, with a mean of 21;6. Their year of birth ranged from 1962 to 1985. They were divided into two groups on the basis of age, but since the subjects were not all tested in the same year, these age groups are identified by birth year. The *older* 15 subjects were born between 1962 and 1969, and had an average age of 25;8 at the time of testing. The *younger* 15 subjects were born between 1970 and 1985, and had an average age of 17;4 at the time of testing. Subjects were all either students at the primary school for special education in Managua, or members of the association of Deaf adults in Managua (predominantly composed of alumni of the school).

3.3.2. Materials

The stimuli consist of two brief non-verbal cartoons, "Mr. Koumal Flies Like a Bird," (Studio Animovaného Filmu, 1969) and "Mr. Koumal Battles his Conscience" (Studio Animovaného Filmu, 1973). The cartoons are each approximately one and a half minutes in duration. These cartoons have been used in previous research by Kegl to elicit narratives from ASL signers. They were chosen because these particular stories tend elicit a high number of motion-location verbs, classifiers, coreference markers, and verb agreement inflections.

3.3.3. Procedure

Each subject viewed a cartoon, and was then videotaped signing the story to a deaf peer. Most of the subjects viewed the cartoon on a small television screen, but during power outages or where electricity was not available, subjects watched the cartoon through the viewfinder of a video camera. Subjects were permitted to watch the cartoon as many times as they liked (generally about three times). The subjects were videotaped in at their school, at the deaf club, at the basketball court where many deaf events take place, or in their homes. The author (a non-Spanish-speaking, non-native signer) was present at all but three of the filmings, which were videoed by Judy Kegl. Most subjects narrated both cartoons. For the present study, we used the "Mr. Koumal Flies Like a Bird" narrative from eleven of the subjects, and the second half of the "Mr. Koumal Battles his Conscience" narrative from nineteen of the subjects. (These were initially begun as two separate studies, but for the present report the data have been combined since they yielded a similar pattern of results.)

3.3.4. Coding and analyses

For each narrative, we noted the total signing time and the number of signs produced. We then coded each sign with respect to the morphological devices exhibited, including mimetic enactments; spatial inflections of path, position, or location; person inflection; number inflection; and the use of handling classifiers, object classifiers, and size and shape specifiers (SASSes). We then compared the prevalence of these forms in the older and younger signers.

The "Bird" narratives were coded by the author, who had two years of experience with Nicaraguan signing, and a fluent signer of ASL who had seven years of experience with Nicaraguan signing. We coded the first four narratives together, resolving the coding of any signs on which we initially disagreed. By the fourth narrative, consistency was high, and the coders completed the remaining narratives independently.

The "Conscience" narratives were coded by the author and a native signer of ASL who had one year of experience with Nicaraguan signing. We coded the first six narratives together, resolving the coding of any signs on which we initially disagreed. By the sixth narrative, consistency was near perfect, and the author completed the remaining narratives alone.

Unfortunately, a signer's age is somewhat apparent on the videotapes, and coders could not be blind with respect to the age group of each signer.

3.4. Results

There were marked differences between the younger and older signers on many of the above measures in the directions predicted.

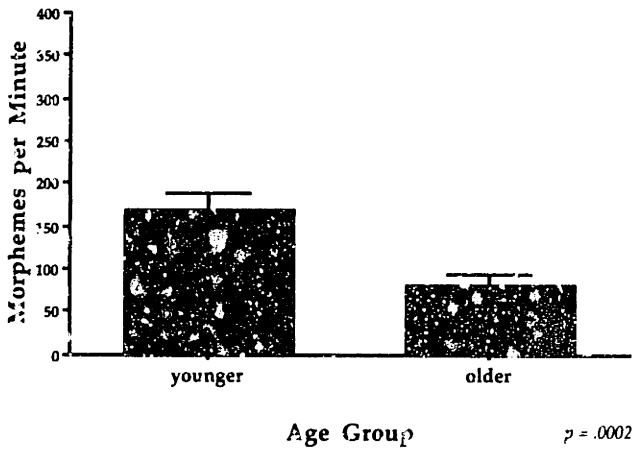
3.4.1. General measures of fluency

3.4.1.2. Morphemes per minute

As a general measure of signing density, the total number of morphemes produced was summed for each signer. This included the basic stems, the spatial and number inflections, and the use of classifiers and specifiers. With this total the number of morphemes produced per minute was computed for each signer. We expected that the younger signers would

produce more morphemes per minute than the older signers. The results from this comparison are presented in Figure 1.

Figure 1: Morphemes per Minute by Age Group

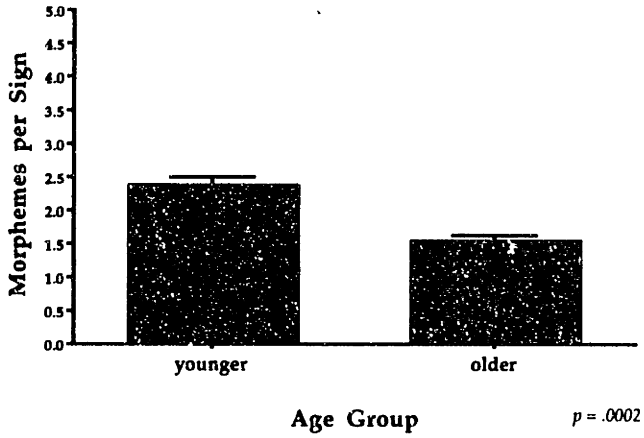


The younger signers produced more than twice as many morphemes per minute (M = 169.8) as the older signers (M = 81.8), t (28) = 17.63, p = .0001, one-tailed. The younger children are therefore producing more basic units of meaning per unit time than their older peers.

3.4.1.3. Morphemes per sign

As a general measure of average sign complexity, we took the total number of morphemes in each narrative and computed the number of morphemes per sign. A signer who produces a string of uninflected signs would score a 1 on this measure; signers who produce more complex, multiply-inflected signs would score higher. We expected that the younger signers would produce more morphemes per sign than the older signers. The results from this comparison are presented in Figure 2.

Figure 2: Morphemes per Sign by Age Group



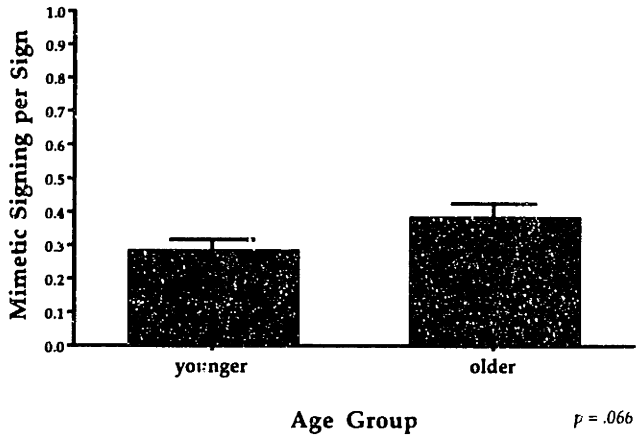
The younger signers produced more morphemes per sign (M = 2.4) than the older signers (M = 1.5), t (28) = 17.63, p = .0001, one-tailed. The younger children are therefore producing more complex, multiply-inflected signs than the older signers. The analyses below will examine in more detail which inflections the children are using.

3.4.1.4. Mimetic signing

Signs that represented an action by how it is performed, or an object by how it is interacted with were coded as mimetic. The mimetic signs in each narrative were counted, and this total was divided by the total number of signs to obtain the proportion of signs that are mimetic. Note that mimetic signing is not necessarily ungrammatical in Nicaraguan signing; some of the signs are mimetic in character and all signers use these signs. But we did expect that younger signers would often have non-mimetic signs and inflections as options that might be less available to an older signer. We expected, therefore, that a proportion of signs that are mimetic would be

lower for the younger signers than the older signers. The proportion of signs that were mimetic produced by the older and younger signers are presented in Figure 3.

Figure 3: Mimetic Signing by Age Group



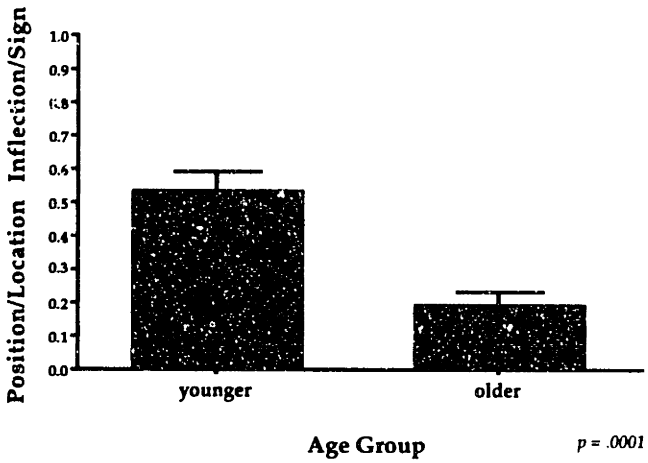
As predicted, the younger signers produced a somewhat smaller proportion of mimetic signs (M = .28) than the older signers (M = .38), t (28) = 3.67, p = .033, one-tailed.

3.4.2. Verbal inflection

3.4.2.1. Position/location inflection

Signs that were inflected with a spatial inflection that included an indication of the position or location (that was not a person inflection) were counted as examples of position/location inflection. The proportion of signs that were inflected for position or location was computed for each narrative. We expected the younger signers to use a higher proportion of these spatial inflections. The mean number of position/location inflections per sign for the two groups is shown in Figure 4.

Figure 4: Position/Location Inflection by Age Group

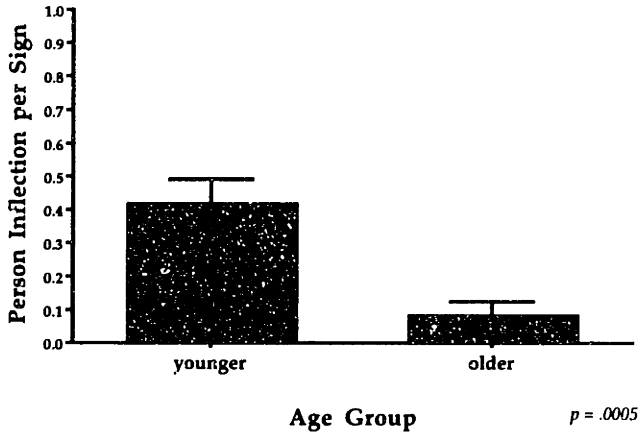


The younger signers produced more than twice as many position/location inflections per sign (M = .53) as the older signers (M = .19), t (23) = 25.84, p = .00005, one-tailed. The younger signers use the inflections for position and location much more than their older peers.

3.4.2.2. Person inflection

Signs that were inflected for person to indicate subject, direct object, or dative object were counted, and the proportion of signs that exhibited person inflection was computed for each signer. We expected that younger signers would use a higher proportion of person inflections per sign than older signers. The mean number of person inflections per sign for the two groups is shown in Figure 5.

Figure 5: Person Inflection by Age Group

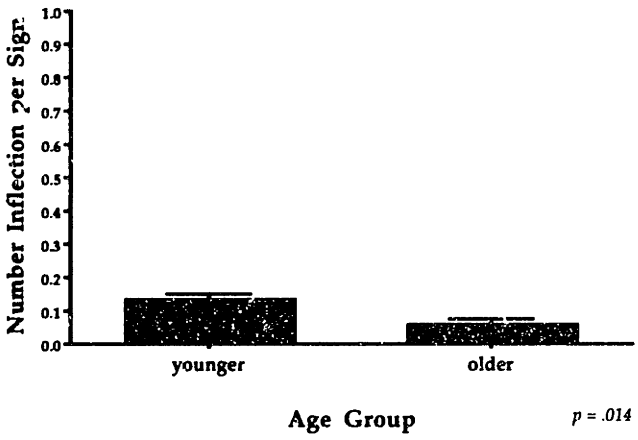


The younger signers produced nearly five times as many person inflections per sign (M = .418) as the older signers (M = .085), t (28) = 15.74, p = .0003, one-tailed. The younger signers clearly use the system of person inflection much more than the older signers do.

3.4.2.3. Number inflection

Signs that included number inflection, either through reduplication, multiple productions of a classifier, or number incorporation (which was much rarer) were counted into the proportion of signs exhibiting number. We expected that the younger signers would produce a higher proportion of signs inflected for number than the older signers. The mean number of number inflections per sign for the two groups is shown in Figure 6.

Figure 6: Number Inflection by Age Group



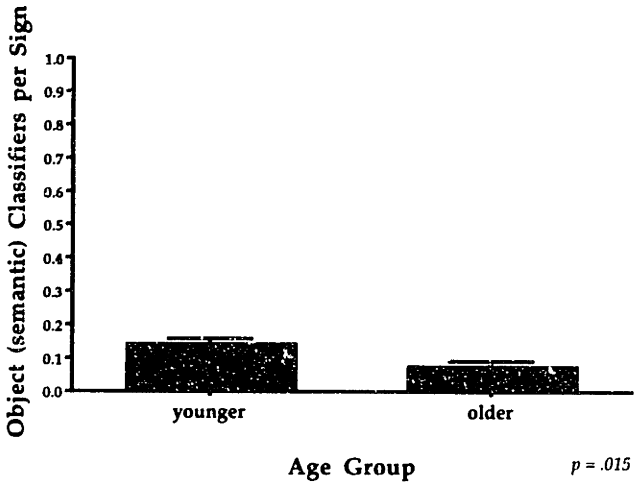
Again, the younger signers produced more than twice as many number inflections per sign (M = .13) as the older signers (M = .06), t (28) = 6.87, p = .007, one-tailed. The younger signers are more apt to use inflections for number than the older signers.

3.4.3. Classifiers and specifiers

3.4.3.1. Object (semantic) classifiers

Object classifiers are handshapes that are incorporated into signs to indicate semantic class. The proportion of signs that included object classifiers was computed for each narrative. We expected that the younger signers would use this classifier system more than the older signers. The mean number of object classifiers per sign for the two groups is shown in Figure 7.

Figure 7: Object (semantic) Classifiers by Age Group

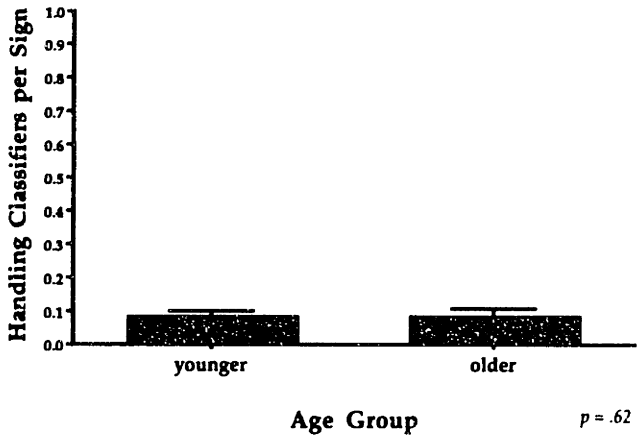


As can be seen in Figure 7, the younger children make much more use of the object classifier system, using twice as many object classifiers per sign (M = .14) as the older signers (M = .07), t (28) = 6.66, p = .008, one-tailed.

3.4.3.2. Handling classifiers

Because handling classifiers can be somewhat mimetic in nature, representing objects by how they are held or interacted with, one might expect them to pattern with the mimetic signs. That is, the older signers would be use handling classifiers more than the younger signers. On the other hand, handling classifiers are part an system that interacts with the movements of signs in ways that the younger children have shown themselves to be more skilled. Because of these opposing influences on handling classifier use, it is difficult to predict which of the two groups would use them more. The proportion of signs that incorporate handling classifiers for each of the two groups is shown in Figure 8.

Figure 8: Handling Classifiers by Age Group

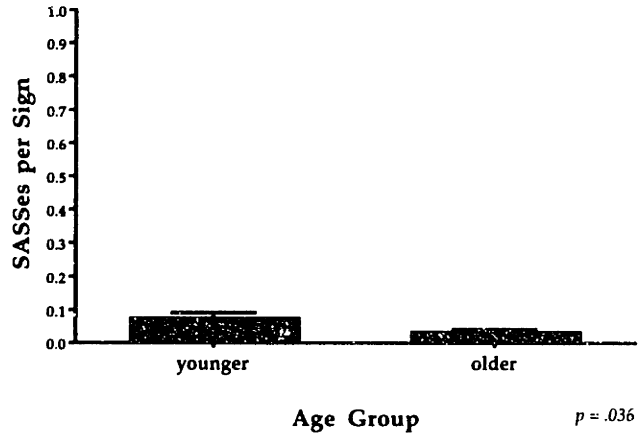


The younger signers produced almost the same proportion of handling classifiers (M = .12) as the older signers (M = .135). These proportions were not found to be significantly different, t (28) = .25, p = 0.62, two-tailed.

3.4.3.3. Size and shape specifiers

Size and shape specifiers (SASSes) are handshapes, or sometimes a combination of a handshape with a with a movement, that indicate the dimensions of a referent. The proportion of signs that included SASSes was computed for each narrative. We have noted that SASSes figure prominently in much of the vocabulary of both older and younger signers, particularly in the compounds for foods mentioned above. For this reason, we expected that the older signers would have this type of construction available, and would use it in situations where a younger signer could take advantage of the object classifier system. For this reason, we expected that the older signers would produce more SASSes than the younger signers. The mean proportion of SASSes for the two groups is shown is Figure 9.

Figure 9: SASSes by Age Group



Contrary to our expectations, the younger signers produced more than twice as many SASSes per sign (M = .075) as the older signers (M = .033), t (28) = 4.87, p = .036, two-tailed. The younger signers use the system of size and shape specifiers much more than the older signers do.

3.5. Discussion

The results of this first study clearly show that the younger Nicaraguan signers are surpassing their models in language production. The younger signers have a more fluent command of the language: They are signing more rapidly, packing more meaning into their signing, and producing more complex, multi-morphemic signs than the older signers from whom they are learning the language.

This increase in language fluency is accompanied by an increase in word-internal morphology. While the older signers tend to produce sequences of uninflected signs, the younger signers use a system of spatial inflection, embedding markers for subject and object into the movement of

many of their verbs, and marking location and position on verbs of motion and location.

The younger signers have also replaced much of the mimetic signing used by their models with a system of abstract classifiers and specifiers. Because they have less of a command of this classifier system, the older signers are more apt to "act out" events in the narratives. For example, some older signers represented "The man took a coin from his pocket" by putting their hand into their own pocket and withdrawing it, shaping the hand as if it held a coin. Signers who commanded more noun classifiers would instead use a container classifier to represent the source of the coin, and a size and shape specifier to identify the object that was withdrawn. In short, the availability of fewer lexical items and fewer inflectional devices increases the amount of mime-like enactions the older signer uses to communicate an event.

Recall that the younger signers used as many handling classifiers as the older signers. We expected that the object classifiers would be replacing some of these forms, since they are somewhat mimetic. However, their use as a productive grammatical component of the language also makes them characteristic of the younger signers. These two forces affect the use of handling classifiers in ways that cannot be examined by looking at the prevalence of their use. What isn't apparent in this kind of comparison, but is noticeable in viewing the videotapes, is the degree to which the younger signers make new, more restrictive, distinctions between handling classifiers and object classifiers. Similar to handling classifier constructions in ASL (Kegl, 1985), younger signers include handling classifiers in verbs to attribute

agency or causation to the subject of the sentence. When no agent is implied, younger signers will select an object classifier instead. Older signers do not make this distinction. They tend to use handling classifiers in both situations, therefore not making a distinction between sentences like "The man had feathers on his arms" and "The man put feathers on his arms." We will return to this distinction in terms of the interpretation and comprehension of these forms in Chapter Five.

The change in signing style that occurs as we move to the younger signers does not involve an active rejection of mimetic signs. Rather, it involves a preference for a system of grammatical regularity and productivity, often at the expense of mimetic transparency. Some of the constructions the children exhibit retain their iconic components, such as the SASSes and many of the spatial inflections. The adoption of other constructions, such as the object classifiers' replacing some handling classifiers, marks a move away from mimetic enactment. What matters to the younger children is productive morphology, not mimetic representation.

In the present study we have identified some areas in which the younger children sign a richer form of Nicaraguan signing. There are two factors which could account for this enrichment. The first is the age at which signers learn to sign. The second is the richness of the language that surrounds the learner. We know that both of these factors are important determinants of someone's ultimate command of a language. In Chapter Two, we saw that language learners were able to produce a language fluently only if they were both young enough at the time of exposure, and exposed to language above some threshold of richness. In the next experiment, I tease

apart these two factors in order to identify the source of some of the changes we have found.

CHAPTER FOUR

4. Study II: The effects of age and year of entry on verbal inflection

4.1. Introduction

In the last chapter, I reviewed some differences observed between older and younger Nicaraguan signers in the grammatical structures that they use. I argued that these differences point to changes that have occurred in Nicaraguan signing since it first began to evolve fifteen years ago. Furthermore, I proposed that these changes in the language occurred in the youngest children as they were acquiring the language, adding systematicity and regularity as a direct result of their language acquisition abilities.

However, one could argue that the results obtained in Experiment One are entirely due to critical period effects. Perhaps the language has not changed over time, and the younger signers simply have a better command of it. Because the groups are defined by age, late-learners are more apt to be in the older group. In order to prove that the language has become richer over the past fifteen years, I need to show that learners exposed in different years were exposed to different levels of language richness.

The present study attempts to tease apart the potential sources of the grammatical changes noted in Experiment One. In particular, it examines different aspects of verb phrase complexity with respect to two factors: signers' *Age at Entry* into the signing community, and signers' *Year of Entry* into the signing community.

4.1.1. Age at Entry

Recall from Chapter Two that children who are exposed to a language at a younger age ultimately achieve greater fluency in the language than those who are exposed only later in life (Newport, 1990). Because the ages at which deaf Nicaraguans acquired sign language range from birth to young adulthood, one can compare their current command of certain constructions to pinpoint the ages at which the constructions could be mastered. All else being equal, signers who entered the signing community at a younger age should show a stronger command of more complex verbal constructions than signers who entered the community only after they were older.

4.1.2. Year of Entry

A second important factor which may account for differences in signers' grammatical complexity is their Year of Entry into the signing community, that is, whether they began learning the sign language at an earlier or later point in time, such as 1981 vs. 1990. The year a child was first exposed to signing is hypothesized to be an indicator of the richness of the signing input that the child received. Kegl & Iwata (1989) have proposed that children first exposed in 1980 received a mix of homesign systems and gestures; children exposed in the mid-80s were surrounded by LSN; and children exposed in the 90s are mostly surrounded by ISN. If I want to argue that the signers are enriching the sign language, rather than just using it more proficiently, I need to show that, all other factors held constant, signers with a later Year of Entry have more complex signing than signers with an earlier Year of Entry. Once the effect of Age of Entry has been taken into account, better signing among later-exposed children would indicates a richer learning environment, thus indicating that the language has become more

complex in later years. More complex signing among children with a later Year of Entry would be evidence that the complexities are new additions to the language.

The combination of these two factors will tell us a story about the development of Nicaraguan signing. Each signer today can be seen as a record of a moment in the development of the language. What was available to that learner during the crucial learning years? What was contributed during those years that subsequently became available to the learners who followed?

4.2. Measures

The present study focuses on aspects of verb phrase complexity. It therefore includes the features of verbal spatial inflection examined in Study One. In addition, I have examined two more aspects of the verb phrase that were not included in Study One: the use of some of the verbal inflections to indicate agreement throughout the narrative, and the ability of verbs to take multiple arguments.

4.2.1. Measures from Study One

Some of the measures coded in Study Two are the same as those described in Study One. Again, narratives were coded for general measures of fluency, which included semantic density, measured as morphemes per minute; and morphological complexity, measured as morphemes per sign.

Since the focus of this second study is the verb phrase, it includes more categories of inflection and agreement than the first study. The additional

features will be described below. Those we have already seen from the first study are the spatial markers indicating position/location and person.

4.2.2. Additional measures

4.2.2.1. Shoulder shift

As discussed in Study One, Nicaraguan signing has many morphological inflections that are embedded into the shape or movement of a sign. Some of these include associating specific referential loci in the signing space with particular referents, and initiating or terminating the movement of a sign at those loci in order to indicate the arguments of the verb. One particular way of incorporating a spatial locus into the verb is to shift the shoulders slightly in the direction of the locus. With this kind of marking, the verb is generally produced in the first person, and the referent associated with the locus is taken to be the subject of the verb. This type of subject marking is sometimes called "role shift" in ASL, since it involves taking on the "voice" of the subject of the verb, rather than that of the narrator (Loew, 1984). Whenever a shift in the shoulders toward a locus was used to indicate this kind of shift in voice, it was tabulated as a *shoulder shift.*

4.2.2.2. Aspectual markers

Nicaraguan signing has several movement inflections that indicate *manner* or *aspect.* The meanings of these inflections tend to be expressed with adverbs and prepositional phrases in English. These include meanings such as *constantly, repeatedly, randomly,* or *in a careless manner.* Like the other verbal inflections, these are incorporated into the movement of the verb. For example, the inflection for repetition or iteration was often

included within the sign FALL to give it a meaning somewhat like "tumble" or "fall head-over-heels repeatedly."

4.2.2.3. Agreement

As described above, many of the spatial inflections used in Nicaraguan signing are used to indicate the arguments of certain verbs. Using these inflections successfully involves two stages: signers must first set up the loci, and identify the referents associated with them. Then the verbs themselves must be inflected to indicate the appropriate loci. A skilled signer will maintain these loci, and their associated referents, throughout the course of a conversation or a lengthy narrative. A less skilled signer may inflect one verb spatially to indicate its arguments, and then set up the same arguments in new loci for the next verb.

A sign is coded as exhibiting *agreement* when its inflection corresponds to an inflection on a previous word in order to co-index them, or to refer to the same argument. For example, a series of verbs would be coded as exhibiting *person agreement* if they were similarly inflected, that is, oriented toward the same locus, in order to indicate that they share an argument.

This measure of *agreement* was devised to take into account the use and context of many of the inflections. The counts of general inflections above does not take their contexts into consideration. In those measures, any inflection produced would be counted, even if it were not consistent with other inflections used in the in the sentence. In the present measure of *agreement* we look at a "correct" use of inflections to maintain reference across the discourse and indicate the relationships between different words.

This use of inflections seems established in the target version of the language today; for this reason I include it as the closest thing we have to a "correct" use of an inflection.

4.2.2.4. Verb phrase complexity

A final measure of grammatical complexity is the number of arguments per verb. Verbs in Nicaraguan signing overwhelmingly take only a single explicit argument, generally the object or indirect object. It is possible that the syntactic structure needed for a verb to support more than one overt argument has only recently appeared in Nicaraguan signing (Senghas, Kegl, Senghas, and Coppola, 1994; Kegl, Senghas, and Coppola, 1995).

Verbs' subjects and/or objects can be articulated in any of three different ways. Some are simply stated as a noun. Some are indicated with an inflectional feature, generally one of the indicators of spatial inflection described above, such as a pointing motion following the verb, or a directional orientation of the verb that associates it with a previously established referent. Some are indicated through a means (which may be unique to Nicaraguan signing) of using the stem of another verb which has been previously associated with the intended referent. To produce this form, a verb is truncated to its uninflected stem form and used later in the narrative in a nounlike way to refer to its argument (this construction is described in more detail in Chapter Six and in Senghas, 1994).

Simple verbs with no explicit arguments are clearly acceptable in Nicaraguan signing, as are single-argument verbs. In fact, these are the most common forms. However, if we consider that verb phrases with multiple

arguments are more complex than verb phrases with one or no arguments, we can look at the number of arguments per verb, and the proportion of verbs that have multiple arguments expressed, as measures of the verbal complexity of a segment of signing.

4.3. Predictions

If younger children are indeed better able to learn such grammatical forms, we should find that, Year of Entry being held constant, signers with a lower Age at Entry should show more fluency and more use of the complex forms than signers with an older Age at Entry. Furthermore, if the language is indeed becoming richer over time, signers with a later Year of Entry should have been surrounded by richer signing as they were learning the language, and should therefore show more use of the complex constructions than signers who were exposed to an earlier form of the language. Finally, if it is the children who are enriching the language, it is they who should show the effect of Year of Entry. That is, signers who were exposed at both a young age and in recent years should show more arguments per verb than signers who were older and signers who were exposed to an earlier form of the language. They should also use more inflectional marking, and more of their inflected forms should exhibit agreement across the discourse.

4.4. Method

4.4.1. Subjects

The subjects of the present study are 25 deaf Nicaraguan signers whose ages at the time of testing ranged from 7;6 to 31;11, with a mean of 21;1. Their Age at Entry ranges from birth to 27;5, with a mean of 9;10. Their Year of Entry ranges from 1977 to 1990, with a median at 1983. The subjects were

drawn from the subjects who participated in Study One. (Five of the subjects from Study One did not participate in Study Two because we did not have information on their Age at Entry and Year of Entry.)

4.4.2. Materials

The stimulus consisted of one of the animated cartoons used from Study One, "Mr. Koumal Battles his Conscience" (Studio Animovaného Filmu, 1973). This cartoon was selected because it tends to elicit a high number of coreference markers and verb agreement inflections.

4.4.3. Procedure

The procedure used was identical to that of Study One, with the exception that all of the segments analyzed were taken from the second half of the "Mr. Koumal Battles his Conscience" narratives. This segment involves several different characters who have all been previously established in the narrative, and is therefore a particularly rich segment for eliciting verbal agreement markers.

4.4.4. Coding

For each narrative, the total signing time, the total number of morphemes, the total number of signs, and the total number of verbs produced was noted. Each sign was coded with respect to the use of markers of verbal inflection, verbal agreement, and verb phrase complexity. The inflectional markers coded included position/location inflection, person inflection, shoulder shifts, and aspectual markers, as well as a composite measure of the total number of inflections on the verb. The agreement markers coded included position/location agreement, and person agreement, as well as a composite measure of the total number of agreement markers on the verb. The measures of verb phrase complexity coded included the number of arguments per verb, and the proportion of verbs exhibiting

multiple arguments. Note that all of these proportions were computed with respect to the total number of verbs in the narrative (as opposed to the total number of signs used in Study One).

The narratives were coded by the author, who had four years of experience with Nicaraguan signing, and a native signer of ASL who had one year of experience with Nicaraguan signing. We coded the first six narratives together, resolving the coding of any signs on which we initially disagreed. By the sixth narrative, consistency was near perfect, and the author completed the remaining narratives alone. Each narrative took approximately 4.2 hours to code.

The Age at Entry and Year at Entry are not as apparent from the videotapes of the signers as Age Group was in the previous study. Nevertheless, the coders were familiar with some of the subjects and were therefore not entirely blind with respect to the Age at Entry and Year at Entry of each signer.

4.4.5. Analyses

In a series of analyses, I then compared the prevalence of each of the measures of interest with respect to the signers' Age at Entry and Year of Entry. I conducted a multiple regression on each factor, with Age at Entry and Year of Entry as regressors. I also conducted a series of analyses of variance (ANOVAs) and t-tests, for which subjects were grouped by Age at Entry and Year of Entry. They were divided into three groups with respect to Age at Entry: *young* (0;0 - 6;6, n = 8), *medium* (6;7 - 10;0, n = 8), and *old* (10;1 - 27;5, n = 9). They were divided into two groups with respect to year of entry: *before*

1983 (n = 13) and *1983 or later* (n = 12). Table 1 below gives the number of subjects in each cell with respect to Age at Entry and Year at Entry. (Note that these groupings were used only for the ANOVAs and t-tests; the continuous variables were used in the regressions).

Table 1: Subjects by Age at Entry and Year of Entry

	Year of Entry		
Age at Entry	Before 1983	1983 or Later	*Total*
young	5	3	8
medium	5	3	8
old	3	6	9
Total	13	12	25

4.5. Results

In order to evaluate the effects of Age at Entry and Year of Entry on the prevalence of each of the constructions discussed above, an Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on each of the measures. The results of these ANOVAs are summarized in Table 2, and are described in more detail in each of the sections below, along with the other analyses. In order to examine how Year of Entry affects each Age at Entry group, a t-test was also performed on each Age at Entry group for each of the measures. The results of these t-tests are presented in Table 3.

4.5.1. General measures of fluency

4.5.1.1. Morphemes per minute

As a general measure of signing density, the total number of morphemes produced was summed for each signer. This included the basic stems, the spatial and number inflections, and the classifiers and specifiers.

Table 2: Study Two — Summary of ANOVA Results

Measures	Year of Entry: Before 1983, Age at Entry: *young* (n=5)	Before 1983, *medium* (n=5)	Before 1983, *old* (n=3)	Before 1983, Mean (n=13)	1983 or Later, *young* (n=3)	1983 or later, *medium* (n=3)	1983 or later, *old* (n=6)	1983 or later, Mean (n=12)	Results: Age at Entry F	Age at Entry *p*	Year of Entry F	Year of Entry *p*	Age x Year of Entry F	Age x Year of Entry *p*
Morphemes per Minute	209.20	206.94	132.30	190.58	350.63	294.63	133.63	228.13	10.76	.0008***	7.71	.012*	2.21	.137
Morphemes per Sign	3.28	3.08	2.64	3.06	4.40	3.86	2.40	3.26	6.77	.006**	3.28	.086	1.83	.187
Position/Location Infl.	.47	.42	.29	.41	.69	.55	.21	.41	6.87	.006**	1.35	.259	1.39	.275
Person Inflection	.70	.47	.22	.50	.88	.92	.22	.56	10.91	.0007***	3.76	.068	1.45	.260
Aspectual Inflection	.46	.24	.28	.33	.79	.68	.18	.46	7.09	.005**	6.74	.018*	3.62	.047*
Total Inflection	2.05	1.67	1.21	1.71	2.83	2.81	1.03	1.93	10.26	.001***	4.99	.038*	2.31	.126
Position/Location Agrmt.	.27	.22	.12	.22	.48	.43	.13	.29	5.97	.010**	5.20	.034*	1.18	.328
Person Agreement	.49	.34	.14	.35	.77	.71	.17	.45	9.74	.001***	5.82	.026*	1.25	.308
Total Agreement	.81	.69	.36	.66	1.40	1.45	.46	.94	8.18	.003**	9.11	.007**	1.52	.245
Arguments Indicated	.93	.70	.33	.70	1.25	1.23	.63	.93	6.29	.008**	6.47	.020*	.23	.795
Multiply-Inflected Verbs	.15	.10	.03	.10	.33	.30	.10	.21	3.77	.042*	7.49	.013*	.53	.597
Shoulder Shift	.57	.43	.28	.45	.84	.48	.25	.46	7.03	.005**	1.00	.331	.89	.428

Table 3: Study Two — t-Test Results

Measures	Age at Entry	Year of Entry: *Before 1983*	Year of Entry: *1983 or Later*	Results: t	Results: *p*+
Morphemes per Minute	*young*	209.20	350.63	-3.88	.004**
	medium	206.94	294.63	-1.25	.128
	old	132.30	133.63	-.04	.484
Morphemes per Sign	***young***	**3.28**	**.4.40**	**-3.13**	**.010***
	medium	**3.08**	**3.86**	**-1.38**	**.109**
	old	**2.64**	**2.40**	**.40**	**.351**
Position/Location Infl.	*young*	.47	.69	-2.19	.036*
	medium	.42	.55	-.99	.181
	old	.29	.21	.54	.304
Person Inflection	***young***	**.70**	**.88**	**-.95**	**.189**
	medium	**.47**	**.92**	**-2.38**	**.027***
	old	**.22**	**.22**	**-.02**	**.493**
Aspectual Inflection	*young*	.46	.79	-2.66	.019*
	medium	.24	.68	-2.35	.029*
	old	.28	.17	.71	.250
Total Inflection	***young***	**2.05**	**2.83**	**-1.95**	**.050***
	medium	**1.67**	**2.81**	**-2.40**	**.027***
	old	**1.21**	**1.03**	**.37**	**.361**
Position/Location Agrmt.	*young*	.27	.48	-2.62	.020*
	medium	.22	.43	-1.86	.056
	old	.12	.13	-.07	.474
Person Agreement	***young***	**.49**	**.77**	**-1.67**	**.073**
	medium	**.34**	**.71**	**-2.24**	**.033***
	old	**.14**	**.17**	**-.17**	**.437**
Total Agreement	*young*	.81	1.40	-2.31	.030*
	medium	.69	1.45	-2.73	.017*
	old	.36	.46	-.35	.367
Arguments Indicated	***young***	**.93**	**1.25**	**-1.35**	**.113**
	medium	**.70**	**1.23**	**-3.30**	**.008****
	old	**.33**	**.63**	**-.91**	**.197**
Multiply-Inflected Verbs	*young*	.15	.33	-2.32	.030*
	medium	.10	.30	-3.37	.008**
	old	.03	.10	-.57	.294
Shoulder Shift	***young***	**.57**	**.84**	**-1.66**	**.074**
	medium	**.43**	**.48**	**-.36**	**.366**
	old	**.28**	**.25**	**.16**	**.440**

+ one-tailed

With this total the number of morphemes produced per minute was computed for each signer. I predicted that signers with a lower Age at Entry and signers with a later Year of Entry would produce more morphemes per minute than signers who were older and signers who entered the community in earlier years.

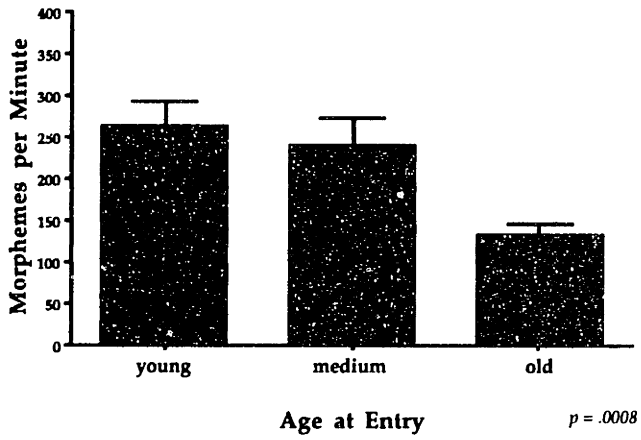
A multiple regression was performed on morphemes per minute, with Age at Entry and Year of Entry as the independent variables. As predicted, Age at Entry significantly predicts morphemes per minute, such that the younger the Age at Entry, the greater the number of morphemes per minute (p = .0001). Year of Entry also significantly predicts morphemes per minute, such that the later the Year of Entry, the greater the number of morphemes per minute (p = .004). The two variables together accounted for 56% of the variance in morphemes per minute (p = .0001).

Due to the circumstances of the formation of the community in the schools, very few people entered the community at a older age in its early stages. For this reason there is a small correlation of .24 between Age at Entry and Year of Entry (p = .01). The strong results of the independent variables in the regression reassure us that the two continuous variables nevertheless have strong, independent effects in the predicted directions.

In order to examine how the effect of Year differs by Age group, an Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of morphemes per minute. This analysis revealed a main

effect for Age at Entry, F (2, 19) = 10.76, p = .0008. The mean morphemes per minute for each Age at Entry group is presented in Figure 10.

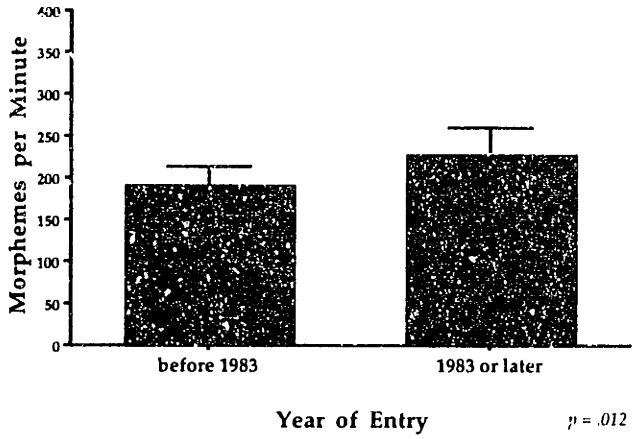
Figure 10: Morphemes per Minute by Age at Entry



Post-hoc comparisons revealed that subjects who began signing at a *young* age used nearly twice as many morphemes per minute (M = 262) as subjects in the *old* Age at Entry group (M = 133), p = .0008, Fisher PLSD. Subjects in the *medium* Age at Entry group also produced more morphemes per minute (M = 240) than subjects in the *old* Age at Entry group, p = .004, Fisher PLSD. There was no difference detected between the *young* and *medium* Age at Entry groups, p = .51.

The ANOVA also revealed a main effect for Year of Entry, F (1, 19) = 7.71, p = .012. The mean morphemes per minute for each Year of Entry group is presented in Figure 11.

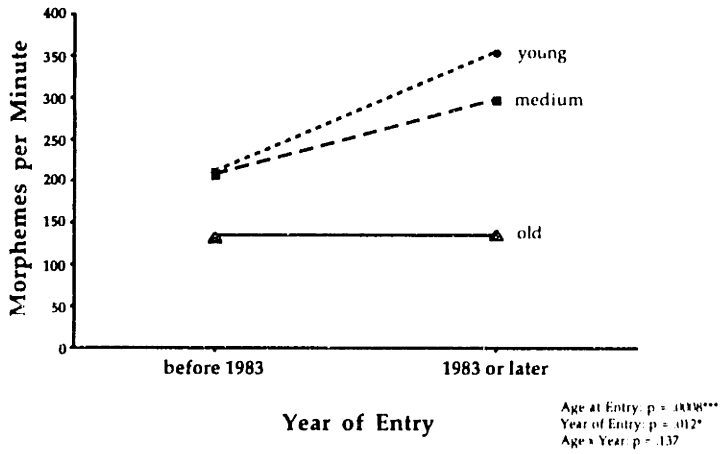
Figure 11: Morphemes per Minute by Year of Entry



Subjects who entered the signing community in 1983 or later produced more morphemes in a minute (M = 228) than subjects who entered the community before 1983 (M = 191).

The combination of the two factors is presented in Figure 12.

Figure 12: Morphemes per Minute by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented as the positive slope of the lines. Although there was no interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry has a significant effect in only the *young* Age at Entry group, t (6) = -3.88, p = .004, one-tailed.

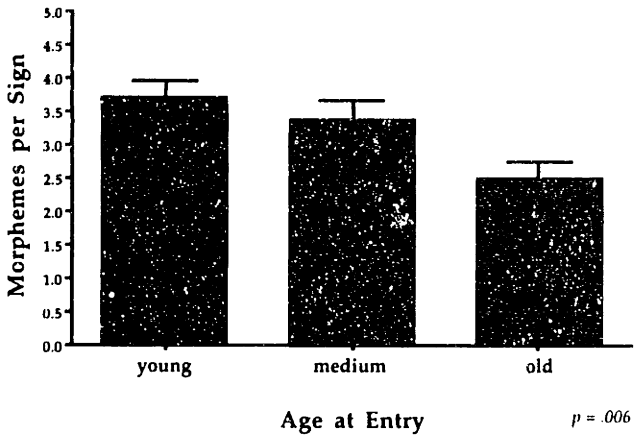
4.5.1.2. Morphemes per sign

As a general measure of average sign complexity, I took the total number of morphemes in each narrative and computed the number of morphemes per sign. Each sign stem counts as a morpheme, as do each of the inflections added onto the sign. A signer who produces a string of uninflected signs would therefore score a 1 on this measure; signers who produce more complex, multiply-inflected signs would score higher. I predicted that signers with a lower Age at Entry and signers with a later Year of Entry would produce more morphemes per sign than signers who were older when they entered the community and those who entered the community at an earlier date.

A multiple regression was performed on morphemes per sign, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts morphemes per sign, such that the younger the Age at Entry, the greater the number of morphemes per sign (p = .0001). Year of Entry also significantly predicts morphemes per sign, such that the later the Year of Entry, the greater the number of morphemes per sign (p = .017). The two variables together accounted for 56% of the variance in morphemes per sign (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of morphemes per sign. This analysis revealed a main effect for Age at Entry, $F(2, 19) = 6.77$, $p = .006$. The mean morphemes per sign for each Age at Entry group is presented in Figure 13.

Figure 13: Morphemes per Sign by Age at Entry

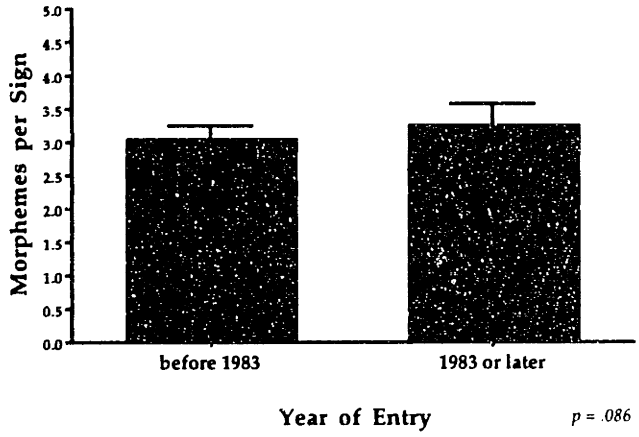


Post-hoc comparisons revealed that those subjects who began signing at a *young* age included more morphemes per sign (M = 3.70) than those who began signing at an *old* age (M = 2.48), $p = .003$, Fisher PLSD. Subjects in the *medium* Age at Entry group also produced more morphemes per sign (M = 3.38) than subjects in the *old* group, $p = .02$, Fisher PLSD. There was no difference detected between the *young* and *medium* Age at Entry groups, $p = .39$.

The ANOVA also showed that those who entered after 1983 had a slightly higher mean incidence of morphemes per sign (M = 3.3) than those

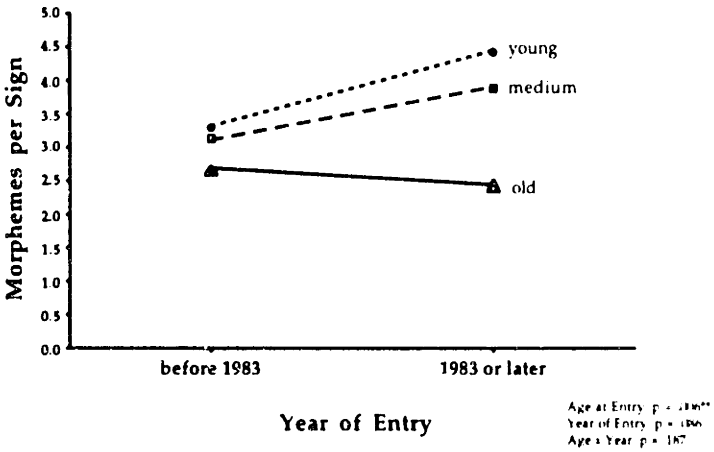
who entered before 1983 (M = 3.06). This difference was not found to be statistically significant, although the trend is in the expected direction, F (1,19) = 3.28, p = .086. The mean morphemes per sign for each Year of Entry group is presented in Figure 14.

Figure 14: Morphemes per Sign by Year of Entry



The combination of the two factors is presented in Figure 15.

Figure 15: Morphemes per Sign by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry has a significant effect in only the *young* Age at Entry group, $t(6) = -3.13$, $p = .01$, one-tailed.

4.5.2. Verbal Inflection

4.5.2.1. Position/location inflection

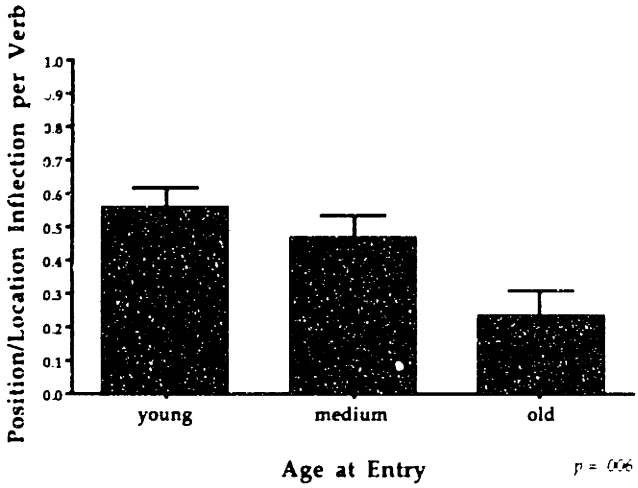
Signs that were inflected with a spatial inflection that included an indication of the position or location (that was not a person inflection) were counted as examples of position/location inflection. The proportion of signs that were inflected for position or location was computed for each narrative. I predicted that signers with a lower Age at Entry and signers with a later Year of Entry would use position and location inflections more often than signers who were older when they entered the community and those who entered the community at an earlier date.

A multiple regression was performed on the number of position/location inflections per verb, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts position/location inflection, such that the younger the Age at Entry, the greater the number of position/location inflections per verb ($p = .0001$). Year of Entry also significantly predicts position/location inflection, such that the later the Year of Entry, the greater the number of position/location inflections

per verb (p = .007). The two variables together accounted for 59% of the variance in position/location inflections per verb (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of position/location inflections per verb. This analysis revealed a main effect for Age at Entry, F (2, 19) = 6.87, p = .006. The mean position/location inflections per verb for each Age at Entry group is presented in Figure 16.

Figure 16: Position/Location Inflection by Age at Entry

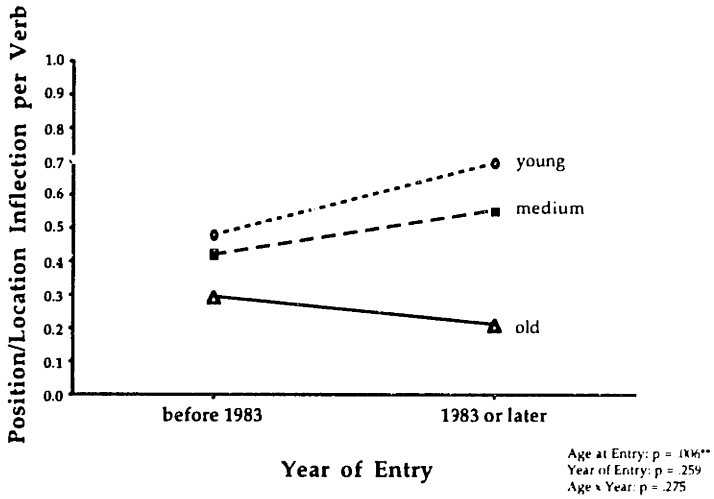


Signers who entered the community at a relatively early age had the greatest proportion of position/location inflected verbs (M = .555), followed by signers in the *medium* Age at Entry group (M = .465), and then signers in the *old* Age at Entry group (M = .236). Post-hoc analyses revealed that the *young* and *old* Age at Entry groups differed significantly, p = .002, Fisher PLSD. The *medium* and *old* Age at Entry groups also differed significantly, p = .02, Fisher

PLSD. There was no difference detected between the *young* and *medium* Age at Entry signers, $p = .33$.

The mean number of position/location inflections per verb was not found to differ significantly by Year of Entry, with the two groups having equal means (M = .41). The combination of the two factors is presented in Figure 17.

Figure 17: Position/Location Inflection by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry has a significant effect in only the *young* Age at Entry group, t (6) = -2.19, $p = .036$, one-tailed.

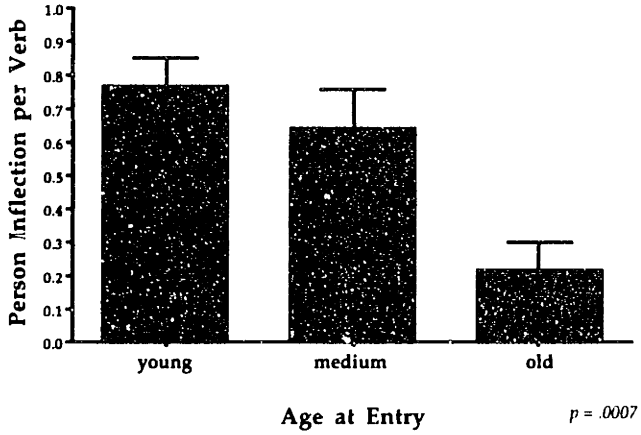
4.5.2.2. *Person inflection*

Signs that were inflected for person to indicate subject, direct object, or indirect object were counted, and the proportion of signs that exhibited person inflection was computed for each signer. I expected that signers with a lower Age at Entry and signers with a later Year of Entry would show a higher proportion of person inflections than signers who were older when they entered the community and those who entered the community at an earlier date.

A multiple regression was performed on the incidence of person inflection per verb, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts person inflection, such that the younger the Age at Entry, the greater the number of person inflections per verb (p = .0001). Year of Entry also significantly predicts person inflection, such that the later the Year of Entry, the greater the number of person inflections per verb (p = .04). The two variables together accounted for 54% of the variance (p = .0002).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of person inflections per verb. This analysis revealed a main effect for Age at Entry, $F(2, 19) = 10.9$, p = .0007. The mean person inflections per verb for each Age at Entry group is presented in Figure 18.

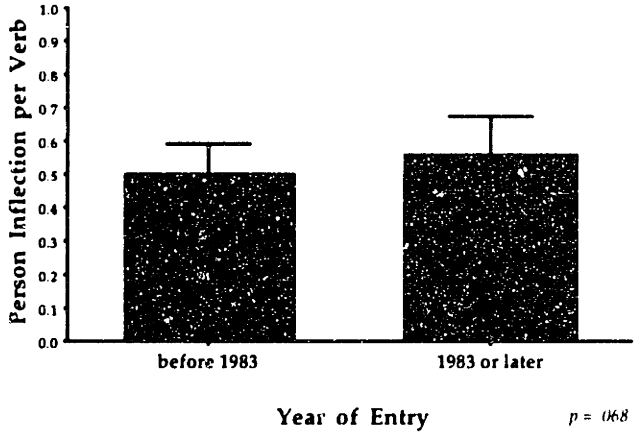
Figure 18: Person Inflection by Age at Entry



Signers who entered the community at a relatively *young* age produced more than three times the proportion of person-inflected verbs (M = .766) as signers in the *old* Age at Entry group (M = .219), p = .0004, Fisher PLSD. Signers in the *medium* Age at Entry group produced more than twice the proportion of person-inflected verbs (M = .642) as signers in the *old* Age at Entry group. p = .003, Fisher PLSD. There was no difference detected between the *young* and *medium* age at Entry groups, p = .35.

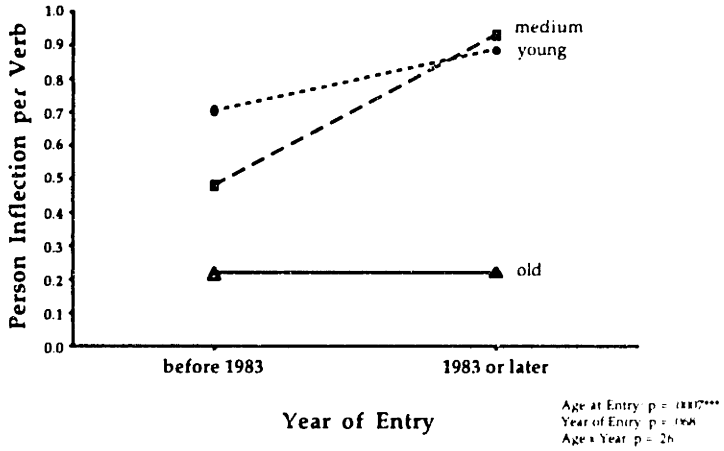
Signers who entered the community before 1983 had slightly fewer person-inflected verbs (M = .50) than signers who entered later (M = .56). This trend was in the expected direction, F (1,19) = 3.76, p = .068. The means for each Year of Entry group are presented in Figure 19.

Figure 19: Person Inflection by Year of Entry



The combination of the two factors is presented in Figure 20.

Figure 20: Person Inflection by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry

factors, the Year of Entry has a significant effect in only the *medium* Age at Entry group, t (6) = -2.38, p = .027, one-tailed.

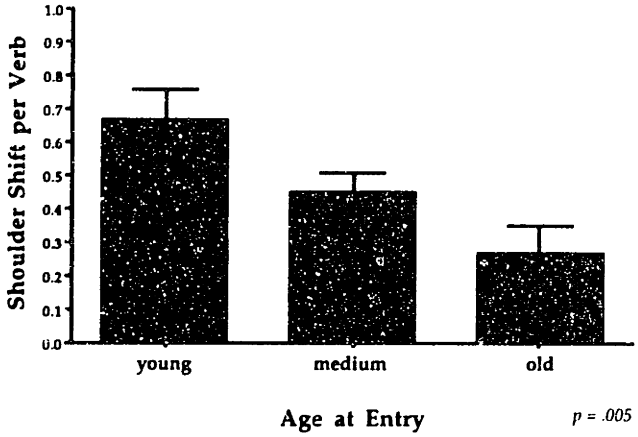
4.5.2.3. Shoulder shift

Signs that included a shift of the shoulders toward a locus in order to indicate the argument (generally the subject) of a verb were counted as exhibiting shoulder shift. I predicted that signers with a lower Age at Entry and signers with a later Year of Entry would use shoulder shifts to indicate the argument of the verb more often than signers who were older when they entered the community and those who entered the community at an earlier date.

A multiple regression was performed on the number of shoulder shifts per verb with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts shoulder shift, such that the younger the Age at Entry, the greater the number of shoulder shifts per verb (p = .0001). Year of Entry also significantly predicts shoulder shift, such that the later the Year of Entry, the greater the number of shoulder shifts per verb (p = .027). The two variables together accounted for 58% of the variance (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of shoulder shifts per verb. This analysis revealed a main effect for Age at Entry, F (2, 19) = 7.03 p = .005. The mean shoulder shifts per verb for each Age at Entry group is presented in Figure 21.

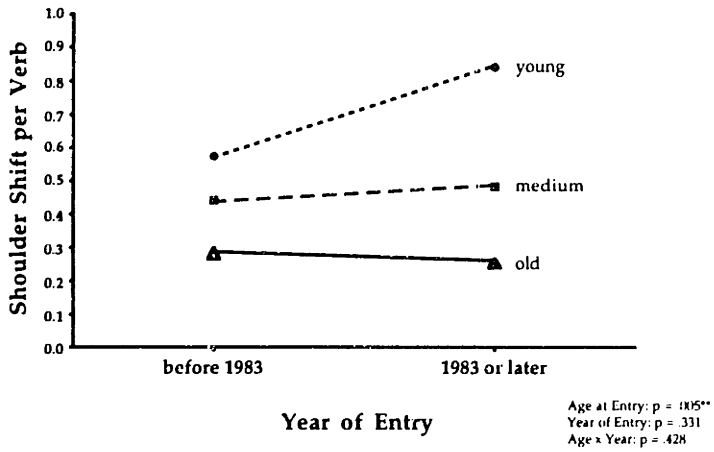
Figure 21: Shoulder Shift by Age at Entry



Post-hoc comparisons revealed that signers who entered the community at a *young* age had more than twice the proportion of shoulder shifts per verb (M = .669) than signers in the *old* Age of Entry group (M = .263), p = .002, Fisher PLSD. A comparison of the young and medium (M = .451) Age at Entry signers reveals a trend in the expected direction, p = .07, Fisher PLSD. There was no difference detected between the *old* and *medium* Age of Entry groups, p = .11.

There was no effect of Year of Entry on the number of shoulder shifts per verb, with the means of the two groups practically equal (before 1983, M = .45; 1983 or later, M = .46). The combination of the two factors is presented in Figure 22.

Figure 22 Shoulder Shift by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry approaches significance in only the *young* Age at Entry group, t (6) = -1.66, p = .074, one-tailed.

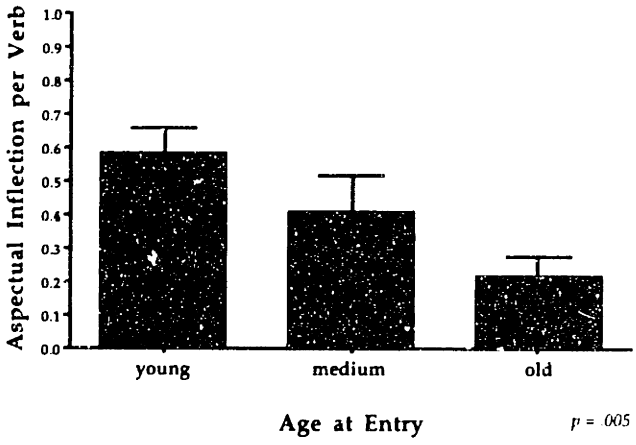
4.5.2.4. Aspectual inflection

Aspectual inflections include meanings such as *constantly*, *repeatedly*, or *randomly*, that tend to be expressed with adverbs and prepositional phrases in English. In Nicaraguan signing, aspect, like other verbal inflections, is often incorporated into the movement of the verb. I predicted that signers with a lower Age at Entry and signers with a later Year of Entry would use aspectual markers more often than signers who were older when they entered the community and those who entered the community at an earlier date.

A multiple regression was performed on aspectual inflections per verb with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts use of aspectual inflection, such that the younger the Age at Entry, the greater the number of aspectual inflections per verb (p = .0001). Year of Entry also significantly predicts aspectual inflection, such that the later the Year of Entry, the greater the number of aspectual inflections per verb (p = .003). The two variables together accounted for 56% of the variance (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of aspectual inflections per verb. This analysis revealed a main effect for Age at Entry, F (2, 19) = 7.09, p = .005. The mean aspectual inflections per verb for each Age at Entry group is presented in Figure 23.

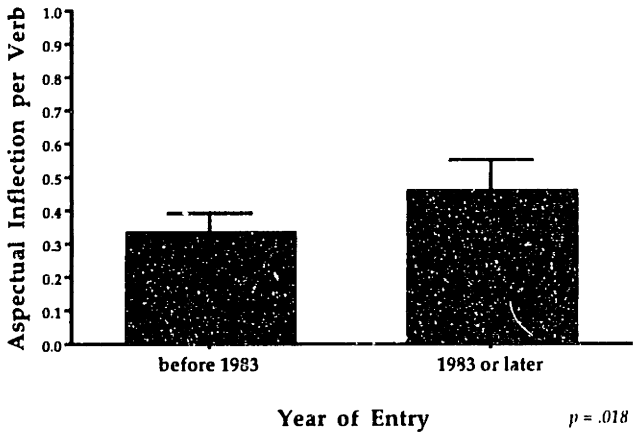
Figure 23: Aspectual Inflection by Age at Entry



Post-hoc analyses revealed that signers who entered the community at a *young* age had more than twice the proportion of aspect-inflected verbs (M = .580) than signers in the *old* Age at Entry group (M = .213), $p = .002$, Fisher PLSD. The difference between the signers in the *medium* Age at Entry group (M = .405) the *old* Age at Entry group also approached significance, $p = .07$, Fisher PLSD. There was no difference detected between the young and medium Age at Entry groups, $p = .11$.

The ANOVA also revealed a main effect for Year of Entry. The means for each Year of Entry group are presented in Figure 24.

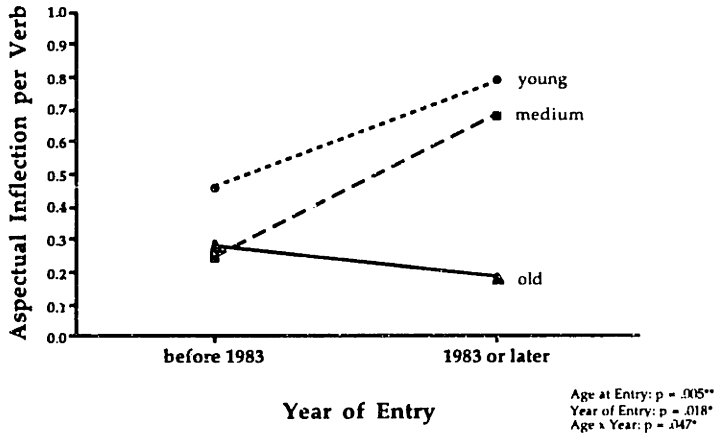
Figure 24: Aspectual Inflection by Year of Entry



Signers who entered the community before 1983 had significantly fewer aspectual inflections per verb (M = .332) than signers who entered later (M = .457), F (1,19) = 6.7, $p = .018$.

The combination of the two factors is presented in Figure 25.

Figure 25: Aspectual Inflection by Age and Year



A significant interaction between the two factors was found, $F(2,19) = 3.6$, $p = .047$. The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group, and the effect of Year of Entry is represented by the different slopes of the lines. Signers who entered the community in 1983 or later at a *young* or *medium* age show more aspectual inflections than those who entered the community before 1983. However, signers who entered the community in 1983 or later at an *old* Age at Entry show *fewer* aspectual inflections than those who entered the community before 1983. The younger signers are able to take advantage of the increased richness of the language (or perhaps create this richness) in a way that the older signers cannot.

4.5.2.5. Total inflections per verb

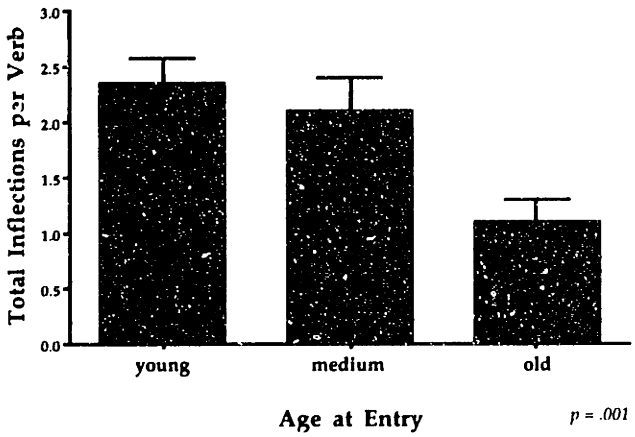
The total number of inflections was tabulated for each verb, including number inflection, person inflection, position or orientation inflection, and aspectual markers. The mean number of inflections per verb was computed

for each narrative. This proportion was examined with respect to the Age at Entry and the Year of Entry of each signer.

A multiple regression was performed on the ratio of total inflections per verb, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts the overall use of inflections, such that the younger the Age at Entry, the greater the total number of inflections per verb (p = .0001). Year of Entry also significantly predicts overall inflection use, such that the later the Year of Entry, the greater the number of inflections per verb (p = .0045). The two variables together accounted for 58% of the variance (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of inflections per verb. This analysis revealed a main effect for Age at Entry, $F(2, 19) = 10.26$, p = .001. The mean number of inflections per verb for each Age at Entry group are presented in Figure 26.

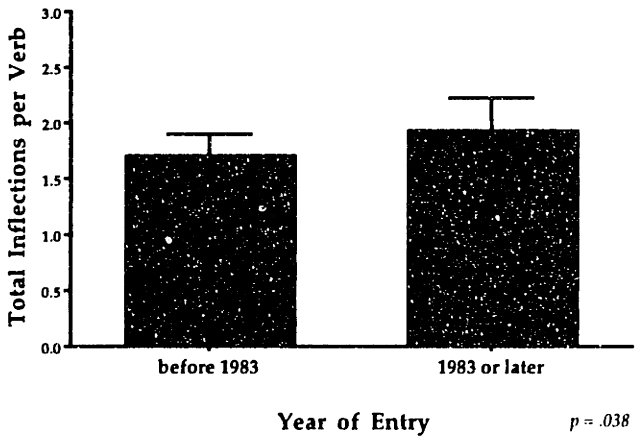
Figure 26: Total Inflections by Age at Entry



Post-hoc comparisons reveal that signers in the *young* Age of Entry group used more than twice as many inflections per verb (M = 2.34) as signers in the *old* Age at Entry group (M = 1.09), p = .0006, Fisher PLSD. Signers in the *medium* Age at Entry group also used nearly twice as many inflections per verb (M = 2.10) as subjects who began signing at an *old* age, p = .003, Fisher PLSD. There was no difference detected between the *young* and *medium* Age at Entry groups, p = .44.

The ANOVA also revealed a main effect for Year of Entry, F(1, 19) = 4.99, p = .038. The means for each Year of Entry group are presented in Figure 27.

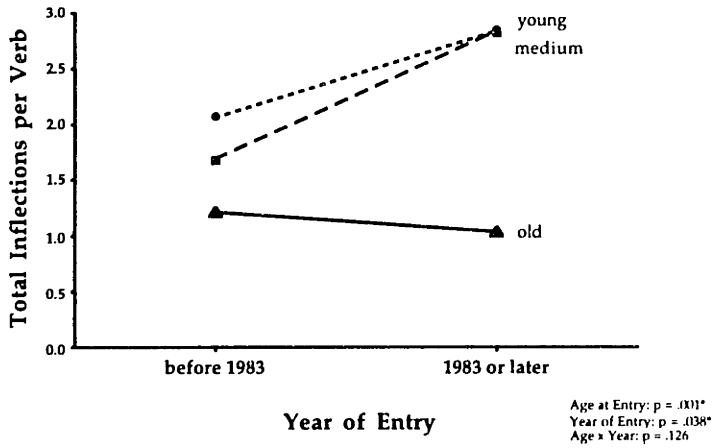
Figure 27: Total Inflections by Year of Entry



Subjects who entered the signing community in 1983 or later used more inflections per verb (M = 1.93) than subjects who entered the community before 1983 (M = 1.71).

The combination of the factors is presented in Figure 28.

Figure 28: Total Inflections by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry has a significant effect in only the *young* Age At Entry group, t (6) = -1.95, p = .049, one-tailed, and the *medium* Age at Entry group, t (6) = -2.40, p = .027, one-tailed. Only young and medium-aged learners take advantage of the richer use of inflection that has surrounded those who have learned the sign language in recent years.

4.5.3. Verbal agreement

4.5.3.1. Position/location agreement

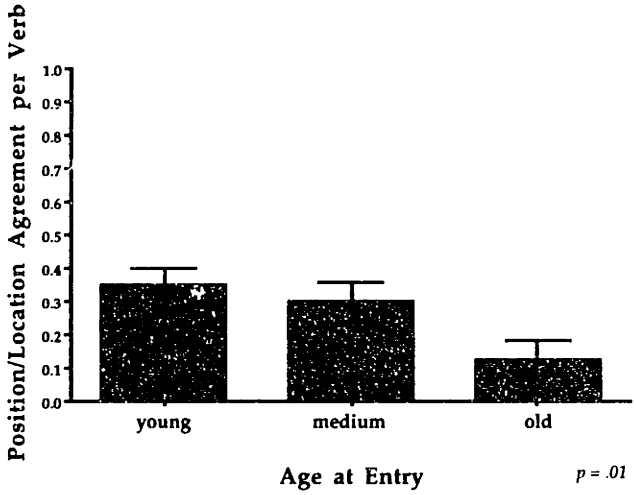
Signs with inflections indicating agreement in position or location with a previous sign in order to co-index them were coded as exhibiting

position/location agreement. The mean number of position/location agreements per verb was computed for each narrative. I expected that signers with a lower Age at Entry and signers with a later Year of Entry would show a higher proportion of verbs that showed position/location agreement than signers who were older when they entered the community and those who entered the community at an earlier date.

A multiple regression was performed on the incidence of position/location agreement per verb, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts position/location agreement, such that the younger the Age at Entry, the greater the number of position/location agreements per verb (p = .0001). Year of Entry also significantly predicts position/location agreement, such that the later the Year of Entry, the greater the number of position/location agreements per verb (p = .0005). The two variables together accounted for 62% of the variance (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of position-location agreements per verb. This analysis revealed a main effect for Age at Entry, $F(2, 19) = 5.966$, p = .01. The mean proportion of position/location agreements per verb for each Age at Entry group is presented in Figure 29.

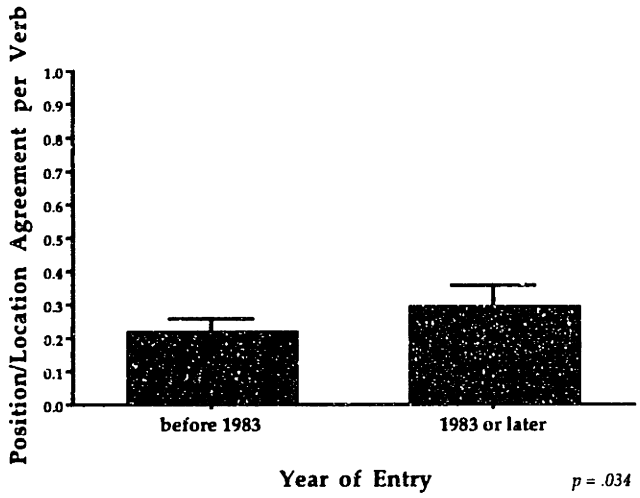
Figure 29: Position/Location Agreement by Age at Entry



Post-hoc comparisons revealed that subjects who began signing at a *young* age used more than twice the proportion of position/location agreements per verb (M = .347) as subjects in the *old* Age at Entry group (M = .126), p = .007, Fisher PLSD. Subjects in the *medium* Age at Entry group also produced more than twice the proportion of position/location agreements per verb (M = .297) as subjects in the *old* Age at Entry group, p = .03, Fisher PLSD. There was no difference detected between the *young* and *medium* Age at Entry groups, p = .52.

The ANOVA also revealed a main effect for Age at Entry. The means for each Year of Entry group are presented in Figure 30.

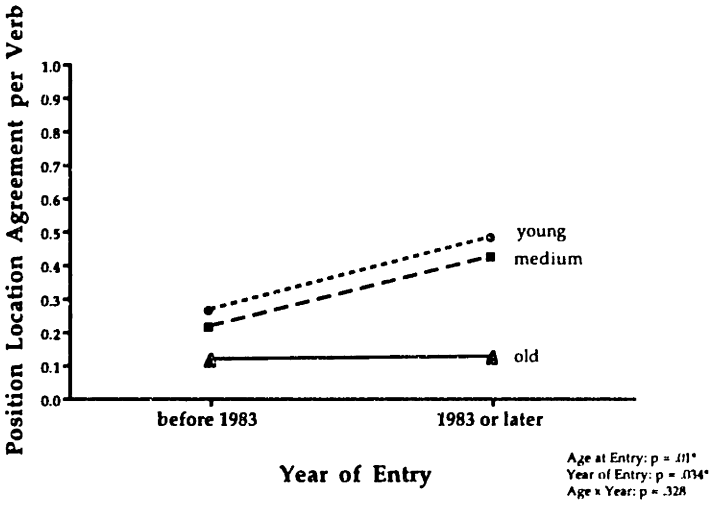
Figure 30: Position/Location Agreement by Year of Entry



Signers who entered the community before 1983 had fewer position/location agreements per verb (M = .215) than signers who entered later (M = .292), $F(1,19) = 5.2$, $p = .034$.

The combination of the two factors is presented in Figure 31.

Figure 31: Position/Location Agreement by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry has a significant effect in only the *young* Age At Entry group, t (6) = -2.62, p = .02, one-tailed, and a marginally significant effect in the *medium* Age at Entry group, t (6) = -1.86, p = .056, one-tailed. Only the young and medium-aged learners show an increased use of position and location agreement in recent years.

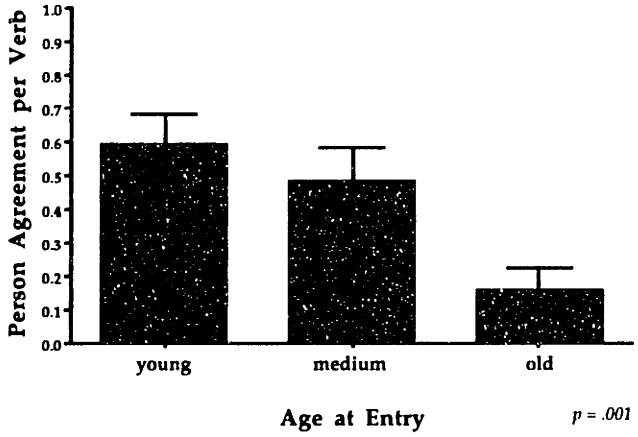
4.5.3.2. Person agreement

Signs with inflections indicating person that agreed with a previous sign in order to co-index them were coded as exhibiting person agreement. The mean number of person agreements per verb was computed for each narrative. I expected that signers with a lower Age at Entry and signers with a later Year of Entry would show a higher proportion of verbs that showed person agreement than signers who were older when they entered the community and those who entered the community at an earlier date.

A multiple regression was performed on person agreement per verb, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts person agreement, such that the younger the Age at Entry, the greater the number of person agreements per verb (p = .0001). Year of Entry also significantly predicts person agreement, such that the later the Year of Entry, the greater the number of person agreements per verb (p = .003). The two variables together accounted for 62% of the variance (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of person agreements per verb. This analysis revealed a main effect for Age at Entry, $F(2, 19) = 9.74$, $p = .001$. The mean ratio of person agreements per verb for each Age at Entry group is presented in Figure 32.

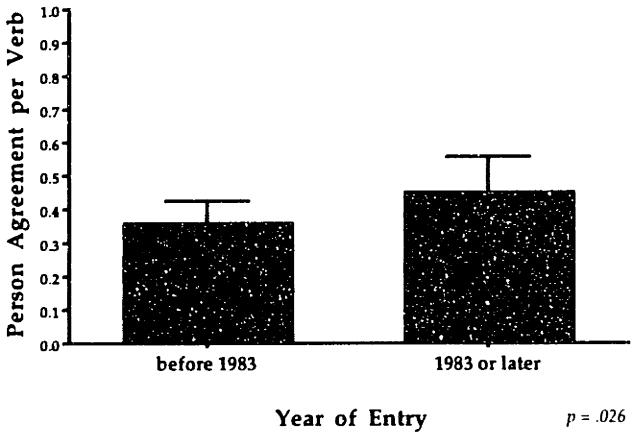
Figure 32: Person Agreement by Age at Entry



Post-hoc comparisons revealed that signers who entered the community at a *young* age produced more than three times the proportion of person-agreeing verbs (M = .593) as signers in the *old* Age at Entry group (M = .160), $p = .0008$, Fisher PLSD. Signers in the *medium* Age at Entry group also produced more than three times the proportion of person-agreeing verbs (M = .482) as signers in the *old* Age at Entry group, $p = .008$, Fisher PLSD. There was no difference detected between the *young* and *medium* Age at Entry groups, $p = .34$.

The ANOVA also revealed a main effect for Age at Entry. The means for each Year of Entry group are presented in Figure 33.

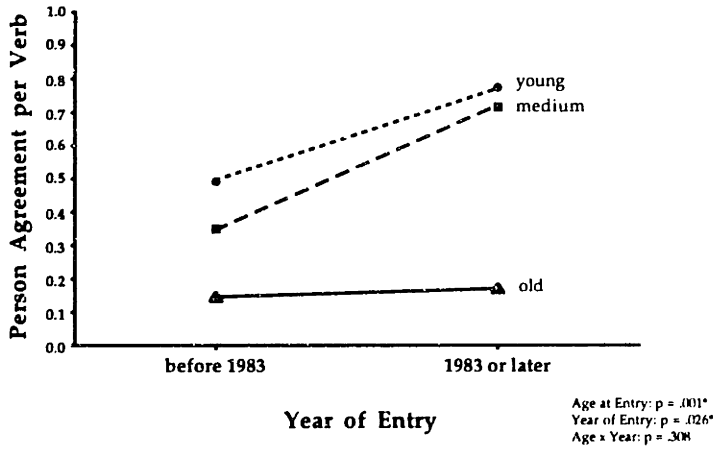
Figure 33: Person Agreement by Year of Entry



Signers who entered the community before 1983 had fewer person-agreeing verbs (M = .35) than signers who entered later (M = .45), $F(1,19) = 5.8$, $p = .026$.

The combination of the two factors is presented in Figure 34.

Figure 34: Person Agreement by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry has a significant effect in only the *young* Age At Entry group, t (6) = -2.24, p = .033, one-tailed, and approaches significance in the *medium* Age at Entry group, t (6) = -1.67, p = .073, one-tailed. No such effect is evident among the signers who entered the community at an *old* age.

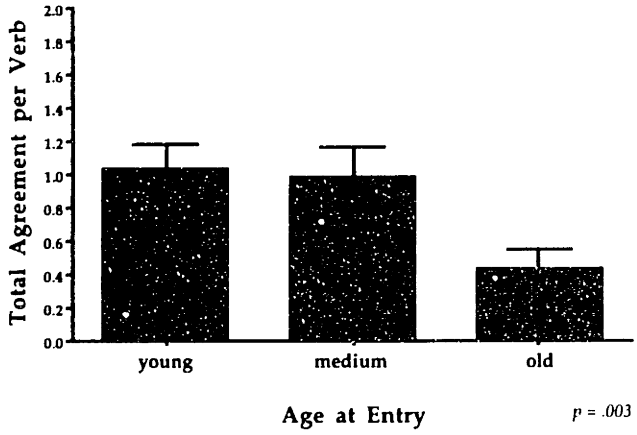
4.5.3.3. Total agreement per verb

Total agreement per verb is a composite measure that includes position/location agreement, person agreement, and number agreement (which had extremely low incidence in these narratives). The mean number of inflections showing agreement per verb was computed for each narrative. This proportion was examined with respect to the Age at Entry and the Year of Entry of each signer.

A multiple regression was performed on the ratio of verbs showing agreement, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts the overall use of agreement, such that the younger the Age at Entry, the higher the incidence of overall agreement per verb (p = .0001). Year of Entry also significantly predicts overall agreement, such that the later the Year of Entry, the greater the incidence of agreement per verb (p = .0004). The two variables together accounted for 57% of the variance (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of inflections showing agreement per verb. The analysis showed a main effect for Age at Entry, $F(2, 19) = 9.07$, p = .007. The means for each Age at Entry group are presented in Figure 35.

Figure 35: Total Agreement by Age at Entry

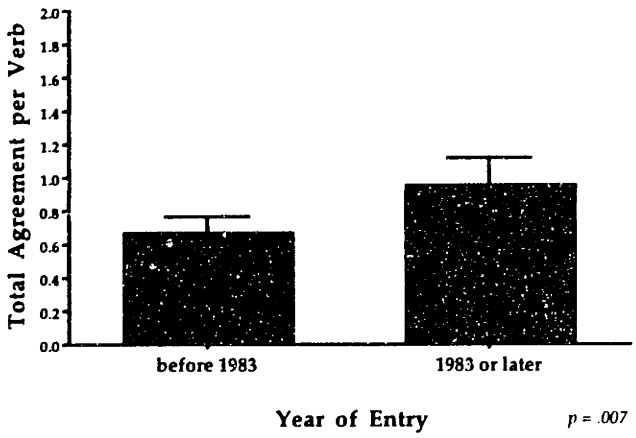


Post-hoc comparisons revealed that subjects who entered the community at a relatively *young* age used more than twice as many

inflections showing agreement per verb (M = 1.03) as subjects in the *old* Age at Entry group (M = .43), p = .004, Fisher PLSD. Subjects in the *medium* Age at Entry group also used more than twice as many inflections showing agreement per verb (M = .98) as subjects in the *old* Age at Entry group, p = .008, Fisher PLSD. There was no difference detected between the *young* and *medium* Age at Entry groups, p = .78.

The ANOVA also revealed a main effect for Year of Entry. The means for each Year of Entry group are presented in Figure 36.

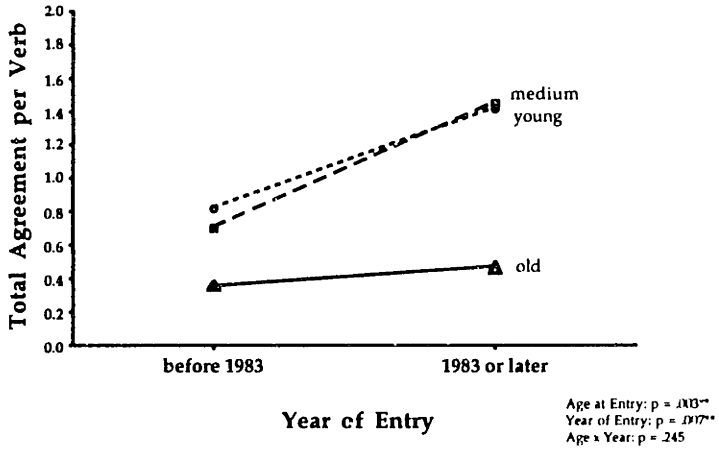
Figure 36: Total Agreement by Year of Entry



Subjects who entered the signing community in 1983 or later indicated more agreement per verb (M = .94) than subjects who entered the community before 1983 (M = .66), F (1, 19) = 8.17, p = .003.

The combination of the two factors is presented in Figure 37.

Figure 37: Total Agreement by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry has a significant effect detected in only the *young* Age At Entry group, t (6) = -2.31, p = .03, one-tailed, and the *medium* Age at Entry group, t (6) = -2.73, p = .017, one-tailed.

There is an increased use of grammatical agreement in signers who entered the community at a younger age, particularly among those who entered in recent years.

4.5.4. Verb phrase complexity

4.5.4.1. Arguments per verb

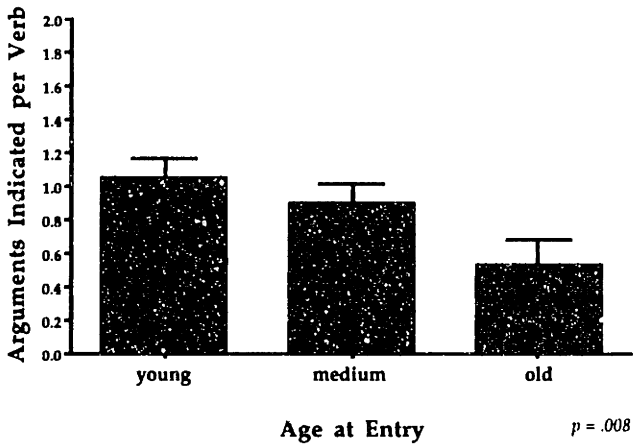
The number of explicit arguments indicated with each verb were noted. These arguments could be indicated by overt nouns, spatial inflections, or deverbal anaphors (described in Chapter Six). The number of

arguments per verb was computed for each narrative. I predicted that signers with a lower Age at Entry and signers with a later Year of Entry would indicate more arguments per verb than signers who were older when they entered the community and those who entered the community at an earlier date.

A multiple regression was performed on arguments per verb, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts arguments per verb, such that the younger the Age at Entry, the greater the number of arguments per verb (p = .0001). Year of Entry also significantly predicts arguments, such that the later the Year of Entry, the greater the number of arguments per verb (p = .0004). The two variables together accounted for 61% of the variance (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the number of arguments indicated per verb. This analysis revealed a main effect for Age at Entry, $F(2, 19) = 6.29$ p = .008. The mean number of arguments indicated per verb for each Age at Entry group is presented in Figure 38.

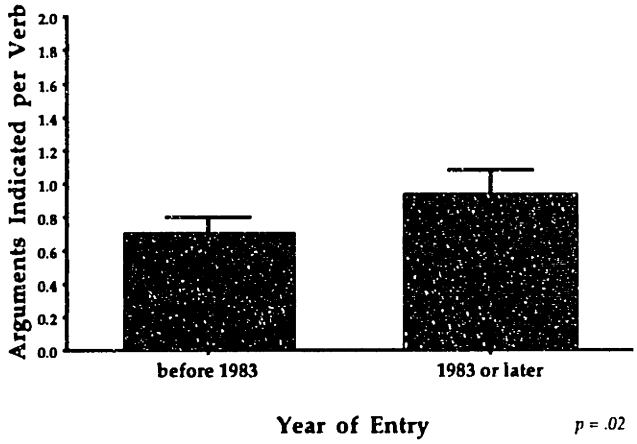
Figure 38: Arguments Indicated by Age at Entry



Post-hoc comparisons revealed that signers who entered the community at a relatively *young* age indicated nearly twice the number of arguments per verb (M = 1.05) as signers in the *old* Age at Entry group (M = .53), p = .008, Fisher PLSD. Those in the *medium* Age of Entry group also produced more arguments per verb (M = .90) than signers in the *old* Age at Entry group, p = .048, Fisher PLSD. There was no difference detected between the *young* and *medium* Age of Entry groups, p = .41.

The ANOVA also revealed a main effect for Year at Entry. The means for each Year of Entry group are presented in Figure 39.

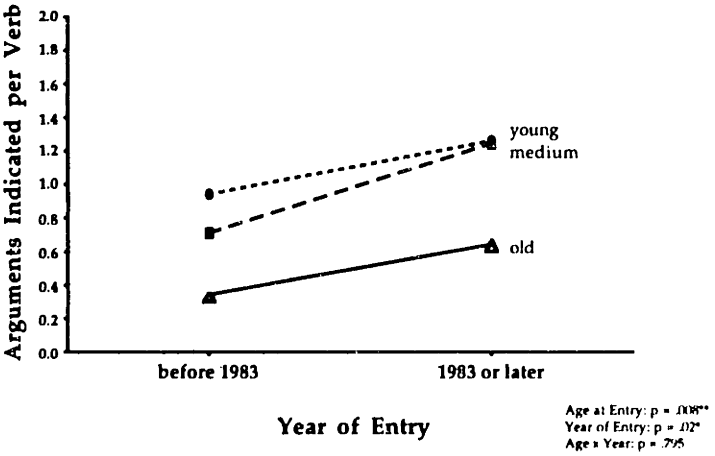
Figure 39: Arguments Indicated by Year of Entry



Signers who entered the community before 1983 indicated significantly fewer arguments per verb (M = .70) than those who entered later (M = .93), $F(1,19) = 6.47$, $p = .02$.

The combination of the two factors is presented in Figure 40.

Figure 40: Arguments Indicated by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although all three Age at Entry groups show a slight positive slope, when the groups were analyzed separately a significant effect of Year of Entry was detected in only the *medium* Age at Entry group, t (6) = -3.30, p = .008, one-tailed.

4.5.4.2. *Verbs with multiple arguments*

The last section presented the mean number of arguments presented with a verb. In this section I evaluate verb phrase complexity in a slightly different way: I examine how many of the verbs have multiple arguments explicitly indicated. The proportion of verb phrases which indicated two or more arguments was computed for each narrative. This proportion was examined with respect to the Age at Entry and the Year of Entry of each signer.

A multiple regression was performed on verbs with multiple arguments, with Age at Entry and Year of Entry as the independent variables. Age at Entry significantly predicts the incidence of multiple arguments per verb, such that the younger the Age at Entry, the greater the number of arguments per verb (p = .0001). Year of Entry also significantly predicts the incidence of multiple arguments per verb, such that the later the Year of Entry, the greater the number of arguments per verb (p = .0001). The two variables together accounted for 65% of the variance (p = .0001).

An Age at Entry (3) by Year of Entry (2) analysis of variance (ANOVA) was conducted on the proportion of verbs with two or more arguments. The

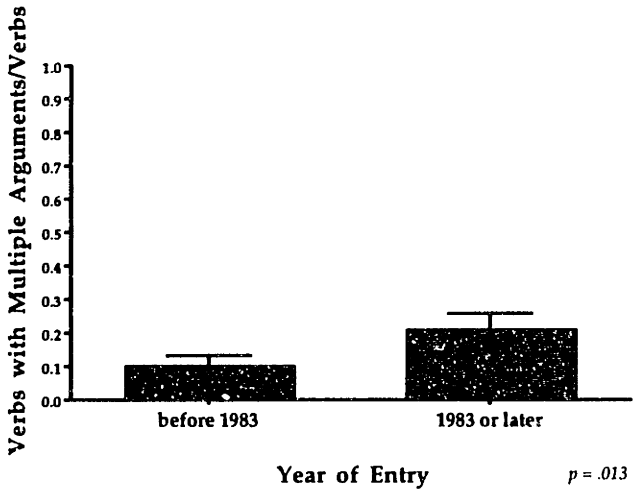
analysis revealed a main effect for Age at Entry, $F(2, 19) = 3.77$, $p = .042$. The means for each Age at Entry group are presented in Figure 41.

Figure 41: Verbs with Multiple Arguments by Age at Entry

Post-hoc analyses revealed that subjects who began signing at a relatively *young* age used verbs with two or more arguments more than twice as often (M = .22) as subjects who began signing at a relatively *old* age (M = .08), $p = .04$, Fisher PLSD. Subjects with a *medium* Age at Entry scored between the two other groups (M = .17), but were not found to differ significantly from the *young* ($p = .50$) or *old* ($p = .15$) Age at Entry groups.

The ANOVA also revealed a main effect for Year of Entry. The means for each Year of Entry group are presented in Figure 42.

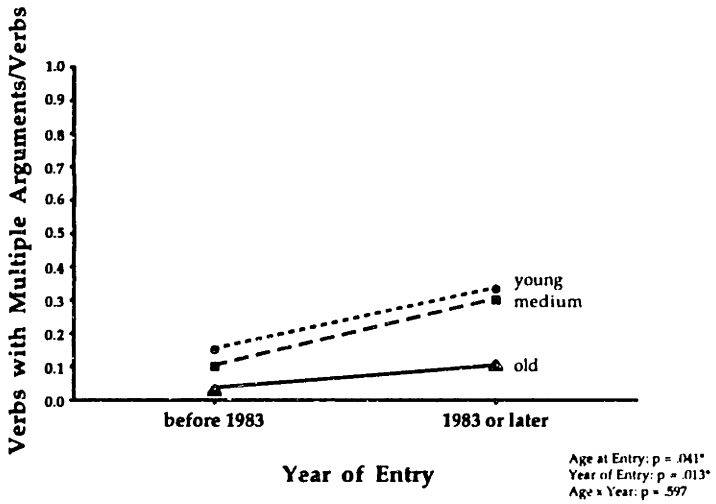
Figure 42: Verbs with Multiple Arguments by Year of Entry



Subjects who entered the signing community in 1983 or later used verbs with two or more arguments more than twice as often (M = .21) as subjects who entered the community before 1983 (M = .10), F(1, 19) = 7.49, p = .013.

The combination of the two factors is presented in Figure 43.

Figure 43: Verbs with Multiple Arguments by Age and Year



The effect of Age at Entry is represented by the gap between the lines corresponding to each Age at Entry group. The effect of Year of Entry is represented by the different slopes of the lines. Although there was no significant interaction detected between the Age at Entry and Year of Entry factors, the Year of Entry has a significant effect detected in only the *young* Age At Entry group, t (6) = -2.32, p = .03, one-tailed, and the *medium* Age at Entry group, t (6) = -3.37, p = .008, one-tailed.

4.6. Discussion

As predicted, both Age at Entry and Year of Entry have strong main effects detected in both the regressions and the ANOVAs. The age at which signers are first exposed to a sign language strongly predicts their ability to command some of its more complex structures. Signers who entered the signing community at a young age are signing more rapidly, packing more meaning into their signing, and producing more complex, multi-morphemic signs than the signers who entered the community at an older age. Furthermore, the signers with a younger Age at Entry use the inflectional verb system more, and are more likely to use it to indicate grammatical agreement. Finally, they can indicate more arguments with their verbs than signers who were exposed to the language only after they were older. These findings are consistent with theories that claim that children's language-learning abilities decrease with age.

The calendar year in which signers entered into the Nicaraguan signing community also predicts their command of many of these same grammatical structures. Those who have entered the community in more

recent years actually include more of the complex constructions in their signing than those who began signing longer ago, despite the fact that the more recent learners have had fewer years of exposure to the language. This evidence strongly suggests that the language has become measurably richer over the last decade and a half as the new generation of signers has acquired it.

The combination of the two factors of Age at Entry and Year of Entry has created an unusual situation in which the most proficient signers in the community are its youngest and newest members.

Although no statistical interaction between the two factors was detected in the ANOVAs, the t-tests clearly reveal that the effect of Year of Entry is nearly always present only in the signers who entered the community under the age of ten. One could argue that the cell sizes in these t-tests are rather small, so that with more subjects an effect might be detected among the older Age at Entry subjects as well. However, such a finding would be unlikely, since the slope of the lines indicating the effect of Year for the old Age at Entry group are near zero and often negative. Furthermore, note that the cell sizes are equally small in the *young* and *medium* age at entry groups where the effect was detected; in fact, these two groups each include one subject fewer than the older group. It seems clear that for measure after measure, only the *young* and *medium* Age at Entry signers who entered in the more recent years have a stronger command of the construction.[1]

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[1] One exception to this generalization is in the arguments per verb, in which the older Age at Entry signers from recent years do have a slight (but not significant) increase over those with an earlier Year of Entry. It is conceivable that an analysis of more subjects would reveal that all signers (not just the younger ones) are increasing their number of arguments per verb as

I have argued from the findings of this study that the changes in Nicaraguan signing originate in the young signers who have entered the community in more recent years. However, one could argue that the adults develop the new forms, and the children just use them more consistently. This is still a logical possibility; however, to explain the obtained pattern of results, this explanation would require that the adults who are serving as the models are using the forms at the low levels observed in the figures above. When older signers initiate new forms or uses of forms, they would have to model them sporadically, or only temporarily until the children adopt them. Recall that Simon, the Deaf child of late-learning Deaf ASL signers, did not learn the constructions that his parents produced most inconsistently (Singleton, 1989)-- and for Simon the constructions were derived from a much richer base than the current Nicaraguan constructions. Because his parents' forms were drawn from ASL, they exhibited much more consistency across signs than the signing modeled today by the older Nicaraguan signers.

It is more likely that the forms originate in the young children first, and remain in their signing as a systematic and integral part of their grammar. Older signers may still exhibit precursors to the children's new structures, and often learn the new forms as well as adult, nonnative learners

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the years pass. Such a finding would not negate the conclusion that most of the grammatical contributions stem from the children. However, it would indicate that these multiple-argument structures could be learned by (and possibly contributed by) older learners as well as younger ones.

can. But they do not have the generative ability found in the younger children.

For nearly all of the measures examined here, older learners are evidently unable to take advantage of the increased richness of the language that surrounds them; it is the younger children who enrich the language as they learn it. When new constructions are added to the language, children young enough to learn or create them will have those constructions at their disposal.

4.6.1. Total years of exposure

Subjects with an older Age at Entry who entered the community in 1983 or later often score lower than the subjects with an older Age at Entry who entered the community before 1983. This fact bears comment, since Age at Entry is constant here, and the later Year of Entry subjects have been exposed to richer language. One might expect the effect of Year of Entry would make them the more proficient of the two groups. However, there are two other factors to be taken into consideration. The first is that the members of the later group have had substantially fewer *total years of exposure* than the members of the earlier group. All subjects had at least four years of exposure, but some of the members of the earlier group had as much as sixteen years. Presumably, once they have had more exposure, these more recent late-learners will achieve the same level of proficiency as the earlier late-learning group. After all, those who entered before 1983 are still around today, benefiting from the increased richness of the language as much as any adult can. It is important to note that the young Age at Entry group who entered the community in 1983 or later also have had fewer years of exposure,

but they have overcome this disadvantage substantially, enough to actually surpass the young Age at Entry group who entered the community before 1983.

Because Total Years of Exposure is almost perfectly negatively correlated with Year of Entry, it is impossible to factor out its effect. However, we can be certain that more years of exposure would result in increased proficiency, so the effect of Total Years of Exposure worked against the predicted (and confirmed) effects of Year of Entry.

4.6.2. Advantage of a homesign

A second factor to consider is that the signing in use today was initially based on the homesign systems introduced by the pre-1983 signers. Any distinctions that they had marked in their homesigns are likely to be marked in today's signing, along with many new constructions. Now that the language is much more stable, it is resistant to the influence of new homesigns. Homesigners who enter the community today rapidly abandon their homesigns and learn the sign language. Morford, Singleton, & Goldin-Meadow (1995) have found that a homesigner learning ASL is more successful at learning structures whose meanings are also represented in his homesign. To the degree that the sign language in Nicaragua today retains structures brought to it from its early homesign roots, the original homesigners will have had an advantage over today's new late-learners in learning those structures. I suspect this advantage would be an extremely slight one, if it does exist, that would be totally overwhelmed by the opposing effect of the increased richness of the language in recent years.

4.6.3. Reanalysis or imperfect learning?

It is interesting to look at particular constructions in the grammar that seem to have undergone a change to try to determine how change in the language occurs. A closer examination of position or location inflection, for example, reveals that while signers who began signing in 1980 are using these inflectional markers, only those who began signing a few years later (and at a young age) use these inflections to mark agreement. That is, everyone is using these spatial inflections to mark position or location on their verbs, but only the newer younger signers use them consistently across several signs in the discourse to indicate that they share an argument.

Similarly, one sign used by many of the older signers incorporates a shoulder shift with a simultaneous wrist rotation to indicate a change in person from the previous verb. Younger, more recent signers use a slightly modified version of this sign, using a shoulder shift toward a particular locus consistently throughout the discourse to refer to (and hence, express agreement with) a repeated argument.

There are two possible ways of interpreting this difference between older and younger signers:

- The older signers may have developed the inflectional marker for change of person early, and used it for several years before younger signers reanalyzed the construction as a way to mark agreement. This type of reanalysis is similar to the kind of work children do acquiring language (Bowerman, 1982), with the exception that in this case there is no adult model for the children to eventually adopt in place of their reanalysis when a

conflict is noted. Therefore, in Nicaraguan signing, the children's reanalysis is more likely to persist. This kind of change is typical of the kind of changes that occur in language creolization, where a language gains new morphological structure as a result of the reanalysis of old forms (Sankoff & Laberge, 1973).

- Alternatively, the younger signers may have introduced a system of inflection and agreement in one piece in 1983, using person and location inflection to mark agreement. Older signers, now turning to the younger, more proficient signers as their models, may have learned this system imperfectly, using the inflection to mark a change of person, but not consistently marking agreement across the discourse. This kind of partial learning of a system of spatial agreement is typical of late-learners of ASL (Newport, 1982; Singleton, 1989) and characteristic of the early stages of children's acquisition of the ASL agreement system (Loew, 1984).

This question might be resolved by finding examples of this construction or its precursors in videos taken during earlier years. Such examples might provide clear evidence of how the current construction evolved. The question might also be resolved by locating signers who were members of the signing community during the early years but have had little contact with younger deaf children since that time. If these signers use the inflection, but not as a marker of agreement, it would be likely that the inflection was reanalyzed by the younger children as an agreement marker.

This questioning motivates an examination of the historical sequence of the emergence of the constructions we have identified so far in Nicaraguan

signing. By mapping out the order in which the sign language in Nicaragua took on different structures, we can consider how specific constructions are being reanalyzed by children as they learn them. In Chapter Eight I use the data from the present study in order to reconstruct some of this sequence.

CHAPTER FIVE

5. Study III: Comprehension of verbal inflection and classifiers

5.1. Introduction

In Chapters Three and Four I presented evidence that the deaf children in Nicaragua have developed a system of verbal inflection and a nominal classifier system. This conclusion is based upon the dramatic increase in their production of these constructions.

However, in order to argue that these constructions are used to communicate meaning, I need to prove that they are understood. Inflections to a sign should alter the meaning of the sign in a specific and predictable way, that can be interpreted by another deaf signer. Otherwise, one could claim that they are merely equivalent variants of the original form of the sign.

The present study is a comprehension experiment designed to verify that the inflections observed in studies One and Two are used productively and understood by interlocutors. Subjects viewed a video of some contrastively inflected signs, and indicated their meanings in a forced-choice task. With this procedure I was able to confirm our interpretation of these forms and to consider whether certain inflections increase the specificity of the meaning of a sign.

5.2. Method

5.2.1. Subjects

The subjects of the present study are 24 deaf Nicaraguan signers whose ages ranged from to 9;3 to 32;6 at the time of testing, with a mean of 18;6. 14 of the subjects are members of the association for Deaf adults in Managua. 10 of the subjects are students at the primary school for special education in Managua.

5.2.2. Materials

The stimuli for this experiment consist of a test video and an answer booklet. The video presents fourteen productions of inflected and uninflected Nicaraguan signs. These video clips were taken from narratives elicited with the cartoon "Mr. Koumal Flies Like a Bird," (Studio Animovaného Filmu, 1969) used in Study One. The clips are extremely brief (on the order of a second long) and were edited out of longer utterances. The clips represent the following utterances: three productions of the bare stem of the verb FALL; three productions of the verb FALL marked with an iterative inflection; three productions of the utterance HAVE/PUT FEATHERS ON ARMS in which "feathers" was represented with a handling classifier; three productions of the utterance HAVE/PUT FEATHERS ON ARMS in which "feathers" was represented with an object classifier; and two distractor productions, one depicting a mountain falling down, and one depicting a bird with many feathers on his wings. These distractor items each included a movement similar to the test items, but differed from the test items in the subject of the verb. The clips were presented in a randomized order, with the constraint that the same inflection could not appear more than twice in a row. Each clip was preceded by a five-second presentation of the trial number on a pale background.

The answer booklet consisted of fourteen identical pages. On each page were six hand-drawn depictions of the events described in the signs on the test tape. The depictions included a man falling straight to the ground (simple fall); a man falling head-over-heels down a mountain (iterative fall); a man with a few feathers on each arm; a man with a full set of feathered wings on each arm; a mountain crumbling; and a bird spreading its wings and showing many feathers.

A sample answer booklet page is presented in Appendix A.

5.2.3. Procedure

Subjects were tested individually at the association for Deaf adults and the primary school for special education in Managua. The procedure lasted approximately fifteen minutes per subject.

Each subject viewed the test video on a television. For each trial, the subject viewed the sign production, and marked an X in a small box above and to the right of the picture which best depicted their interpretation of the sign. Subjects were permitted to view the video clip of the sign again if they were uncertain. After completing all 14 trials, the subjects viewed the entire videotape through another time and checked their responses.

5.2.4. Coding and analyses

5.2.4.1. Accuracy

An overall *accuracy* score was computed for each subject by dividing the total number of correct choices by the total number of trials, which was 14.

This score was compared to chance, which was estimated at 50%. Although there were six choices available for each trial, it was assumed subjects could identify whether the action involved falling or feathers. This 50% figure further assumes that subjects will correctly identify the subject of the utterance, thus avoiding the distractor choices, which was not always the case. For this reason it is a conservative estimate of chance performance.

5.2.4.2. *Iterative FALL*

A score of *iterative FALL accuracy* was computed for each subject by considering the three trials in which the iterative inflection was produced with the verb FALL. Since the comparison of interest is whether subjects distinguish between this inflected form and the uninflected form of the verb, a ratio was computed of iterative responses over iterative and simple fall responses combined. In this way we determined the proportion of iterative sign productions for which the subject gave an iterative fall interpretation as opposed to a simple fall interpretation, excluding the distractor item errors from the analysis.

5.2.4.3. *Uninflected FALL*

A score of *uninflected FALL accuracy* was computed for each subject by considering the three trials that presented the uninflected form of the verb FALL. Since the comparison of interest is whether subjects distinguish between this uninflected form and the iterative form of the verb, a ratio was computed of simple fall responses over simple fall and iterative responses combined. In this way we determined the proportion of uninflected sign productions for which the subject gave a simple fall interpretation as opposed

to an iterative fall interpretation, excluding the distractor item errors from the analysis.

5.2.4.4. *Proportion of iterative selections*

For those trials that presented iterative and uninflected FALL on which subjects had selected the iterative or simple fall response, the proportion of iterative responses was computed for each subject. The proportion of iterative responses on *inflected* FALL trials was then compared to the proportion of iterative responses on *uninflected* FALL trials. In this way we could determine whether subjects were more likely to select the iterative response when presented with an inflected as opposed to an uninflected production of the verb FALL.

5.2.4.5. *Iterative - Uniterative interchangeability*

As a measure of the interchangeability of the two forms, the proportion of iterative fall responses to the production of *uninflected* FALL was compared to the proportion of simple fall responses to the production of *iterated* FALL. These ratios were computed across subjects for each trial that presented an iterated or uniterated production of the verb FALL, including the distractor error items. In this way we could determine if one of the two forms is limited to a more specific meaning.

5.2.4.6. *Object classifier FEATHERS*

A score of *object classifier FEATHERS accuracy* was computed for each subject by considering the three trials in which the object classifier was used to indicate FEATHERS. Since the comparison of interest is whether subjects distinguish between this object classifier form and the handling classifier

form of the verb, a ratio was computed of object classifier responses over object classifier and handling classifier responses combined. In this way we determined the proportion of object classifier sign productions for which the subject gave a many-feathers interpretation as opposed to a few-feathers interpretation, excluding the distractor item errors from the analysis.

5.2.4.7. *Handling classifier FEATHERS*

A score of *handling classifier FEATHERS accuracy* was computed for each subject by considering the three trials in which the handling classifier was used to indicate FEATHERS. Since the comparison of interest is whether subjects distinguish between this handling classifier form and the object classifier form of the verb, a ratio was computed of handling classifier responses over handling classifier and object classifier responses combined. In this way we determined the proportion of handling classifier sign productions for which the subject gave a few-feathers interpretation as opposed to a many-feathers interpretation, excluding the distractor item errors from the analysis.

5.2.4.8. *Proportion of many-feathers selections*

For those trials that presented object and handling classifier FEATHERS on which subjects had selected the many-feathers or few-feathers response, the proportion of many-feathers responses was computed for each subject. The proportion of many-feathers responses on *object classifier* FEATHERS trials was then compared to the proportion of many-feathers responses on *handling classifier* FEATHERS trials. In this way we could determine whether subjects were more likely to select the many-feathers

response when presented with an object as opposed to a handling classifier production of FEATHERS.

5.2.4.9. *Object classifier - handling classifier interchangeability*

As a measure of the interchangeability of the two forms, the proportion of many-feathers responses to the production of *handling classifier* FEATHERS was compared to the proportion of few-feathers responses to the production of *object classifier* FEATHERS. These ratios were computed across subjects for each trial that presented an object or handling classifier production of FEATHERS, including the distractor error items. In this way we could determine if one of the two forms is limited to a more specific application.

5.3. Results

5.3.1. Accuracy

Overall accuracy on the comprehension task was quite high. Subjects had a mean accuracy of 84%, which was found to be greater than chance, t (23) = 15.92, p = .0001. Subjects' age at the time of testing did not predict their accuracy; nor did subjects' Age at Entry into the community. The inflections presented here are evidently understood clearly by both older and younger members of the community, and by early- and late-learners.

5.3.2. Iterative FALL

Subjects selected an iterative fall interpretation in 98.6% of the iterative FALL production trials that received an iterative or simple fall interpretation. This percentage was found to be significantly greater than chance, t (23) = 35.36, p = .0001.

5.3.3. Uninflected FALL

Subjects selected a simple fall interpretation in 82% of the uninflected FALL production trials that received an iterative or simple fall interpretation. This percentage was found to be significantly greater than chance, t (23) = 4.80, p = .0001.

5.3.4. Proportion of iterative selections

The percentage of iterative responses on inflected FALL trials was significantly higher (98.6%) than the percentage of iterative responses on uninflected FALL trials (18.1%), t (23) = 12.15, p= .0001. Subjects were more likely to select the iterative response when presented with an inflected as opposed to an uninflected production of the verb FALL.

5.3.5. Iterative - Uniterative interchangeability

The percentage of iterative fall responses to the production of uninflected FALL was significantly higher (18.1%) than the percentage of simple fall responses to the production of iterated FALL (1.4%), t (4) = 9.016, p = .0008. Evidently the iterated form has a more specific application than the uninflected form.

5.3.6. Object classifier FEATHERS

Subjects selected a many-feathers interpretation in 97.3% of the trials in which the object classifier was used to indicate FEATHERS and the subject selected a few- or many-feathers interpretation. This percentage was found to be significantly greater than chance, t (23) = 24.84, p = .0001.

5.3.7. Handling classifier FEATHERS

Subjects selected a few-feathers interpretation in 78.6% of the trials in which the handling classifier was used to indicate FEATHERS and the subject selected a few- or many-feathers interpretation. This percentage was found to be significantly greater than chance, t (23) = 6.301, p = .0001.

5.3.8. Proportion of many-feathers selections

The percentage of many-feathers responses on object classifier trials was significantly higher (97.3%) than the percentage of many-feathers responses on handling classifier trials (21.4%), t (23) = 13.61, p= .0001. Subjects were more likely to select the many-feathers response when presented with the object classifier as opposed to the handling classifier production of FEATHERS.

5.3.9. Object classifier - handling classifier interchangeability

The percentage of many-feathers responses to the production of the handling classifier FEATHERS (21.4%) was not found to be significantly different from the percentage of few-feathers responses to the production of object classifier FEATHERS (3%), t (4) = 1.39, p = .24.

5.4. Discussion

Nicaraguan signers use the inflectional system to make certain specific meaning distinctions. Interlocutors observing marked and unmarked signs understand the intended distinctions, and assign the forms different interpretations.

The iterative inflection marked on the verb FALL in this study is interpreted to indicate an iterated occurrence of an event. Signs marked with this inflection can only be interpreted to mean an iterated occurrence. The form cannot be applied to a situation of simple falling.

On the other hand, the bare, unmarked form of the verb FALL appears to have a wider application. For the most part, it is interpreted to mean a simple fall. However, it can also occasionally be applied to an iterated occurrence. Evidently the unmarked form is the more general of the two. Adding the inflection has increased the specificity of the language.

The difference between handling and object classifiers is also a distinct one, although neither form necessarily has a broader application than the other. The handling classifier productions that were used in this study did not include a marker or a movement that indicated "a great number" of feathers. The object classifiers that were selected for this study were produced with all of the fingers extended, which is an indication of plurality, specifically, a great number of long-narrow objects. The use of the handling classifier seems to indicate a causative agent, similar to how handling classifiers are used in ASL (Kegl, 1985). In this causative sense it would be interpreted as "The man put feathers on his arms." The use of the object classifier, on the other hand, does not indicate an intentional agent, but can be marked for number or degree. In this case, it takes the interpretation "There were many feathers on the man's arms." Perhaps because this feature of causation was not directly visible in the pictures, subjects showed a little bit more variation in their selection of a picture to correspond to the handling classifier form. There was a slightly lower accuracy obtained for this form,

perhaps for this reason. Nevertheless, the subjects clearly recognized that the object classifier form was marked for degree or number in a way in which the handling classifier was not, since object classifier productions were almost without exception interpreted to refer to the many-feathers interpretation.

The inflections examined in this comprehension task clearly alter the meaning of signs in specific and predictable ways. These inflections are understood and used productively by interlocutors in the Nicaraguan Deaf community. The addition of these forms increases the specificity of signs, and does not merely represent equivalent variants of signs. Therefore, the emergence of these inflections and others like them indicates an increase in the complexity of the sign language in Nicaragua.

CHAPTER SIX

6. The Deverbal Anaphor Construction

6.1. Description

In the course of coding the arguments included within each verb phrase, I came across a striking construction that merits a focused description. Nicaraguan signing has a possibly unique device for referring to previously established referents.

As I described in Chapter Three, Nicaraguan signing, like many other signed languages, often uses indexing and spatial inflections to refer to previously established referents. However, anaphora can also be realized with a *deverbal anaphor*[1].

To produce this form, the signer produces a reduced, truncated form of a recently-signed verb, usually in neutral signing space. This form is used to refer back to the referent in the narrative that last served as the most salient argument (usually the subject) of that verb.

For example, in the following sequence of sentences, the signer has just been talking about a man who has fallen down a mountain. He describes how the man then collects feathers, using a plural inflection on the verb COLLECT to make it agree with its object FEATHER-PL.[2] This sentence is followed by a comment about a different character, the bird. The signer then

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[1]This label was suggested by Edward Klima.

[2] Plural inflection here is indicated by the letters -PL appended to the English gloss of the sign. In actuality, the verb is inflected by producing the first syllable of the sign three times, initiating it in three different spatial loci, followed by the final syllable of the sign.

refers back to the man of the first sentence by repeating the sign COLLECT (the last verb associated with the man), producing it in front of his body in neutral space, in a small, quick form, showing none of the inflections that were included with the verb when it appeared in the first sentence.

(16) MAN FALL-DOWN-[iterative]
"The man falls down head-over-heels."

FEATHER-PL FLOAT-DOWN, MAN COLLECT-PL.
"Feathers float down and the man collects them."

BIRD LAUGH
"The bird laughs."

$[\text{COLLECT}]_{N}$ LOOK-UP
"**The collector** looks up."

Because the man is the most recent subject of verb COLLECT, the anaphoric form of the verb COLLECT in this instance refers to the man.

This process requires the signer to maintain, for every potential referent, the last verb associated with that referent in the discourse. In fact, within a single narrative, the stems of several different verbs reduced in this way can specify the same referent. For example, this signer could continue his narrative, later referring to the same man with a reduced form of the verb LOOK-UP that serves as the subject of the verb SELL, and still later using a reduced form of the verb SELL that serves as the subject of yet another verb, and so on.

I first noticed these forms in the signing of Santos, a nine-year-old signer whom we have been following since he was seven. Santos' aunt and uncle are both ISN signers, so he has been exposed to quite rich signing from birth. Because there are no deaf children with deaf parents in the community, Santos represents the first of the next generation of native signers. His rich, early exposure is evident in his signing- his signs are crisp, tight, and richly inflected, with a smooth, clear rhythm.

Santos produces deverbal anaphors quite frequently and clearly, so I initially believed that they were a newly emergent structure in the language. However, we have since gone back and looked in some of the earlier narratives, and discovered that the deverbal anaphors are present in the signing of many different signers in the community, both older and younger (although I have not yet found one in the signing of a signer with both an older Age at Entry and a late Year of Entry).

6.2. Examples

Deverbal anaphors consist of a verb stripped of its spatial inflections. The verb can retain a handshape classifier, but not a size and shape specifier (SASS) that incorporates a movement. Some verbs clearly seem to be preferred over others, perhaps because they are more easily nominalized. Often several other verbs will intervene between the original production of the verb selected to produce the deverbal anaphor and the anaphor itself. It is not clear what guides the signers' selection of a verb stem. Perhaps it is the verb that is most salient for that argument. It is possible that some verbs are unavailable for use as deverbal anaphors because of their phonology or their argument structure. Some examples of verbs used to construct deverbal

anaphors are given in sentences (17) through (23). These examples are drawn from the narratives described in Chapter Three. Deverbal anaphors are noted in boldface. Ellipses indicate substantial intervening material.

17) The poor man drives a car. **Driver** tosses a coin.

18) The man thinks about the money... **Thinker** has spirits emerge from his body.

19) The man thinks, and resists the money... **Thinker resister** body splits into two. (The two halves) hit each other... **Hitters** look down... **Thinker** reaches into his pocket.

20) **Flickee** (coin) arcs through the air... **Flickee** lands in his hand.

21) The man **resists** the money... **Resister** puts his hand out.

22) The man looks at the money... **Looker** fights.

23) The man resists the money... **Resistor** body becomes dark on one side.

It is interesting to consider how the interlocutor is supposed to determine which argument of the verb is represented by the deverbal anaphor. Generally, it is the subject of a transitive verb (such as RESIST, LOOK-AT, and HIT) or the subject of an intransitive (unaccusative or unergative) verb (such as FLY, THINK, or FALL). The example in [d] above is a deverbal anaphor referring to the direct object of a transitive verb (FLICK), that is, the coin that was flicked. This is an unusual case, but it was an unambiguous one. Perhaps because the verb was never initially produced with a subject, the coin was the salient argument associated with FLICK even

though it is the direct object. The deverbal anaphor FLICK in this construction approaches a handing classifier, in that it represents the coin by how it was interacted with.

It is interesting that it is generally the subject that is referred to in a deverbal anaphor, particularly when one considers that most verbs in Nicaraguan signing agree with their objects. Object agreement is usually marked with a spatial inflection, and it is spatial inflections that are stripped from the verb in deverbal anaphors. So the argument that is saliently associated with a verb is not the one that is explicitly marked in the morphology.

If deverbal anaphors arose during a time when Nicaraguan signing included only single-valence verbs, there would have been no ambiguity as to which argument served as the referent. However, today deverbal anaphors are quite common among signers who use multi-valence verbs.

It is interesting that such a construction should appear in a signed language, since it makes no productive use of the spatial component of the language. It is an unusual construction for any language, signed or spoken. A deeper analysis of these deverbal anaphors awaits future study and explicit elicitation. For the present, let it be noted that these forms are a definite move away from iconic or mimetic transparency.

CHAPTER SEVEN

7. The order of the emergence of forms

7.1. Introduction

I have argued that the sign language in Nicaragua is being shaped by children as they nativize it. How are these origins reflected in the early stages of the language? In this chapter I will consider the time course of some of the early grammatical devices that have emerged in Nicaraguan signing.

Unless one is present at the moment of the innovation of a new form, it is impossible to determine exactly when a construction enters a language. In order to approximate the sequence of the constructions analyzed in Chapter Four, I estimated the year in which each form achieved 75% of its current level of use among the most fluent users. This year was based on the Year of Entry of the signers whose use of the form first exceeded 75% of its maximum level. This estimate assumes that if a construction was being used above some threshold of consistency in a given year, young signers who entered the community in that year would acquire it. This way of ordering the constructions is somewhat speculative. The year associated with each construction is not particularly meaningful in itself. However, it does give us a way to order the constructions in a sequence that may reflect the order in which the constructions became firmly seated in the language.

In the present analysis, I will consider whether the early forms developed in Nicaraguan signing display the effect of tendencies that are known to guide language acquisition. For example, are the types of forms that seem the easiest for young children to acquire the first to appear? Are the

early constructions more mimetic, and do they favor minimal processing? Or are there other forces that seem to shape the course of the language?

7.2. Method

The data for the present analysis come from the narratives coded in Chapter Four. Only those measures that represented constructions in the language were included in the present analysis. Measures of general fluency (such as morphemes per minute) were not included. The following measures were therefore included in the Time Course analysis: position/location inflection and agreement, person inflection and agreement, shoulder shift, aspectual inflection, overall inflection, overall agreement, and multi-argument verbs.

Using the following procedure, I essentially plotted a line of the development of each construction among its most proficient users over the years, and chose the 75% mark to note the order in which the lines fall.

As in Chapter Four, the prevalence of each construction was determined for each signer, and divided by the total number of verbs in the narrative to determine the proportion of verbs that included the construction (such as person inflections per verb, shoulder shifts per verb, etc.). The means of these proportions were calculated for the signers from each Year of Entry (from 1977 to 1990) for each Age at Entry group, and the maximum proportion ultimately attained by each measure was noted.

Since many of the constructions doubled in use from the earliest to the latest Year of Entry, a half-life (or three-quarter-life, if you will) was computed

for each construction by multiplying this maximum by .75, and determining the Year of Entry of the signers in which the construction first exceeded that frequency of occurrence. For example, position/location agreement per verb reached its maximum occurrence at .56. The Year at Entry of the signers who first exceeded 75% of this amount (.42) was in 1985. A similar "half-life" year was computed for each of the constructions. The constructions were then ordered with respect to their "half-lives".

7.3. Results

The constructions reached 75% of their maximum occurrence in the following order:

1980
position/location inflection
overall inflection

1983
person agreement
shoulder shift

1984
person inflection
overall agreement

1985
aspectual inflection
position/location agreement
multiple arguments per verb

Keep in mind that the particular years listed above are not very meaningful, but the sequence of the constructions may provide us with a rough idea of the order that these forms stabilized in Nicaraguan signing.

7.4. Discussion

The first thing to note is that overall inflection precedes overall agreement in this list.[1] Inflection and agreement here are composite scores of all of the inflectional and agreement markers coded in Experiment Two. The observation that inflectional markers stabilized first is consistent with the interpretation that the agreement markers have developed as a reanalysis of some of the inflectional markers.

It is also interesting to note that position/location inflection precedes both person inflection (and agreement) and shoulder shift. It is likely that abstract person markers develop out of location inflection. Both involve setting up referential loci in the signing space and incorporating these loci into the movements of verbs. Position/location loci are used to represent real world locations and relative movements between them. For example, one locus might be identified to represent Boston, another to represent Managua. Producing the verb FLY with a movement from the first locus to the second would mean "to fly from Boston to Managua." Use of abstract loci to represent person involves another level of abstraction. In ASL, this form is acquired relatively late (after 4;6, according to Loew, 1984). However, its

[1] Note that the fact that agreement markers are themselves inflections does not necessarily mean they will appear second on this list. If agreement and non-agreement inflections had appeared at the same time, they could have been established in the same year, and if agreement markers had leveled off more rapidly, they could have appeared first, indicating that they had become established before the other inflectional markers had stabilized.

mastery is preceded by a stage of using the real-world location of people to represent abstract persons (Hoffmeister, 1978). This kind of semi-real-world spatial agreement is common in the signing of the older deaf signers in Nicaragua as well. In fact, if there are not enough people present in a conversation to represent all of the characters in a narrative, friends will be recruited from nearby to come stand in the circle of conversation with the sole function of serving as the locus for the argument of verbs. Younger signers never use this strategy, but instead set up and refer back to abstract loci with ease. In this case, the sequence in the emergence of the form in Nicaraguan signing seems to mirror the manner in which the equivalent form is acquired in ASL.

It is unexpected that person agreement should precede person inflection, although they are separated by only a year. Perhaps for the younger Age at Entry signers they emerged as a piece, and have stabilized together. In our interactions with deaf signers over the years, we have been able to observe the progression of the system of person agreement. In earlier years, (and today in some of the older signers), the arguments of a verb were often identified by a pointing gesture that followed the verb, indicating the participants of an action. The younger signers have taken these points and incorporated them into their signs as a sweeping movement between two loci that occurs simultaneously with the verb (Kegl & Iwata, 1989). So an older signer would sign "She talks to him" by producing the sign TALK, followed by two points, while a younger signer would produce the sign TALK simultaneously with a sweeping motion that moved from the first locus to the second.

Slobin (1982) has noted that cross-linguistically, morphology that is sequential and stressed, that does not affect the phonology of the verb is acquired early by children learning the language. In contrast, morphology that is nonsequential and fused with the verb is acquired much later. In Nicaraguan signing, this acquisition ordering is reflected in the course of the development of the language. The sequence in the emergence of the morphology in Nicaraguan signing seems to mirror the manner in which morphology is acquired cross-linguistically.

Finally, in examining the Time Course above it is interesting that aspectual inflection and multi-argument verbs stabilized the latest. These forms can be quite mimetic in nature, but complex morphologically. For example, inflecting the verb GIVE with both a subject and dative object locus makes the sign's movement originate at the locus associated with the giver and end at the locus associated with the recipient. This movement actually mimetically approximates the action of giving more than a morphologically simpler form that incorporates only one locus. Recall that Meier (1982) has shown that young ASL signers initially find the more iconic construction to be the more difficult one. In both the course of ASL acquisition and the development of Nicaraguan signing, more mimetic forms do not necessarily stabilize before less mimetic ones.

7.5. Serial verb constructions in Nicaraguan signing

In discussing the course of language change in Nicaraguan signing, I would like to briefly consider a construction that may be in the middle of a stage of transition. We are currently observing the possible emergence of serial verb constructions in Nicaraguan signing. These constructions in

Nicaraguan signing were first noted in Senghas, Kegl, Senghas, & Coppola (1994) and are described in more detail in Kegl, Senghas, & Coppola (1995). We noticed them in the course of transcribing utterances elicited with the Sign Order Comprehension response stimuli from the *Test battery for American Sign Language morphology and syntax* (Supalla, T., Newport, Singleton, Supalla, S., Coulter, and Metlay (in press). The stimuli consist of pairs of pictures depicting a boy and a girl engaged in different activities, such as showing a book, pushing, or giving a gift. In one picture of each pair the girl would be the agent, and the boy would be the recipient of the action, and in the other picture the boy would be the agent, and the girl would be the recipient of the action. It is possible that the verb phrase constructions elicited with these stimuli were a product of the format of the stimuli. We had not specifically intended to examine serial verb constructions when we conducted this task. For this reason, this discussion is somewhat preliminary, and further analysis depends upon the specific elicitation of these forms.

7.5.1 Description of the construction

Older signers do not seem to produce verbs that license both an overt subject and object NP. That is, we do not see sentences of the form:

(24) *WOMAN PUSH MAN (NP V NP) "The woman pushes the man."

Verbs seem to license only one overt noun argument. Multiple inflections that can be produced with the movement of a sign are common, as described in Chapter Three. However, overt noun arguments are generally limited to one per verb. When additional nouns need to be licensed, serial verb constructions combine multiple verbs to accommodate the additional

arguments. An additional noun is often added to an utterance as the subject of a subsequent verb. Typically, the primary meaning is expressed by the first verb, while the second verb tends to express a result or termination of the event.

(25) WOMAN PUSH MAN GET-PUSHED (NP V NP V)
(26) WOMAN PUSH MAN REACT
(27) WOMAN PUSH MAN FALL
(28) WOMAN PUSH MAN CRY

While some signers seem to allow a valence of only one argument per verb, other signers (possibly the younger signers) show further grammaticization of these constructions by allowing the argument of the second verb to appear in the position preceding the entire serial verb construction. This placement (possibly a base-generated topic) is evidence that the serial verb construction is a multiple verb utterance rather than a sequence of two distinct utterances. For example:

(29) MAN, WOMAN PUSH MAN GET-PUSHED "The woman pushes the man."

At least one young signer (Santos, our young native signer) has begun to drop the second verb entirely, as in:

(30) MAN WOMAN PUSH "The woman pushes the man."

This new development may signal the emergence of double-valence verbs.

Single-valence verbs still predominate in Nicaraguan signing, even in this last signer's production. As we argue in Kegl et al. (1995), serial verb constructions, being a feature of natural languages, are a natural option for early languages, and can be expected to persist into later stages of the language. If early grammars lack the syntax to unambiguously associate multiple arguments with a verb, single-valence verbs could be used to avoid argument structure ambiguity. As the language becomes nativized by child learners, pairs of single-valence verbs might be reanalyzed as a serial verb construction.

7.6. Conclusion

This initial consideration if the order in which forms are emerging in Nicaraguan signing is consistent with a model in which creolization mirrors language acquisition. Early forms that have emerged seem, to some degree, to have followed the sequence in which they are generally acquired. However, it would be premature to claim that we had clear evidence of such a pattern. Such a claim awaits a systematic observance of the emergence of new forms and the certain identification of their predecessors.

CHAPTER EIGHT

8. Conclusion: A community creates a language

A new language has emerged in the hands of a generation of deaf children in Nicaragua. This language differs dramatically in linguistic complexity from the forms lacking internal structure to which the children were exposed. The new developments in the language originate in the youngest children in the community. As they apply their natural language acquisition capacity to the nonnativized, incomplete input that surrounds them, they generate a rich and structured grammar, which becomes measurably richer with each passing year. This creation of a language gives us substantial insight into the processes of both language acquisition and creolization.

The development of this language presents an historic opportunity. Linguists have observed the changes in languages within communities over generations; psychologists have witnessed the emergence of language in children in a matter of years. Now, for the first time, we can witness the simultaneous emergence and restructuring of a language within a community of children.

It is the emergence of a community that has created this language. Powerful as the language acquisition device is, it cannot work in isolation. Only when children interact as a community can their language acquisition abilities converge upon a grammar.

8.1. The emergence of a community

The deaf community in Nicaragua began when the first public schools providing education to deaf children opened in 1980. Before that time, deaf children were isolated from each other. There were no deaf parents with deaf children to provide intergenerational contact. Deaf children interacted primarily with hearing family members. With the opening of the schools, they had contact with deaf peers for the first time. Together, they immediately began to create a new, indigenous sign language.

Children who first arrived in the schools in 1980 brought with them a collection of varied homesign systems. Upon contact, they developed the pidgin/jargon form of signing that many of them still use today. They quickly developed a shared lexicon, and a set of rules and strategies for indicating the relationships among words (Kegl & Iwata, 1989).

8.2. The emergence of a language

The sign language has changed dramatically since its early years. As new children entered the community, they surpassed their older peers in the fluency and complexity of their signing. In Chapter Three we examined some of the changes that have taken place by comparing the signing of today's older and younger signers.

The younger signers have a more fluent command of the language. They sign more rapidly and produce more complex, multi-morphemic signs than the older signers from whom they are learning the language. While the older signers tend to produce sequences of uninflected signs, the younger signers use a system of spatial inflection, embedding markers for subject and

object into the movement of many of their verbs, and marking location and position on verbs of motion. The younger signers have also replaced much of the mimetic signing used by their models with a system of abstract classifiers and specifiers.

The differences between today's older and younger signers indicate an abrupt change in the language. An incomplete, inconsistent pidgin has been nativized to become a natural, grammaticized language.

8.3. Evidence that the changes originate in the children

In Chapter Four, we found that Young children who entered into the signing environment since the early 80s have abruptly changed the language. As more and more children converged upon a natural grammar, the richness of the language has increased measurably.

8.3.1. Age at Entry

The age at which signers first enter the Nicaraguan signing community has predicts their ultimate ability to command some of its more complex structures. Signers who arrived at a young age are signing more rapidly, packing more meaning into their signing, and producing more complex, multi-morphemic signs than the signers who entered the community at an older age. Furthermore, the signers with a younger Age at Entry use the inflectional verb system more, and are more likely to use it to indicate grammatical agreement. Finally, they can indicate more arguments with their verbs than signers who were exposed to the language only after they were older. These findings are consistent with theories that claim that children's language-learning abilities decrease with age (Newport, 1990).

8.3.2. Year of Entry

The calendar year in which signers entered into the Nicaraguan signing community also predicts their command of many of these same grammatical structures. Those who have entered the community recently include more of the complex constructions in their signing than those who began signing longer ago, despite the fact that the more recent learners have had fewer years of exposure to the language. This evidence strongly suggests that the language has become measurably richer over the last sixteen years as the new generation of deaf children has acquired it.

The effect of Year of Entry is present only in the signers who entered the community under the age of ten. It may be that older signers are unable to take advantage of the increased richness of the language that surrounds them; or perhaps only the younger children enrich the language as they learn it. When new constructions are added to the language, children young enough to learn or create them will have those constructions at their disposal.

The fact that these changes are occurring only in the signing of the younger children who are new to the community provides strong evidence that they are the result of innate language learning principles.

8.4. Nativization as language acquisition

I have argued that the processes by which children nativize a language are the same processes by which children learn existing languages. Bowerman (1982) has argued that language acquisition is characterized by the

analysis of previously unstructured forms. The Nicaraguan children very productively exploit this process. However, the difference between the case of the Nicaraguan deaf community and most cases of language acquisition is that in the Nicaraguan case the changes that the children make will persist in the language. There are no adult forms to serve as a target language, and thus the children do not "unlearn" their reanalyses. As the Nicaraguan deaf children reanalyze their input, they expand on the weak underlying structure that supports the forms they are producing. In so doing, they can reduce the elaborateness of the surface forms that had previously been necessary for the signing to be adequately expressive. Multiple points or signs become reduced to quick inflective movements or handshapes that can be produced simultaneously with the production of a sign.

This process of reanalysis creates new forms from old ones, such as the development of a system of verb-argument agreement from a system of spatial inflection. The process of reduction leads to an increasing grammaticization of forms, an increase in the ease of sign production, and a move away from mimetic transparency.

These child-driven changes are very different from the type of contribution adults make to the language. Adults can contribute vocabulary items that are unanalyzed wholes, since they tend toward learning a new word rather than assimilating a new inflection that might be capable of representing the same meaning.

Adults can also take advantage of the semantic transparency provided by mimetic gesture, which may also be a characteristic of pidginization.

Goldin-Meadow (1982) has noted that homesigners create forms that have unambiguously mimetic properties. Despite the fact that these examples are from children, they seem to represent the process of pidginization rather than nativization. As a mimetic sign becomes nativized, its mimetic component is sacrificed whenever it competes with ease of production or the development of a systematic morphology. Sometimes the mimetic component will be the basis for an inflection (as is the case for much of the spatial agreement system), but children do not prefer these forms over others and will not hesitate to sacrifice them (Bernstein, 1980; Meier, 1982, 1987).

8.5. The crucial community component

Not all children who are exposed to incomplete language will nativize it. I have discussed some cases in which child learners have systematized their input, but not to the degree that a full language will be created. In the extreme, feral children do not develop any system of language. Homesigners develop little more than a small lexicon and basic word ordering strategies (Goldin-Meadow and Feldman, 1975). An important component missing in these cases is the dynamic interaction of a peer group whose constant attunement allows the members to converge upon a new grammar. Without a peer group of language users, a rich language does not emerge.

An interesting exception is the case of Simon, the child of late-learning signers, who surpassed the unsystematic input of his parents (Singleton & Newport, 1987; Singleton, 1989). Simon did not have a community of fellow creolizers with whom to converge upon a grammar. However, he had fragments of the language of such a community. The pieces of ASL to which Simon was exposed had been nativized by previous generations of signers.

Simon's parents were too old to detect the regularity of form embedded in their own language production. Simon, however, was young enough to analyze these forms as a set across which to extract underlying regularity.

The case of the emergence of a sign language in Nicaragua makes it clear that such rich fragments are not crucial for the emergence of a new language, provided that the learners can generate their new language as a dynamic, interacting community.

8.6. Phylogeny recapitulates ontogeny

The sudden appearance of a Deaf community in Nicaragua has been like the birth of a child. Like a child, the community has developed rapidly, assumed an identity, and is beginning to establish a place for itself in the adult world. Like a child, this community rapidly and effortlessly acquired a language, building new structure upon old structure, expanding its vocabulary, and productively generating new forms. Like a child, it did not learn this language from books or schools; instead, the language came from within itself and was shaped in daily interactions, taking its surface forms from the environment, but organizing itself according to internal, systematic constraints. Like the language of a child, it progressed from real-world reference to abstract reference, from strings of independent lexical items to a systematic morphology, and from pockets of regularity to a full, integrated grammar.

The development of the group mirrors the development of the individual; that is, phylogeny recapitulates ontogeny.

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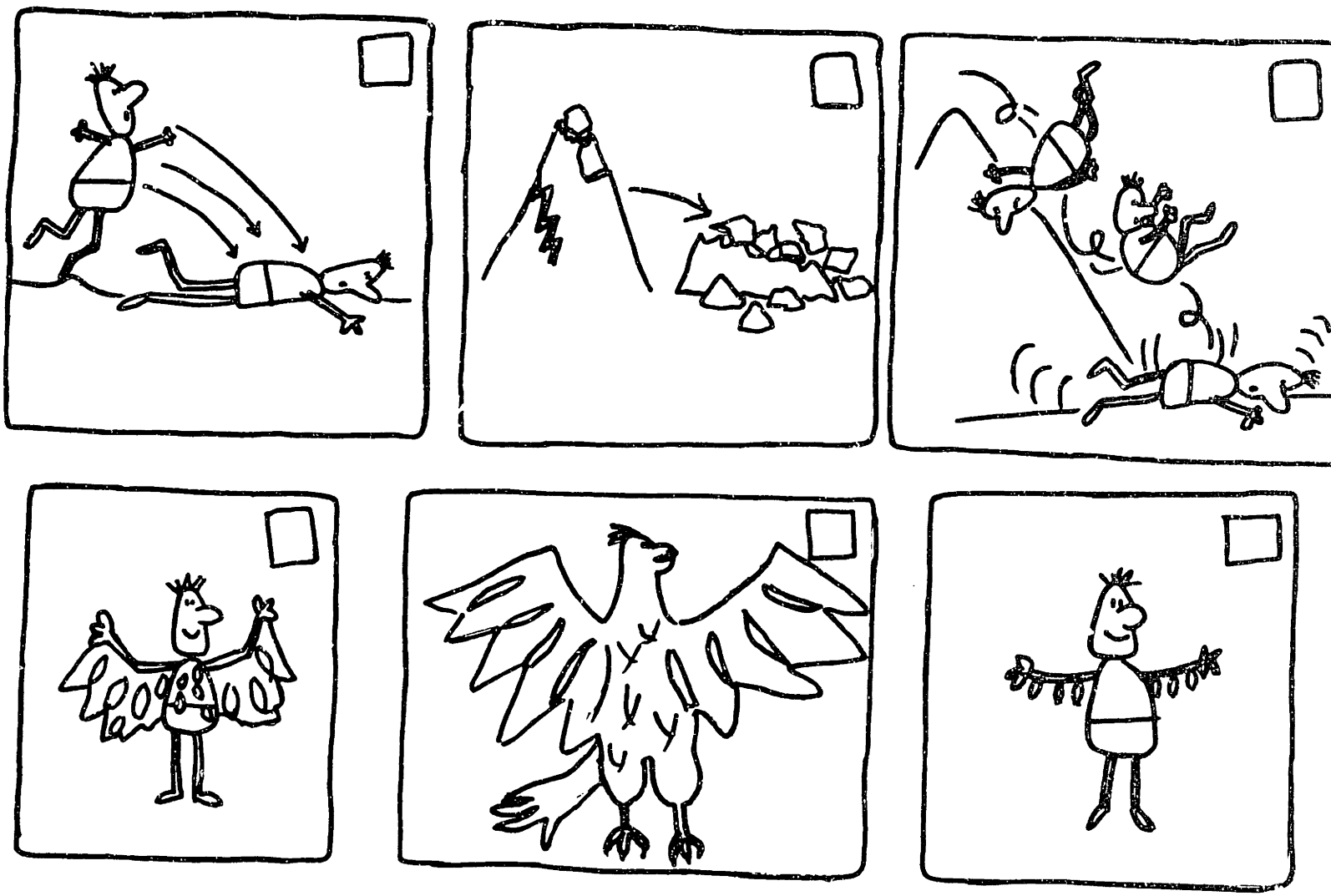
Appendix A
Sample response sheet for Study Three



PÁGINA _____