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CONVENTIONALIZATION OF SHARED HOMESIGN SYSTEMS IN GUATEMALA: SOCIAL, LEXICAL, AND MORPHOPHONOLOGICAL DIMENSIONS

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Abstract

This dissertation is a study of *homesign* systems developed by deaf children from Nebaj, Guatemala. In the absence of accessible linguistic input, children who are deaf develop structured manual systems to communicate with others in their social world. These systems are termed homesign systems and share many structural properties with natural languages (Goldin-Meadow 2003). Prior work on child homesign systems focused on the question of innate or resilient properties of language, asking which elements of language children would generate, even in the absence of a language model; a natural experiment that would illustrate the outer edge of Chomsky's poverty of the stimulus theory (1959). In this dissertation, based on five months of field work conducted in Nebaj, Guatemala over five years, I revisit the question of linguistic input. I ask about the effects of two scales of socio-communicative input on child homesign systems. At a socio-historical timescale, I consider the role of particular ideologies of child development, language socialization and learning on the communicative ecology in which child homesigners are embedded. I develop the notion of *communicative ecologies* as social networks characterized by variable frequency of social interaction, contexts of interaction and relative age and social status of network participants, focusing on three types of ecologies: individual, family and peer, and explore the role of ecology on emergent linguistic structure. At the micro-interactional scale, I consider the effects of a deaf adult relative or peer homesigner on two dimensions of communicative systems: (1) the emergence of phonological and morphological structure and (2) convergence between two homesigners on linguistic forms, or the seeds of a shared lexicon.

The dissertation is divided into two parts. In the first section, I discuss the contribution of research on homesign systems to broader debates about language input and innateness.

Following a brief sketch of the cultural and social history of Nebaj, I present an ethnographic study of homesigners from Nebaj. I focus, in particular, on the relationship between typical ideologies of how children develop, and the relative absence of parent intervention or active promotion of development, in Nebaj and many other Mayan communities (Gaskins 1999; Rogoff 1981; Greenfield and Childs 1977). I suggest that Mayan beliefs about socialization and learning (Moore, 1973; Nash, 1958) create an environment in which both deaf and hearing infants are equally embedded as social actors, except that the deaf infant cannot hear the spoken language in the social context. I also discuss the school environment in Nebaj, and the ways in which literacy practices – inadvertently – may offer deaf students pathways to participation in the classroom.

In the second section of the dissertation, I conduct an empirical analysis of homesign productions that I elicited using standardized materials. These materials have been used with signers of standard sign languages (Brentari et al. 2016), adult homesigners and signers of Nicaraguan Sign Language, a natural language less than fifty years old (Goldin-Meadow et al. 2015). The majority of child homesigners in this study (eight of ten focal child participants) use iconic handshape types, representing either the shape of an object – *object handshapes* – or how it is handled – *handling handshapes* – to mark agentivity. The distribution of handshape type in their elicited descriptions resembles comparable data from natural sign languages. Thus handshape types, which are morphological markers in standard sign languages, are a productive strategy accessible to homesigners from different communicative ecologies. In the second analysis, I develop a novel method for describing the distribution of handshape in homesign systems. I find that homesigners who produce more signs, in the context of two elicitation tasks, have a higher density of unique handshapes. In general, homesigners in family ecologies produce more signs, and have a larger inventory of unique handshapes, while individual homesigners as

well as homesigners in peer ecologies, produce fewer signs and have a smaller inventory of unique handshapes. In the final analysis, I compare the set of signs produced by nineteen participants to describe a set of photos of familiar objects, people, animals and foods. I find that homesigners who are in contact with each other are more likely to use the same signs for the same referents, but I also find substantial variation based on the properties of the sign form as well as properties of the referent, such as animacy. In a second analysis, I characterize each signer's set of signs with two parameters: the most common sign, used for multiple referents, and the proportion of signs used to refer uniquely to a single item. Homesigners from peer ecologies have a higher proportion of hapax signs, suggesting that this type of social context promotes maximally informative signs, at a rate of one unique sign per referent. Homesigners from family ecologies have a balanced proportion of hapax signs and the most frequent sign, suggesting that these signers may be more likely to produce a repeated sign to indicate a class or category of items, as well as a maximally informative, more specific sign.

This dissertation offers a mixed method, interdisciplinary study of atypical language development in a Mayan community. It offers several suggestions for ongoing documentation of newly emerged communication systems, in particular work with children, including the use of standard elicitation tools to facilitate comparison with other systems. This thesis also illustrates the value of contextualizing work on emergent communication systems, grounding documentation efforts in an understanding of ideologies of communication and development.

Introduction, Homesign: Communicative Ecology and Emergent Structure

0.1 Socialization, Linguistic Input and the study of Homesign Systems

Children who are deaf and children who are hearing learn their native language with or without explicit instruction, correction, or demonstration – as long as they are immersed in that language. While children achieve relatively advanced proficiency in their native language in a remarkably short span of time, they also only learn the language(s) to which they are exposed. This fact contributes to a persistent puzzle for researchers of language development: What is the role of the language in which the child is immersed – their input – in their eventual acquisition of that system? The strong nativist position asserts that children have significant innate, language-specific, abilities from birth (Chomsky, 1965), while functionalist and usage-based perspectives argue that children discover or construct the categories in their language, through their experiences with linguistic input (Bates et al., 1998; Bates & Goodman, 1999; Bates & MacWhinney, 1982).

One approach to test theoretical claims about the role of input in language development is to document systems for communication that emerge in atypical contexts of development, specifically, when a child has limited or altered access to the language in their environment. Children who are deaf and are not exposed to a standard sign language provide an example of this atypical context for language development. These children develop manual-gestural systems, termed *homesign systems*, for communicating with their hearing family members and friends (Coppola & Newport, 2005; Frishberg, 1987; Fusellier-Souza, 2006; Goldin-Meadow, 2003). Early research demonstrated that, even in the absence of a language model, homesign systems are structured in ways that resemble standard languages.

In this dissertation, I describe and analyze the visual-manual communication systems developed by children and adults who are deaf and who live in the Guatemalan town of Nebaj. Deaf individuals in Nebaj interact with relatives and neighbors who speak Ixil Maya[1] and Spanish. They can observe the visible co-speech gestures that their hearing interlocutors make when they talk – but they cannot hear the speech produced in these interactions and they are not exposed to a standard sign language. They are homesigners, because they do not have access to the spoken language input in their environment, but many of the deaf children and adults I work with have a deaf relative or deaf peers who they attend school with. This dissertation thus builds on and expands the research question study of language input. First, this study documents homesigners who have extensive contact with other homesigners – they do have access to the signs of another homesigner as a source of accessible input. Additionally, I suggest that we expand the definition of input to constellations of linguistic input, linguistic access, education and interaction with other homesigners. I term the intersection of these characteristics of social context *communicative ecologies* (Haugen, 2001; Mühlhäuser, 2003; Nonaka, 2009). When I describe the larger communicative ecologies in which signers are embedded, I also suggest we account for ideologies of development and socialization that vary cross-culturally and which inform differences in the socialization experience of deaf children.

[1] Ixil is a Mayan language in the Mamean family of the Eastern Branch of Mayan languages (Kaufman, 1974). Recent surveys (SIL, 1998) suggest that there are 69,000 speakers living in three *municipios*, Chajul, Cotzal and Nebaj. The three *municipios* correspond to dialects that are roughly 70% mutually intelligible (Lengyel, 1987, 1991). Ixil is used as a language of instruction in schools, alongside Spanish, the primary language of instruction (Maxwell, 2009; Moore, 1973). Ixil is spelled both with and without an 'h': Ixil/Ixhil. The presence of the 'xh' reflects orthographic conventions of the Ixhil language, where the 'x' represents a retroflex palatal fricative, while 'xh' represents a non-retroflex palatal fricative. The Comunidad Linguistica Ixil of the Academia de Lenguas Maya de Guatemala has not made a definitive decision on the official spelling (García, 2014).

The child participants who are the focus of this work are different from the homesigners in the United States not only because they frequently interact with other deaf signers, but also because they are growing up in a community with different beliefs about language learning and development, and these beliefs inform the way that all children in this community, including those who are deaf, are socialized. Beyond the direct interaction that homesigners have with each other, the findings in this dissertation suggest that daily communicative interactions shape homesign systems. If we place homesign in a larger continuum of semiotic systems, with varying degrees of systematicity, a continuum that includes systems considered languages, then this project asserts that communities in which semiotic systems are unevenly shared will have an effect on the structure of systems like homesign, that emerge in their social milieu. Further, larger socio-communicative practices (Haviland, 2017) will shape the structure of emergent systems, specifically practices around misunderstanding, clarification, and social relationships. To address this question, demands a project that is comparative and makes use of both ethnographic methods and methods from linguistic documentation.

0.2 Shared Homesign Systems

Homesign systems were first studied in the United States, in families with a deaf child enrolled in an oral (non-signing) preschool program (Feldman, Goldin-Meadow, & Gleitman, 1978). This early research was motivated by the opportunity to study language acquisition in a naturalistic context, but in which the typical conditions of acquisition were altered such that the language

learning child had limited linguistic input. For deaf children of deaf parents[2], linguistic input comes in the form of a standard[3] sign language and for hearing children this linguistic input comes in the form of spoken language. Homesign systems, however, exist outside the typical cycle of language transmission and acquisition. These systems are distinct from two of the core tenets of language articulated by Saussure (1986) – first, its historical inheritance (72) and second, its distribution across a substantive community of speakers (74).

Homesign systems are historical, only in the sense that they build on the visible communicative material that the homesigning child is able to observe – the inventory of gestures used by hearing speakers, and any additional gestural strategies used by hearing people who communicate with them using improvised, spontaneous gestures. In terms of a community of speakers and signers who share a language, the homesign system is again anomalous. The homesigner is the only primary user of their homesign system. Other interlocutors may sign with

[2] Mitchell and Karchmer (2004) estimate that 92% of children who are deaf or hard of hearing in the United States are born to hearing parents, approximately 4% are born to one deaf or hard of hearing parent and one hearing parent and approximately 4% are born to two deaf parents. In the United States, the advent of Cochlear Implant (CI) devices since the 1980's has dramatically altered the landscape of language development for children who are born deaf, but the outcomes of CI implantation for speech comprehension and speech production are still relatively understudied. For recent reviews and discussion see: Bouchard, Ouellet, & Cohen, 2009; Davidson, Lillo-Martin, & Pichler, 2014; Humphries et al., 2014. In Guatemala, I have not encountered any children who are deaf who have received a cochlear implant, some aid organizations have distributed hearing aids to deaf children, but there are no certified audiologists or speech therapists in Nebaj to engage in the necessary follow-up and speech training for deaf children to make use of these devices.

[3] In the dissertation I use the term standard (Frishberg 1986) sign language to refer to sign languages that have the following characteristics: intergenerational transmission (whether within families with genetic deafness or across age-cohorts in an institutional setting), institutional support, either in a school setting or from civic organizations like deaf clubs and a substantial community of users who use the language in their daily lives. Other authors have referred to these languages as "established, deaf community sign languages" (Meir et al., 2005).

the homesigner regularly, but if they are hearing, they always have an alternative channel of communication – the spoken language that they acquired natively.

I use the term homesign, but I expand it to include not only the absence of all input, but the absence of *conventional linguistic input*. My definitions of homesign and *shared homesign* systems fit into a larger typology of diverse circumstances of language input and learning for children who are deaf in communities around the world (de Vos, 2012; Kusters, 2014b; Nonaka, 2012; Nyst, Sylla, & Magassouba, 2012). The term *shared homesign* refers to homesigners who are in contact with other deaf homesigners. In these instances, the homesigners are not the only deaf person using an improvised sign system, but instead occupy an ecology with other homesigners and hearing people who interact more regularly with deaf homesigners. In her work on Nepali Sign Language, which coexists with a system termed *natural sign*, Green (2014, p. 7) notes the inadequacy of current models of sign language versus homesign systems versus gesture, she notes that the categories in Nepal,

> challenge the assumption – sometimes implicit, sometimes spelled out – that either deaf people communicate in *ad hoc* sign systems known as home sign because they are "isolated" or they communicate in a fully conventional sign language because they are situated either within a deaf-centered, institutionally-scaffolded community or are born into a hearing-majority community characterized by a high percentage of deaf people across multiple generations…

Green's larger project demonstrates the immense variation in fluency and engagement between deaf signers, hearing signers, deaf non-signers (deaf people in Nepal who have not learned Nepali Sign Language but use natural sign as their primary means of communicating), hearing non-signers who interact with deaf signers and non-signers, and hearing non-signers who are reluctant to communicate with deaf signers and non-signers. This project builds on the

observations of Green, and many others, to highlight the diversity of experiences of deaf children and deaf people cross-culturally.

In terms of its theoretical import, the children I work with have more input accessible to them than homesigners without deaf relatives or peers, but less input than children who are deaf who are learning a standard sign language. These case studies provide an opportunity to document and analyze the effect of input that is not from a standard language, but that the child homesigner can nonetheless access. In some case studies, researchers find that children are able to take advantage of, and "surpass" their input, even when the input does not match the grammatical model of a standard language (Singleton & Newport, 2004). This project asks us to critically consider the full range of experiences that constitute input for a child's communicative development.

0.3 The role of homesign research in the question of language input and language community

Early work on homesign offered a tantalizing case study of the "forbidden experiment" suggested by Chomsky's poverty of input theory - here were children who were deaf, being raised in otherwise typical home environments in the United States. They interacted with siblings, parents and friends at school. And while all of their physical, social and emotional needs were met, they could not hear the language spoken by their parents, siblings and friends. Hearing children immersed in speech, and deaf children surrounded by sign, cannot help but take in this input, but homesigners cannot access the linguistic input or language model in their social environment. The assumption that followed was that any patterns in the children's homesign systems that resembled the grammatical structure documented in standard sign languages would

be attributable to the innate Universal Grammar that Chomsky posited. Researchers did identify systematic structure in child and adult homesign systems including morphological structure (Goldin-Meadow et al., 1990; Goldin-Meadow, Mylander, & Franklin, 2007); the grammatical categories of noun, verb, adjective, and subject (Coppola & Newport, 2005); generic nouns (Goldin-Meadow, Gelman, & Mylander, 2005); constituent structure built around the noun (Hunsicker & Goldin-Meadow, 2012); sentence-level negation and question operators (Franklin, Giannakidou, & Goldin-Meadow, 2011); and narrative structure (Van Deusen-Phillips, Goldin-Meadow, & Miller, 2001). Goldin-Meadow describes these structural characteristics as "resilient", since they emerge in the systems of child homesigners, even in the absence of accessible linguistic input. Further, the structural patterns documented in child homesign systems were distinct from (did not replicate exactly) patterns found in gestures produced by their hearing mothers (Flaherty, Hunsicker, & Goldin-Meadow, 2016; Goldin-Meadow & Mylander, 1983, 1984).

This thesis returns to questions about the nature of social and linguistic input, expanding the scope of input and documenting circumstances in which children do have accessible input, but input that may be less systematic than standard languages. The central questions concern the relationship between these circumstances of socialization and acquisition and the formal and structural properties of the homesign systems that children who are deaf develop. I consider the characteristics of the social world of children in Nebaj, including the broader social and historical context of Mayan communities in Mesoamerica, but I also use comparative methods, including standard elicitation tools. Each communicative ecology, nested within the same larger context of Nebaj, provides a case study of a particular ecology. By collecting comparable data

across ecologies, I can describe the effects of different ecological structures on homesign utterances produced in a semi-structured description task.

0.4 Outline of the Dissertation

The thesis has two parts. Part 1 (Chapters 1-4) provides theoretical framing for the study and describes the social, cultural and historical context for the field research. Part 2 (Chapters 5-7) analyzes in detail three components of child homesign systems and the relationship between the socio-communicative circumstances, ecologies, of homesigners the structural properties of the homesign systems they develop.

Chapter 1 gives an overview of the theoretical problem central to this thesis, namely, the effect of a communicative model (or its absence) on particular components of homesign systems created by children in unique communicative ecologies. Chapter 2 consists of a description of the historical, cultural and social history of Nebaj, with a focus on characteristics of each of these dimensions that are relevant for children in this community, and homesigners in particular. Chapter 3 is an ethnographic study of child homesigners in Nebaj, with an account of the daily lives of deaf children who have deaf relatives, deaf children who do not have deaf relatives, and deaf children who attend school together. Chapter 4 provides an overview of the methods used to collect, annotate and analyze the ethnographic and elicited data for this project. Chapter 5 is an analysis of emergent phonological structure in child homesign systems and includes a study of the relationship between phonological inventory and handshape complexity, as well as the distribution of phonological complexity in two handshape types introduced in chapter 5. Chapter 6 is an analysis of emergent morphological structure in child homesign systems, building on existing studies of the use of handshape type to mark an agentive contrast in standard and young

sign languages. Chapter 7 comprises an analysis of the emergence of categories in homesign lexicons, convergence of sign forms between homesigners who interact with each other, as well as homesigners who do not interact with each other, and finally, an analysis of distributional properties of unique sign forms in homesign lexicons, referred to as lexical richness.

This study offers an interdisciplinary, mixed methods approach to the documentation and analysis of homesign systems. It is grounded in ethnographic observations concerning ideologies of child development and language socialization particular to Mayan communities and uses these observations to inform generalizations about the language learning environment of deaf children in Nebaj. The analyses that are presented in the second section of the dissertation include both established and novel methods for describing and understanding homesign data at the level of handshape, handshape type, and sign form. The results suggest that rather than direct, overlapping similarity in shared homesign systems, the strongest similarities between homesign systems may arise in the distribution of features like complexity and lexical richness within the system. This project thus expands our ways of thinking about what it means to "have" phonology or morphology in a newly developed communicative system, as well as reconsidering social and cognitive factors that contribute to convergence of sign form, meaning and structure.

1. The Theoretical Problem

1.1 Introduction

Though most contemporary researchers of language development and acquisition readily acknowledge the dual contribution of language input and innate cognitive or language-specific abilities, the relative contribution of each of these variables remains contested (Bates et al., 1998; Bowerman, 2010; Chouinard & Clark, 2001; Christiansen & Chater, 2016; A. Clark & Lappin, 2009; E. Clark & Bernicot, 2008; Elman et al., 1996). The data in this project contribute to this discussion by analyzing a case where normal input has been compromised. In particular, it provides a case study of children who live in Nebaj, Guatemala and who are insulated from the spoken language in their environment because they are deaf. The children's parents, siblings and friends are primarily hearing, and they speak Ixil[1] or Spanish. These children develop their own strategies to communicate using manual signs, and I refer to them as homesigners (see the Introduction for an overview of the term homesign). Unlike child homesigners studied previously in the United States, some of the child homesigners in the study interact with other deaf homesigners and by studying the structure of the homesign systems that they develop, we can begin to untangle the relative contribution of input to a child's acquisition of language.

This case allows us to test existing ideas about the order of emergence of different levels of linguistic organization in young sign languages (Aronoff, Meir, & Sandler, 2005; Brentari, Coppola, Mazzoni, & Goldin-Meadow, 2012a; Meir, Israel, Sandler, Padden, & Aronoff, 2005; Sandler, 2017; Sandler, Aronoff, Meir, & Padden, 2011b), the relationship between acquisition and the socio-communicative ecology (Brown, 2011; Heath, 2012b; Miller, 1982; Ochs, 1988;

[1] Ixil, sometimes spelled Ixhil, is a Mayan language in the Mam family. For more information see chapter 2, introduction and section 2.4.

Ochs & Schieffelin, 1986; Schieffelin, 1990) and to consider the case of interactions between homesigners (Haviland, 2013, 2016; Hou, 2016), in the context of deaf relatives at home or peer relations at school. In addition to specific hypotheses about the emergence of structures and distributions of phonological and morphological units that resemble those in standard sign languages, I consider whether patterns of language socialization typical to Nebaj, as well as ideologies about learning and teaching at home and in schools, have discernible effects on the social experiences of homesigners. These experiences are different from homesigners in other communities, and it is critical to continue to document ideologies of speaking and signing, as well as ideologies about language development and disability, in the social context of homesigners.

1.2 Theoretical Landscape of the Project

1.2.1 Interdisciplinary Work on Language Development

This project fits into a legacy of research that uses comparative anthropological approaches as a testing ground for psychological theories. In this case, the psychological theories under investigation concern the stages of language emergence on two timescales, first, in the ontogenetic timeline of an individual, developing child, and second, in the phylogenetic timeline of a community of individuals who ultimately produce a new language. Specifically, many theories about individual language emergence (in a single child) (Bates et al., 1998; Macwhinney et al., 2004; Tomasello, 2003) and communal language emergence (between individuals in a community) (Aronoff et al., 2007; Padden, et al., 2010; Senghas, 2003) focus on the relationship between external (social) factors and internal (innate, biological) factors that interact in the growth of a new language.

In the early 20th century, work by Franz Boas (1912) on immigrants to the United States initiated an emphasis on the plasticity of humans (both on human morphology and presumed/entailed cognitive plasticity) in the field of anthropology. This work has been described as "anthropology as cultural critic of developmental ideas introduced by psychologists and based largely on Western samples" (Levine, 2007). Boasian anthropology was carried forward by Margaret Mead (1928, 1947) and similar work was also undertaken by British anthropologist Bronislaw Malinowski (1929) in ethnographic studies designed to test contemporary theories from psychology. Many of these theories were based on data collected almost exclusively from Western upper-middle class participant groups. Mead's work on adolescent females in Polynesia (Samoa) was a response to claims about the universality of certain behaviors in adolescence (e.g., Hall, 1904) and Malinowski's work in New Guinea, with the matrilineal Trobiander group, was a response to Freudian theories of the universal Oedipal complex (Freud, 1999, 2016). Neither Mead nor Malinowski found these characteristics – previously declared 'universal' human traits – in evidence in the communities that they studied, highlighting the shortcomings of theories that suggest certain developmental processes are universal, based on evidence from limited or homogenous samples of participants. Mead and Malinowski's work also inspired a generation of documentation of communities outside of western cultures. However, Mead and Malinowski did not emphasize language socialization per se, rather, "Child-rearing was given a favored place in this scheme… but only in the sense that it was the initial phase of a persisting, self-replicating system that underlies human personality and behavior, including their organization and motive forces" (Munroe & Gauvain, 2010, p. 37). Decades later, Ochs and Schieffelin would issue a call to focus cross-cultural and cross-linguistic studies, with a particular focus on language development, as a strategy to better understand

trajectories of language acquisition that were suggested to be universal, but largely based on restricted samples from western cultures (Ochs & Schieffelin, 1986).

This project aims to take seriously the role of diverse inputs and contexts in the development of homesign systems. I begin, however, by articulating and addressing legitimate criticisms levied against similar "theory-testing" studies which emphasized cross-cultural work (Du Bois, 1944; Kardiner, 1939, 1945) or *holocultural* studies (Whiting, 1963; Whiting & Child, 1953; Whiting & Whiting, 1973) to assess the breadth and diversity of child-rearing practices. One of the most well-known cross-cultural comparative studies, the *Whiting Comparative Field Project* (1973), established some of the basic methodologies that continue to be used in socialization studies. These methods included focal follows – tracking the activities of a single child over developmental time to understand the allocation of their time – as well as repeated observations and summary act categories, and were foundational for future cross-cultural comparisons, particularly in developing measures that would allow for quantitative compatibility both within and across cultures. Munroe and Gauvin (2010) describe these studies as instances of 'childhood determinism,' and are critical of conclusions that they assert overextended and overstated the role of early experience on later personality. Levinson and Malone would also criticize unsubstantiated claims from this work, e.g., "Many of the holocultural studies of… the effects of child rearing practices on adult personality… *are not direct tests of the hypotheses they claim to test*… The [hypothesized] cause and effect are measured, the mediating variable (e.g., fixation) is not" (1980, p. 198). This critique remains valid today, but some of the recent work on specific practices of language socialization (e.g., participant structure, de León (1998, 2015), and visual attention, Brown (Brown, 2011) offer promising starting points as possible mediating

variables between social causes and linguistic effects. The current study situates itself in this more recent tradition.

1.2.2 Disciplinary debates: Linguistic Data, Competence versus Performance and implications for Homesign

Brown and Gaskins (2014) characterize the divide between developmental psychologists – who study "language acquisition" – and linguistic anthropologists – who study "language socialization" – in terms of different theoretical interests, values and analytical methods. They describe psychologists' principle focus on "the nature of the language capacity itself… [and] language as a capacity of the individual human mind" (187,189), compared to anthropologists' focus on "how the child as novice embedded in a culturally constituted environment develops communicative competence and sociocultural membership" (188). Recent overviews of the field of language socialization highlight linguistic anthropology more generally, and language socialization in particular, as a testing ground and advocate for attending to the immense variability and plasticity of human behavior (see discussion above), with a specific focus on human communicative behavior. The authors self-consciously set language socialization in opposition to language acquisition (from Ochs & Schiefflin, 2012, pp.1-2)

> Language socialization arose out of an anthropological conviction that language is a fundamental medium in children's development of social and cultural knowledge and sensibilities, a domain that the field of language acquisition does not capture…language socialization research emerged in the 1980s to consider aspects of the sociocultural environment of children's communicative practices that were left out of linguistic, psychological and anthropological studies. Suddenly, what children were told, by whom, and in what language variety or register became as important as the order by which particular sounds or syntactic constructions were being acquired

1.2.3 Socialization and Homesign

This section provides an overview of theories of language socialization, with a particular emphasis on studies of beliefs and practices about children and their development. These theories illuminate the types of factors that are likely to affect the homesign systems that children develop and the ideologies about socialization shared between deaf and hearing parents. Early work on homesign emphasized the unique characteristics of the deaf child in a hearing family (sometimes termed "oralist homesign", Nyst et al., 2012), focusing on the ways in which these children's circumstances were different from typically developing hearing children in a hearing family. But some ideologies about child development, specifically about how children learn language, apply to both hearing and deaf children, whereas, in other cases, ideologies will be unique to hearing children or unique to deaf children. We need to look at both. The current study will provide the opportunity to consider the impact of different configurations of deaf and hearing adults and children, and to attempt to understand the role of ideologies of child development within this constellation of deaf and hearing families and children.

In a comparative study of "three developmental stories" – Ochs and Schieffelin (1986) highlight the three principle areas of focus for their work, including the social organization of the verbal environment, the extent to which children are expected to adapt to the environment (or the extent to which their environment is adapted to them) and the negotiation of meaning by caregiver and child (Ochs & Schieffelin 270-282). The most significant point for Ochs and Schieffelin is that there is more than one path to "becoming social" and that the process of becoming social is culturally constructed (271). To address these questions, Ochs and Schieffelin compare ethnographic studies of children in the United States, Western Samoa and Papua New Guinea.

They observe that (middle-class) Anglo-American adults in the United States go to great lengths to accommodate the developing child in terms of language comprehension and production. This is based on observations about the physical configuration of the child (often the child is set up to face the adult, in a face-to-face, dyadic conversation), the treatment of the child as a legitimate interaction partner from birth (engagement of the child in proto-conversations from a very early, preverbal age) and more generally rich interpretation of any expression from the child combined with "self-lowering" (Irvine, 2002) or simplifying speech addressed to young children. These practices seem to be somewhat specific to the primary caregiver in US (Heath, 2012a; Ochs, 1988; Watson-Gegeo, 1992). Ochs and Schieffelin tie these practices to a general discomfort with relative incompetence and underdevelopment of the child as a social actor and efforts to mask the child's current state of development. Importantly, the expert communicator's efforts in this regard often construct an explicit interpretation of the developing speaker/signer's utterance, and this interpretation is then available to the child (Chouinard & Clark, 2001; H. Clark & Wilkes-Gibbs, 1986).

Ochs and Schieffelin contrast the circumstances in middle-class families in the United States with families in Western Samoa and Papua New Guinea. In Kaluli families from Papua New Guinea, Schieffelin observes that children are rarely treated as legitimate conversation partner, to be directly addressed in a dyadic interaction, as children in the United States are. In terms of their physical orientation, children are faced outward from their mothers, and often are props in triadic interactions in which their mother voices for them using speech that is not simplified, as child-directed speech in the United States context is, but is marked by higher pitch and nasalization (274). The Kaluli believe that children must be explicitly shown how to speak, and they are frequent recipients of speech that they then repeat back in the context of specific

social situations. Importantly, Ochs and Schieffelin note that any responsibility for clarification of unclear speech is assigned to the child. Unlike children in middle-class American families, caregivers do not reformulate unclear utterances from the child, the child is expected to adapt to the social situation, not the other way around (277). In many respects, interactions with children in Kaluli society reflect a broader ideology that is characterized by an aversion to guessing at the intentions or goals of others, "there is a cultural dispreference for talking about or making claims about what another might think, what another might feel, or what another is about to do" (275). This cultural dispreference informs the socialization practices that are characteristic of interactions.

In the final comparative "developmental story," Ochs and Schieffelin discuss socialization in a highly stratified, hierarchical Samoan society. Similar to the Kaluli society, children are rarely addressed directly before they are mobile. Talk is directed at infants, and older children are directed to repeat utterances from caregivers. Children are often sent as messengers, because of their unique position in the social hierarchy, but this also gives them opportunities to practice repeating and using language with a variety of interlocutors of varying social rank. In terms of clarification, in this Samoan community, responsibility for verbal clarification is based on the social status of the two (or more) interlocutors engaging in conversation. The lower ranking interlocutor is responsible both for clarifying any of their own utterances that are ambiguous or unclear, and for correctly interpreting or clarifying speech from the higher ranking interlocutor, in the case that they produce utterances that are ambiguous or unclear. In Samoan society, notions of respect for higher ranking member are associated with the ability to take the perspective of a higher ranking person. Thus, although these patterns of

interaction resemble the Kaluli in some respects, they are grounded in a distinct ideology about who speaks and who clarifies interactions.

I include the specific examples described above because they highlight the range and variability of both practices of communicating with children, and the ideologies that underlie these practices. In chapter two, I discuss the socialization practices that have been documented in communities similar to Nebaj, and in chapter three, I describe patterns of interaction that I have observed between parents (some deaf homesigners and some hearing) and children (some deaf homesigners and some hearing) in my project. The broader implications of Ochs and Schieffelin's work is that there are not universal ways of interacting with children. Even within the United States, work by Heath (1982) and Miller (1982) demonstrated that there is enormous diversity in the ways in which children are physically oriented, when and how caregivers address and engage children in conversation, and the characteristics of a dedicated child-directed register of speech or sign, as Ochs and Schieffelin observe, "simplification is culturally organized in terms of when, how and extent" (285), but perhaps more significantly, in both the Kaluli and Samoan contexts, "caregivers do not speak in a dramatically simplified manner to very young children. They do not do so for different cultural reasons" (ibid). Importantly, the first aspect of variability in socialization is to note the presence or absence of particular practices, but the second is to understand that the reasons for the presence or absence of the same behavior are also diverse and the social goals of caregivers should not be assumed to be equivalent across cultural groups (285).

For homesign, the significant question is that, if we are to take the socialization literature seriously, then we must consider a wider range of social behaviors that can impact the nature of homesign systems that emerge in that context. Within a given cultural group, then, it is critical to

first establish what the typical socialization practices are, and then to consider how and whether these will be adapted in the case of one or more homesigner adults or children. As noted above, I return to these questions, with respect to Nebaj, in chapters two and three.

1.3 Linguistic Structure and Homesign Systems

1.3.1 Linguistic Structure in Homesign Systems and Standard Sign Languages

Whereas the previous section reviewed the literature on the social context that will be relevant for later components of this project - in terms of the social context of homesign – this section reviews the literature on linguistic structure in homesign systems and young sign languages that have already been documented and studied. I focus on providing background on two aspects of linguistic structure, which correspond to chapters five and six, including: the organization of units that contribute to the meaning of an utterance (treated in chapter 5) and the organization of units that do not contribute to the meaning of an utterance, but are contrastive – distinguishing one utterance from another (treated in chapter 6). In chapter 7, I analyze properties of emergent lexicons of signs, focusing the interaction of social context and features of the lexicon. For each topic, I discuss the significant theoretical concerns in linguistics broadly, then those issues as they relate to sign languages and finally existing studies of each topic in homesign or a young sign language.

Ultimately, this work gains interpretive value when it is placed alongside similar data from other languages. The data elicitation methods (discussed in detail in chapter 4) were selected to afford comparisons between the participants in this study and the following established and young sign languages: American Sign Language (ASL), British Sign Language (BSL), Italian Sign Language (LIS), Hong Kong Sign Language (HKSL), the young sign

language Nicaraguan Sign Language (NcSL) and adult and child homesigners who live in Nicaragua. The stimuli materials used to elicit the data that is analyzed in chapters five and six were used with all of the groups listed above, offering a rich comparative sample of standard and young sign languages (Brentari et al., 2016; Brentari, Coppola, Mazzoni, & Goldin-Meadow, 2012a; Coppola & Brentari, 2014a; Goldin-Meadow et al., 2015; Horton et al., 2015).

1.3.2 Meaningless Contrastive Units (Phonology) in Standard Sign Languages

The units of language that provide contrast between unique sign or speech types, without contributing to the denotational value of the token, are typically referred to as phonemes. The most basic, and frequently cited, examples are illustrated in Hockett (1960) and Saussure (1921) with minimal pairs of words from spoken English. Minimal pairs are tokens with different denotational values, identical in all phonological features except one, or, alternatively, forms for which the substitution of one phonemic segment results in a change in meaning. For example, the English words '*pin*' and '*bin*' which differ only in the first consonant segment of the word. Because these are different words English, these segments are included in the inventory of phonemes specific to the English language. More specifically, /pin/ and /bin/ differ only in the voicing feature of the /p/ and /b/ segments, both are bilabial stops, but /b/ is voiced while /p/ is voiceless.

In early work on sign languages, William Stokoe (1972, 1976) identified the features of handshape, movement and location (place of articulation) as the components of signs that distinguish minimal pairs of signs in American Sign Language, and analogues of spoken language sound features like voicing, place of articulation or nasality. Later models of sign language phonology added orientation and non-manual features, and further subdivided

handshape into articulatory features that serve as unique contrasts in minimal sign pairs (see Brentari 1998, forthcoming).

Despite identifying these phonological features of signs using traditional (minimal pairs) methods, sign linguists frequently noted the limited set of minimal pairs in many standard sign languages (e.g., Eccarius & Brentari, 2010). The basic structure of signs poses a further difficulty to conducting phonological analyses that are analogous to spoken language phonological analyses. Sign languages include more simultaneous processes of articulation, an affordance of the visual-manual modality, but this seems to interact with the number of phonological alteration processes that are used in spoken languages to test things like sound change

If the phonological level of language is fundamentally about the creation/existence of basic oppositions that mark tokens with different denotational values, then a critical factor in the study of these units has been on processes that neutralize or otherwise violate these oppositions. This brings us to the system-wide organization of these oppositions. Rather than consider each opposition in isolation, Autosegmental phonological theory (Goldsmith, 1976) accommodates two levels of in the phonology, one that includes the discrete units, and another, parallel *autosegmental level* that spans discrete units and accommodates languages with tonal features, which often span multiple otherwise discrete phonemes. In addition to acknowledging the more simultaneous nature of many features of phonology, empirical work on systems like homesign pushes us to considers the system-wide distribution of features. Even in the absence of identifiable minimal pairs, Clements (2001), proposes alternative types of contrasts, including *prominent features* that are associated with morphological form. This theory was taken up in sign language research by Eccarius and in Eccarius and Brentari (2008, 2010). Brentari (forthcoming) suggests that distributional patterns and prominent contrasts, such as the pattern of handshape

complexity considered in this dissertation, may also serve as indicators of a phonological level of organization, even in the absence of traditional methods for identification of phonologically contrastive units, whether or not that feature participates in a documented minimal pair.

In Chapter 6, I present descriptive analyses of the distribution of handshape units and complexity in the set of signs that homesigners produced across multiple tasks. These sets are treated as representative of the homesigner's lexicon. I consider whether homesigners systematically vary the handshapes they use in their descriptions of two kinds of events – those with a human agent and those without a human agent, with particular attention to handshape complexity. The results of this analysis address the first and second research questions introduced above. The first question concerns the relationship of different levels of organization in a communicative system, like phonology and morphology, and the order of their emergence, while the second question concerns the relationship between properties of these emergent levels of organization and properties of the communicative ecology of the homesigner, that is, different communicative ecologies (family, individual, peer) promote conventionalization of different levels of organization (phonological level, morphological level, lexicon).

1.3.3 Meaningful Units (Morphology) in Standard Sign Languages

Early research on sign languages emphasized the complex morphology, often produced simultaneously on a single verb or predicate (Klima & Bellugi, 1978; W. C. Stokoe, 1972; Supalla, 1983). Cross-linguistically, many sign languages were found to have complex polymorphemic predicates, similar to heavily inflecting languages. In an example from Aronoff et al (2005), the verb LOOK-AT "can be inflected for subject and object agreement as well as for temporal be accompanied by a grammatical nonmanual (e.g. facial) marker adverbial. Such a verb, meaning, for example, 'he looked at it with enjoyment for a long time', consists of five

morphemes" (p. 302). Aronoff et al emphasize that there are, in fact, two types of morphology in many sign languages – highly complex, simultaneous morphology, and fairly simple, sequential morphology, often appearing as a single affix, derived from a lexeme in the language. One example is the affixal morphology for agentive forms, derived from verbs, in American Sign Language (ASL) (Aronoff et al, 2005, pp. 312-313). The set of affixes is fairly restricted, for example, approximately five have been identified in ASL (Sandler & Lillo-Martin, 2006).

In this dissertation, I present an analysis of the first type of morphology – specifically polycomponential predicates, that are typically referred to as classifiers in the sign language linguistics literature (Emmorey, 2003; Zwitserlood, 2012) – and ask whether there is distributional evidence in homesign for a specific phono-morphological form found in many standard sign languages (Benedicto & Brentari, 2004; Benedicto, Cvejanov, & Quer, 2007; Brentari et al., 2016, 2012b; Coppola & Brentari, 2014b; Goldin-Meadow et al., 2015).

All standard sign languages documented to date (with the exception of Adamorobe Sign Language (AdaSL) (Nyst, 2007), have constructions used to iconically desribe the movement or arrangement of objects in space. These are termed spatial classifiers or spatial predicates (Emmorey, 2003; Engberg-Pedersen, 1993; Padden, 1983; Supalla, 1982) and are one of three classes of verbs, including spatial, plain and agreeing verbs, identified by Padden (1983).

In some analyses of classifier verbs, a verbal root is produced with a classifier handshape, defined in Zwitserlood (2012), "Classifiers are generally considered to be morphemes with a non-specific meaning, which are expressed by particular configurations of the manual articulator (or: hands) and which represent entities by denoting salient characteristics" (p. 158). Benedicto and Brentari established that, in American Sign Language (ASL), classifier handshapes with *handling* iconicity, i.e., classifier handshapes that iconically resemble the way a hand

manipulates an object, license an external agentive argument in classifier verbs, while classifier handshapes termed *whole entity*, that iconically resemble a size or shape dimension of an object, do not license an external argument (Benedicto & Brentari, 2004; Benedicto et al., 2007). This finding was based on acceptability judgments from native signers, but was later extended to diverse groups of signers in a descriptive elicitation task (Brentari et al., 2016; Brentari, Coppola, Cho, & Senghas, 2017; Brentari, Coppola, Jung, & Goldin-Meadow, 2013b; Brentari et al., 2012b; Coppola & Brentari, 2014a; Goldin-Meadow et al., 2015). I use the same elicitation tools in the analyses in Chapter 5 of the dissertation to compare distributional patterns of handshape types (handling handshapes and object[2] handshapes) in homesign with the patterns found in prior work on standard and young sign languages.

1.3.4 Form-Meaning Pairs: Emergence of a Lexicon in Homesign Systems

It is a common intuition that human language depends on a stable collection of form-meaning mappings – whether spoken words or manual signs – that constitute 'consensus on a set of distinctions' (Hutchins & Hazlehurst, 1995, p. 6) or a shared lexicon. That these forms are conventional is also tacit in many theories of language structure and acquisition, "Lexemes, and the information about them in the lexicon, are conventional – that is, these form-meaning pairings are common knowledge among the speakers of the language, and we have had to learn these particular associations of form and meaning from other members of the language

[2] The analysis in Benedicto and Brentari (2004) focused on *whole entity* classifiers, which represent the shape of an object. In our analyses we include forms from homesigners that resemble both whole entity and size and shape (SASS) classifiers from standard sign languages. Size and shape classifiers represent a specific size dimension of an object, but not necessarily its full shape. We call this set of handshapes in homesign systems *object handshapes* to avoid confusion with the term *whole entity*, which refers to a specific subset of classifier handshapes in ASL and other standard sign languages.

community" (Murphy, 2010, p. 6). Further, theories of morphological and and phonological structure often presuppose a stable, conventional set of forms. A significant body of work, however, demonstrates that there is substantial variation in lexicons across dialects of the same language, and even within the same dialect (Trudgill, 1995). Lexical items fall out of common use and new ones are taken up that reflect cultural and technological change, as well as social cohesion and group identity (Eckert, 2012; G. Guy & Hinskens, 2016; Labov, 1963; Milroy & Milroy, 1985) and while it is possible to disentangle the complicated etymology of many words in languages with written records, the processes by which lexicons develop and conventionalize in spoken languages are obscured by centuries of transmission and contact. Additionally, there remains substantial disagreement about how lexical changes actually occur, e.g., how or why new words are introduced and spread in languages (Eckert, 2012; Labov, 2001). As a result, researchers have developed two methods that make it possible to observe the emergence or construction of novel lexical forms in controlled experimental settings, these include laboratory studies, termed experimental semiotics (Galantucci, 2005; Scott-Phillips & Kirby, 2010; K. Smith, Kirby, & Brighton, 2003; K. Smith et al., 2016) and computational models (Gong, Baronchelli, Puglisi, & Loreto, 2012; Richie, Yang, & Coppola, 2014; Yang, 2002). Laboratory studies of language emergence have obvious benefits, particularly the ability to control social parameters in the interactive environment – for example how many times participants are able to interact or the amount of exposure participants have to input (see Scott-Phillips & Kirby, 2010 for an overview).

This dissertation is similar to these experiments, because the homesigners who participate are exposed to different quantities and types of communicative input, but it is a departure from the controlled environment of laboratory experiments and computational models.

The data are drawn from homesigners who are members of overlapping categories, and it is often difficult to precisely quantify the amount and types of input they receive. The value of this data, however, is that it is more similar to ecologically valid interactions, daily talk, and offers insight into the communicative practices of children and adults using their primary communication system, rather than inventing a system in the context of a behavioral experiment.

In Chapter 7, I use two methods to describe the sets of signs that homesigners produced in elicitation tasks, again, treated as illustrative of their lexicon of signs. I measure convergence on particular sign forms for participants who are in contact with each other, compared to participants who never interact. I also measure the likelihood that all signers use the same sign form for a given item in the stimulus set, suggesting that there may be some signs that are so tied to the shared context and experience of being a member of the Nebaj community, that there is a high probability that all signers will converge on this form, regardless of whether they are in direct contact. Lastly, I analyze the sets of signs that homesigners produced in terms of two measures of information in the system of signs: the most frequent sign and the proportion of the set that consists of signs produced only once in the set – the hapax legomenon. These identifiers suggest how much a given homesigner produces unique signs, versus a sign that is used to describe multiple stimuli items. The signs that homesigners use to describe multiple stimuli items may be less informative for a specific item, but may serve to highlight categories, or similar properties of referents. The signs that homesigners produce only once in the set, and which are therefore only associated with one referent, are maximally informative, but might ultimately tax the memory or cognitive resources of a signer and their interlocutors. The results in Chapter 7 address the third research question introduced at the beginning of the introduction, specifically, the relationship between direct interaction and convergence on a shared set of signs.

1.4 The Relationship Between Communicative Ecology, Linguistic Structure and Lexical Convergence

The guiding questions for the studies in chapters 5, 6, and 7 are the following:

(1) Do particular elements of linguistic systems emerge earlier than others in child homesign systems?

(2) Are particular elements of linguistic systems associated with particular features of communicative ecologies?

(3) Is sign form convergence associated with direct interaction between two homesigners?

The first question concerns language emergence. Across the diverse emergent and young sign languages that have been studied to date, researchers have contested which levels of linguistic organization emerge first in the gradual development of a language in a community of users. This study adds to the growing body of work on emergent languages with an additional example of micro-communities in which we can ask about the emergence of a morphological versus a phonological level of organization in the sign systems that participants develop.

The second question concerns the relationship between particular ecologies and different levels of linguistic organization. The variation in communicative ecologies that the participants in this study represent provide an opportunity to isolate specific factors that might contribute to the emergence of one level, such as a phonological level of organization, relative to other kinds of conventionalization like the emergence of a stable lexicon.

Finally, the third research question addresses the role of direct interaction in the emergence of a stable, shared lexicon of signs. The diversity of experiences in the sample of participants for this study includes participants who frequently interact with other homesigners as

well as participants who never interact with another homesigner. This offers the chance to consider the relative role of sustained, daily interaction versus brief, intermittent interaction, on the set of sign forms that signers regularly use.

These questions are grounded in mixed methods that combine a close ethnographic study of the daily interactions and routines of homesigners in deaf families and homesigners who attend school together with other deaf peers. To capture the diverse socio-communicative experiences of these participants, the project develops the concept of communicative ecologies. Communicative ecologies provide a framework for thinking about the numerous dimensions of the social and linguistic context that shape all children's language learning processes, including: beliefs about children and their development, access to linguistic input, access to formal education and the presence of other people who share the same system for communication. Communicative ecologies illustrate a potential mechanism to expand our knowledge and awareness of the social factors that shape homesign systems. Communicative ecologies help us to answer the guiding questions above, as potential mediating factors in the diverse structures that we are able to identify in child homesign systems.

2. The Historical, Cultural and Linguistic Setting of Nebaj, Guatemala

2.1 Introduction to Nebaj

Nebaj (Naab'a') is a *municipio*[1] located in the Western region of the Quiche Department of Guatemala (figure 1). It is the largest of three towns in the Ixil region, which shares its name with the local Mayan language (see map, figure 1). The region lies within the Cuchumatanes mountain range that begins in Chiapas, Mexico and runs through central Guatemala to the eastern coast of the country. Altitudes in the region range from 700-3,000 meters above sea level, Nebaj is at an elevation of 1,900 meters. The closest large town is Santa Cruz del Quiche, the capital city of the Quiche department. Nebaj is 155 km north of Guatemala City. The municipio of Nebaj has 106,237 inhabitants[2] (INE, 2002), with approximately 70% of the population living in rural *aldeas*, or hamlets, surrounding Nebaj. The remaining population – over 30,000 people – reside within the bustling town of Nebaj.

[1] In Guatemala, the 22 primary administrative subdivisions (Departments) are further divided into municipios, most similar to counties in the United States (Stoll 1993, Tax 1963). Nebaj is one of 21 municipios in the Quiche Department.

[2] Population estimates vary, but this one is taken from a projection of the 2002 census (INE 2002)

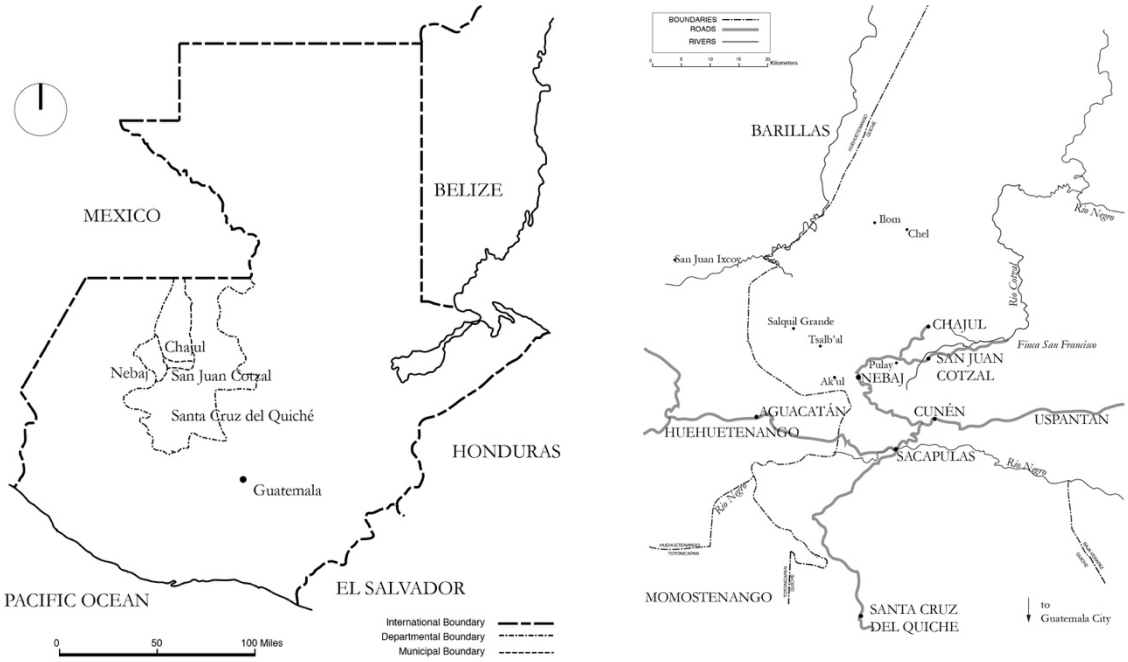

Figure 1. Map of Guatemala (based on Colby and van den Berghe, 1969) showing the municipios of Nebaj, Chajul and San Juan Cotzal (left figure) and a more detailed view of Nebaj and surrounding areas, including Cunén, Sacapulas and Huehuetenango (right figure).

This chapter is a sketch of the social and cultural history of the Mayans who live in the Ixil region, beginning with the distant past, continuing through time to the people I work with as part of this study. I am not able to go into detail about many dimensions of this history, and I dwell primarily on aspects of the literature that are relevant to my project, specifically, historical and contemporary patterns of labor, migration and education; traditional family and socialization practices in this community; the history and structure of Ixil, the spoken Mayan language in Nebaj; and cultural beliefs about language and development in childhood and across the lifespan.

The first section of this chapter consists of a historical overview of the Ixil region, focusing on Nebaj. I begin with the most distant past, locating Nebaj in a long history of continuous residence in the Cuchumatanes mountain range in Northern Guatemala. I briefly

discuss the effects of colonial contact with the Spanish and the impact of the recent civil war (1960-1996). I also discuss the effects of migration to the United States in recent years, and the national project of universal education in Guatemala. The second section of the chapter provides an overview of beliefs about childhood, development and learning in Mayan communities, drawing on ethnographic studies conducted in Guatemala and Mexico beginning in the 1940s. In the next section, I provide an overview of the structure of Ixil. Ixil is spoken by the majority of Nebajeños, alongside Spanish, which is the language of instruction in local schools. The final section is a sketch of present-day Nebaj (as of 2017), based on existing government sources and observations from my fieldwork.

Acknowledgement of the long history and ethnographic characteristics of other Mayan communities contributes to our understanding the social world that the child homesigners at the center of this study inhabit. Understanding the social lives of children, in Guatemala, in Mayan communities, and in Nebaj, in particular, contributes to a richer conception of the interaction of social factors and the structure of emergent homesign systems. Social practices informed by both a long history of practice and contemporary ideologies, shape the interactions in which homesigners are participants, and these interactions shape the homesign systems themselves.

2.2 Social and Historical Context: Mayan communities in Mesoamerica

2.2.1 Nebaj through Historical Time

2.2.2.1 Ancient and Colonial Nebaj

Archaeological evidence suggests that the Ixil region was not densely populated during the earliest periods of Mayan history (before 200 AD). The area appears to have been the site of a more densely populated, stratified community and trade or cultural center from 600 to 1000 AD. Based on artifacts from tombs located in Nebaj (Smith & Kidder, 1951), the Ixil-speaking area (in and around Nebaj) benefited from its location along trade routes between highland Mayan communities (to the south) and lowland Mayan communities (to the north); some records indicate that there were well maintained trade routes and roads extending from the Ixil area to communities in the Yucatan peninsula in modern-day Mexico (Balduini 1856, cited in Colby & van den Berghe 1969).

The region was primarily dominated by the Quiché kingdom centered in Utatlán (just outside the modern departmental capital, Santa Cruz del Quiché), in the immediate period before Spanish contact (Carmack, 1981), but maintained contact with other Mayan groups through extensive trade networks (Colby & van den Berghe, 1969, p. 39-40). This was the status of the region, as well as can be determined from the archeological evidence, at the time of Spanish conquest. In 1530, when a Spanish force, supported by veteran Mexican Indian auxiliaries, was dispatched from Mexico to conquer a local holdout in the town Uspantan, 50 kilometers east of Nebaj, Colby and van den Berghe (42) estimate the population of the Ixil area was approximately 20,000-25,000. When the Spanish did conquer Nebaj, and eventually Uspantan, they governed the region primarily through local Ixiles, members of the already existing noble class in the community.

In the subsequent decades, previously scattered small settlements or hamlets of Ixiles, were concentrated in four population centers: Nebaj, Chajul, Cotzal and Ilom. This forcible

relocation had significant implications for both crop cultivation and disease transmission. Records of repeated requests to the Spanish monarchy for reduction of tribute payments from Nebaj, Chajul and Cotzal reflect the devastating reduction of the population in the region through the mid-eighteenth century (Cook & Borah, 1960; George, 2015; Hill, 1987, 1991; Warren, 1989; Colby and van den Berghe, 1969).

2.2.1.2 Nebaj in the Guatemalan Civil War, 1960-1996

Nebaj and the surrounding rural enclaves (*aldeas*) were devastated by Guatemala's prolonged civil war which officially began in 1960 and lasted through the 1996 signing of peace accords. During the war, more than 200,000 people died or disappeared (83% estimated to be Mayan) and more than 1.5 million people were displaced (CEH, 1999; Sanford, 2003, p. 149).

In Nebaj, many families[3] fled into *montañas*, the densely forested mountains and ravines surrounding Nebaj and its *aldeas*. Families lived in the mountains for months or years, to avoid the military presence in town and under the somewhat volatile protection of the various guerilla groups in the region, primarily the Guerilla Army of the Poor (EGP), later the Guatemalan National Revolutionary Union (URNG). These communities came to be called the "communities of population in resistance" (CPRs), though Stoll reports that many refugees simply refer to this period as time in the *montaña*, spent living in crude shelters in proximity to their *milpas* and without the ability to migrate to coastal plantations for wage labor, without access to commercial

[3] Stoll reports that in the early part of the 1980's, as many as 50,000 civilians were living in the mountains, with fewer than 25,000 remaining there for the next decade. The majority of these (72% of registered refugees in 1988) were Nebajeños. As of 1992, the communities of popular resistance (CPR) in the mountains numbered 17,000 12,000 estimated to be Ixiles (Stoll 1993, p. 147).

goods, and variable degrees of cooperation with the EGP (Stoll, 1993, pp. 131-132). Many Ixiles starved in the mountains or were "disappeared" (García, 2014; Sanford, 2003; Stoll, 1993). When these populations returned from the mountains, frequently in response to government promises of amnesty, many of these families were resettled in "resettlement villages," variously referred to as "model villages" and "development poles" (Chapin, 1988; Stoll, 1993, pp. 156–160). Twelve were established in 1985, followed by sixty more villages by 1990, often inhabited by men and women who had been part of the guerilla movement only months prior (Stoll, p. 156). The nature of these villages is contested, with some reports describing them as nothing more than concentration camps, but Stoll insisting that they offered better conditions than the *montañas*, and the ability to migrate to coastal *fincas* for the desperately needed wage labor required to pay for reconstruction of destroyed homes and *milpas*. "However poor these people had been before the war, they had always been able to return from the plantations to solid adobe-and-tile houses stocked with spare clothes, blankets and tools, surrounded by domestic animals, and proximate to maize fields. Now they had lost everything down to their cooking utensils" (Stoll 1993, p. 159).

More recently, Nebaj has been the focus of significant aid and intervention from both the Guatemalan government and external Non-Governmental Organizations (Philpot-Munson, 2009; Stoll, 2013). The town is home to multiple grassroots community organizations that have advocated for exhumations of massacre victims buried in clandestine graves to be interred in the local cemetery, as well as actively pursuing charges of genocide in the trial of former leader General Efraín Ríos Montt for genocide committed between 1982 and 1983 in the Ixil region (García 2014, forthcoming).

2.2.2 Formal Education in Nebaj

In his early ethnography of Nebaj, Lincoln (1945) notes that the first school in Nebaj was started by a ladina[4] woman named Doña Juana B., who moved to Nebaj from Sacapulas in 1890. Lincoln reports that initially the local population resisted her arrival, repeatedly burning the materials she had stored to construct a house. Eventually Doña Juana did succeed in building a home, which she used as a boarding house for the first *ladinos* to visit Nebaj, and also opened the first school to teach Ixiles written and spoken Spanish (Lincoln, 1945, 60-62, p.113-115). Colby and van den Berghe suggest that the increase in a local *ladino* population in Nebaj (and Chajul and Cotzal) in the first decades of 20th century was associated with higher rates of literacy, school attendance, and greater integration of the region with the national economy (Colby and van den Berghe 74).

In 1945, Gerardo Gordillo Barrios, an illegitimate son of planter Lisandro Gordillo Galán and a *ladino* schoolteacher and congressman from the Ixil region, encouraged two *ladino* teachers to open a school to teach Ixil children Spanish in preparation for the regular schools in the area, taught primarily by monolingual Spanish-speaking *ladino* teachers (Stoll 1993, pp. 43-45). The *Escuela de Castellanización,* supported by the national government, was staffed by exclusively *ladino* teachers, but the youngest classes were taught by instructors who knew some Ixil, thus transitioning their monolingual Ixil-speaking students into the Spanish-only environment of later years of schooling. Despite this program, in the early-mid 1960s, when

[4] *Ladino* is the term used in Guatemala for people who wear Spanish or non-indigenous styles of clothing, speak primarily Spanish (instead of an indigenous language) and interact primarily with other *ladinos*. The social division is based primarily on these social and cultural characteristics and less so on any genetic inheritance. See Colby and van den Berghe (1969) for a sociological study of *ladino*-indigenous relations in Nebaj in the mid-20th century.

Colby and van den Berghe conducted fieldwork in Nebaj, indigenous students constituted only 12-15% of total enrollment in the two local urban schools, taught by exclusively *ladino* teachers (Colby and van den Berghe, p. 158). In 1950, 19% of the *ladino* population of the Quiche department was enrolled in school, while only 1.8% of the indigenous population was enrolled (ibid 159).

The *Escuela de Castellanización* also trained bilingual *promotores*, to prepare indigenous children for school classrooms taught in Spanish. This venture was additionally supported by USAID and Bible translators from the Summer Institute of Linguistics[5] (SIL), (Stoll 1993, p. 45). Significantly, *promotores* became some of the first members of an Ixil "professional" class, and important cultural mediators when political unrest began in the early 1980s. These early efforts reflect the ambivalent stance of the Guatemalan national government towards bilingual education.

The first Ixil teachers entered classrooms in Nebaj in 1967, but all disappeared or were assassinated in the early years of the war (Stoll, p. 209). By 1989, eighteen new Ixil primary teachers had been hired, but the national teacher's union advocated for Spanish as the language of instruction in all schools. Stoll suggests that this is motivated by the fact that any preference for bilingual teachers would disadvantage *ladino* applicants (ibid). Additionally, Stoll claims that the violence in the Ixil region during the war actually boosted school attendance, from 1,273 in 1979 to 3,320 in 1988 (with 1,108 additional students enrolled in the preprimary bilingual education programs). He attributes this to the concentration of the population in response to the violence and subsequent resettlement into model villages (Stoll 1993, p. 210). Enrollment in

[5] The Summer Institute of Linguistics, SIL are a team of Bible translators, who aim to teach indigenous Maya people to read the New Testament in their native language

higher grade levels of education (grades 7-12) also increased in the early 1990s, but absenteeism remained high, particularly when families would migrate to the coastal plantations, or *fincas*, taking their children with them (ibid). By the mid-1990's, the Guatemalan national government legally instated a national program for bilingual education, as well as the right to an education for girls (Maxwell, 2009, pp. 84–85).

Despite apparent commitment to universal, bilingual primary education – for example, the government built 24 new normal schools that specialize in bilingual education between 2002 and 2003 – there continue to be significant barriers to universal education, including severely restricted funding, limited resources within schools, and frequent teacher strikes (Maxwell, 2009). This is the institutional context of the *Escuela Oficial para Educación Especial de Nebaj* (EOEE - The Official School for Special Education in Nebaj), one of the primary sites of this study. I discuss this site in greater detail in chapter 3, but ideologies about instruction and language use, pervasive in the national education system, filter into the EOEE via local teachers who are employed by the national government to work at EOEE. I have spoken with some teachers at EOEE, during my time in the field between 2013 and 2017, who suggest that EOEE is not a particularly desirable teaching placement, but that there is such an imbalance in the number of trained teachers and teaching positions (the 40,000 teachers actively employed in 1990 were vastly outnumbered by the 60,000 trained teachers waiting for an appointment, Stoll, p. 211) that they were willing to work at the school for a year or two while waiting for a better placement.

2.2.3 Contemporary Mayan Communities

2.2.3.1 Household Composition and Family Units

In his study of life cycles in the Kaqchikel-speaking community of Atchalán[6], anthropologist Moore (1973) notes that, although the household is the central social unit, its shape and composition change over the life cycle of an individual and a family (38). "If an infant is the last of many offspring, he is likely to be born into a 'nuclear family'. That is, the household will consist of his parents and his brothers and sisters only. When he marries and brings a wife to that household, he thereby turns it into a 'joint family,' composed of two (or more) nuclear families living together" (38). Similarly, in a study of Canteleño community, Nash (1958) notes, "The nuclear family is the unit of consumption, production and ritual performance, child rearing and religious activity. It is the family which has social status in the community, and it is the family, rather than individuals, which takes turns in the discharge of civil and religious offices" (40).

Nash identifies three types of family in Cantel, including: the nuclear family, patrilineal joint family, and compound family. The nuclear family consists of two generations of parents and children, and is the most frequent and stable social unit. Nash notes that the patrilineal joint family, consisting of three generations, the oldest married couple, and one (or more) of their married children and grandchildren, as well as the compound family, consisting of a combination of multiple nuclear families, typically related by kinship, are considered unstable, and "deny one of the nuclear families its full social position" (41). While the patrilineal joint family and compound family arrangements certainly happen in Nebaj, most often due to economic circumstances, they are not the most desirable household structure, based on conversations I

[6] Moore does not reveal the precise location of Atchalán, a pseudonym for the town where he conducted fieldwork between 1965 and 1970. Based on photos from his book, the town is in proximity to Antigua, near Lake Atitlán.

have had with friends and acquaintances, and most families in these circumstances express a desire to move to an arrangement of a nuclear family. Several of the families I work with in Nebaj have cycled through these arrangements during the course of my fieldwork. Household composition and living circumstances are relevant for homesigners, especially homesigners who are children, because it impacts the number of adults and other children in their immediate social network.

For example, Rosa, a child homesigner participant in this project, used to live in a compound family with her grandfather, Pedro, who is also deaf. Rosa was surrounded by cousins, aunts and siblings, and had daily contact with Pedro as well. Her family has since relocated to a separate house, approximately ten minutes, walking, from their former compound home. Rosa's family is now a "nuclear family" again, consisting of only Rosa, her mother and father and siblings, in their house. The home of Diego (Rosa's grandfather) transitioned from a compound family, to a "consanguineal family," (Moore 1973, p. 39), consisting of family members related by blood, not by marriage. This household contains Pedro and his unmarried daughter, who is Rosa's aunt and Luisa's sister. Rosa's family visits Diego and her aunt frequently (at least a few days each week, according to Luisa, Rosa's mother) and all of the children (Rosa and her younger siblings, Ana, aged one year, Diego, four years and Alberto, six years old) travel back and forth between the homes independently as they wish.

In terms of kinship ties, Nash notes that although the nuclear family is the primary social unit in Cantel, "this is not a kinship society" (40), rather he notes that although women – mothers and daughters or sisters – may maintain closer and more intimate ties than male relatives, "The respective kindreds should be viewed as a set of respect relationships, with opportunities to ask things of kinsmen one would not ask of a stranger. But whether or not one seeks out a kinsman

depends as much upon mutual attractions and personal adjustments as it does on the kinship tie" (Nash 1958, p. 44). Similar to fluid household composition, I have found Nash's characterization to be consistent with the families I know in Nebaj. Deafness, of a child or adult, does not seem to drive particular affiliation or contact. Diego and Tomás, for example, are cousins whose families used to live in the same family compound, but the family of Tomás soon moved to a new nuclear household, on the other side of town and he is now a great distance from Diego.

Even within a family compound like the one that Tomás and Diego shared, there are unspoken or unmarked boundaries between family homes. Moore notes, "there are tacit circles of privacy around hearths, which may be surrounded by other, tangible barriers such as cornstalk fences" (38). Significantly, while Nebajeños who are deaf may choose to interact with each other when they are in shared social settings, deafness *per se*, does not seem to predominate as an identifying characteristic, and certainly does not subsume social units like nuclear or extended families. This characteristic has been noted by researchers working with deaf individuals in other communities (Kisch, 2012; Kusters, 2014b; Nyst, 2015).

2.2.3.2 Life Cycles

I discuss children's social worlds in greater detail in section 2.3.1, however, here I briefly mention some of the significant milestones and practices that have been documented in other Mayan communities that resonate with my own experiences in Nebaj. Returning to Moore's account of the life cycle in Atchalán, there are elaborate traditions surrounding the birth and baptism of newborn babies in the community (34-36). The baby and mother are somewhat physically isolated from other relatives and friends initially, and there is a ritual process of selection of godparents (*compadres*) for the new child. The relationship between

compadre/*comadre* and child is more often an economic one, with the chosen couple serving as *compadres* committing to a life-long relationship of support for the new child. The ceremonies surrounding the baptism, including meals and visitations to the home of the new baby, are centered more on the couple that will serve as compadres, than on the infant (Moore 1973, pp.34-6).

These events are significant for homesigners, however, because they serve as a preliminary introduction and recognition of the child as a social member of the community. With early medical intervention and diagnostic services largely absent in Guatemala, a deaf child would likely participate in these ritual passages just as a hearing child would. Significantly, the deaf child in Nebaj is likely not immediately diagnosed or identified as deaf at birth. Thus, the profound and deep alteration that characterizes this news for parents in, for example, middle-class American families, is notably absent. The child begins the initiation into the social world on the same trajectory as any other infant. I do not know if this is the case for all children who are born deaf, however, Luisa, Rosa's mother, reported to me that they were not aware that Diego, Rosa's younger brother, was deaf, until he was over a year old. This in spite of their knowledge that both Rosa and her grandfather, Pedro, are deaf.

There are several cultural facts that might contribute to this inattention to the hearing status of a new baby, in addition to the absence of hearing tests at birth, including a certain flexibility about children's development (discussed in detail in the next section) and also certain physical characteristics of how infants are carried and socially addressed (also discussed in the next section). Significant for us here, is the fact that deaf child is started on the path to becoming a social actor in the community, and although they cannot hear the Ixil being spoken around them, they are not treated or addressed differently relative to their hearing siblings.

2.2.3.3 Labor and Migration

Historically, Ixiles were subsistence farmers, cultivating primarily corn and beans, with one harvest season per year in autumn or winter. Most cultivation is done by hand, the land is cleared with machetes and axes, and furrows are made with hoes. In the past, it was more common for farmers to practice slash and burn agriculture, in which a field was used for two to three years, then a new field was cleared. The first field would lie fallow for five to six years, and would then be cleared and burned and returned to cultivation. Today, fertilizer has made agriculture more intensive, and continuous cultivation is more common(Stoll, 1993; Watanabe, 1992). However, few families have adequately sized plots of land to produce all of the corn necessary to sustain a family, thus they are forced to purchase corn and other food to sustain a family throughout the year. The purchase of chemical fertilizer, to increase the productivity of small plots of land for *milpas*, requires an additional source of cash income (Colby & van den Berghe, 1969; Stoll, 2013; Watanabe, 1992).

Ixiles primarily cultivate corn or maize. After drying on the stalk, maize is harvested and shelled by hand for seeds to be used in the planting the following year. The remaining maize is stored and periodically rehydrated to create be ground into *masa* (cornmeal), used to make tamales, tortillas, and the hot corn drink *atole*. Tortillas are the primary food for most families, and are eaten with chili, salt or a sauce of crushed tomato. Some Ixiles grow beans, which are boiled with chili. Most keep chickens, primarily for eggs, which are scrambled and eaten with tortillas. Meat is a rare luxury for most families, and frequently boiled and served in a soup (*caldo*) with other vegetables like carrots, *ayote* (a type of squash), and potatoes. Families often drink hot beverages, like corn or rice *atole*, or a weak coffee with chili.

In their study of the Ixil region, Colby and van den Berghe attribute a significant shift in the structure of economy in and around Nebaj to coffee cultivation in Guatemala, "coffee cultivation destroyed the isolation of the Ixil zone, and led to its gradual impoverishment" (71). Between 1855 and 1890, Guatemalan coffee exports grew from 5 tons per year to 25,000 tons per year. As coffee is a labor-intensive crop, many of the larger coffee plantations on the coast sent labor recruiters to the Ixil region to recruit wage laborers, by force if necessary. Beginning in the 1870s, liberal political reforms at the national level made large church estates available to private landowners and dissolved communal landholding, leading to an influx of *ladino* and European transplants to the region (Lincoln 1945). During this period, Doña Juana, a *ladino* woman from Sacapulas moved to Nebaj and later opened one of the first schools in the area (ibid). Migration to the coffee *fincas* on the coast peaked around 1909, with 6,000 Ixiles migrating to the coast annually. By the time Lincoln, one of the first anthropologists to visit Nebaj, arrived in 1940, this number had decreased to 600.

Colby and van den Berghe (1969) assert that Nebaj's integration into the national economy is a relatively recent phenomenon, "only during the last seventy-five years did Ixil country become significantly integrated into the complex plural society of modern Guatemala" (79). They claim that prior to this period, the Ixil region constituted a "largely autonomous, monoethnic sub-society… with a largely self-sufficient economy" within Guatemala. The transition to a regional economic center, connected to Guatemala City and beyond through exports of labor and import of basic goods (i.e., movement away from a subsistence economy), is a consequence of several factors, including an increasing number of *ladinos*[7] who gradually

[7] By 1921 *ladinos* comprised 4% of the population of Nebaj, 6.5% of the population of Chajul and 2.2% of the population of Cotzal (Colby and van den Berghe, 1969, p. 74)

came to dominate local government, population increases, soil erosion and emigration of the able-bodied workforce to coastal plantations (Colby and van den Berghe 74). Whereas historically, Ixiles were compulsorily forced into labor for plantations (under the encomienda system, during Spanish colonial rule, see Colby and van den Berghe 46-51), in contemporary Nebaj, men and families without land voluntarily migrate seasonally to the coast for the work on plantations. Though this work is dangerous, it is one of the few reliable sources of wage labor for many families. This pattern fits with longstanding patterns of seasonal migration (voluntary or otherwise) but affects homesigners mostly in terms of the composition of their households, which may be absent one or more adult family members for months (if the migration is to the *fincas*) or years (if the migration is to Guatemala City or the United States). In all of the families that I know in Nebaj, there is at least on family member currently in the Unites States, or in the process of trying to travel to the United States. Families endure immense financial strain to send a son or brother or uncle or father to the United States, with the tacit assumption that this family member will send remittances from the United States once they arrive and are able to work (Ibáñez-Holtermann, 2011; Stoll, 2013). I know children, for example, who do not remember seeing either of their parents in person, because their parents migrated to the United States when the child was less than two years old.

2.3 Ideologies of childhood

2.3.1 Beliefs about learning and language development in Mayan communities

Gaskins (1999) offers one of the most detailed and thorough studies of childhood in a Mayan community, documenting stages of development and socialization of children growing up in a village in the Yucatan in Mexico. She identifies three cultural principles of engagement that

shape interaction between parents and young children in this community, including (1) the primacy of adult work, (2) the importance of parental beliefs and (3) the independence of children's motivation (Gaskins 1999, pp. 32-37). Based on my own fieldwork, many of these features are also characteristic of child-rearing in Nebaj and have the capacity to impact the way that parents interact with hearing and deaf children alike.

In the Yucatec community where Gaskins works, and in Nebaj, the primacy of the child is far less common than in many middle-class American families, as Gaskins notes, "Life… as experienced by children is structured around adult work activities. In particular, it is not structured around young children's interests or desires, nor around adult goals for children" (33). Although these patterns of behavior seem unusual compared to families in the United States, Rogoff (1990) suggests that in communities where children are more integrated into adult activities, they experience more of the day-to-day going-ons of the adult world which they will eventually inhabit. She notes that in the Mayan community where she works, "Children are present at most events of interest in the community, from work to recreation to church. They are able to observe and eavesdrop on the ongoing processes of life and death, work and play, that are important in their community. As infants, they are often carried wherever their mothers or older siblings go, and as young children they may do errands and roam the town in their free time, watching whatever is going on" (Rogoff, 1990, p. 124). For a child who is deaf, these practices necessarily involve them in the activities of daily life. Although they cannot hear the language spoken around them, they accompany adults and older children everywhere, and are everywhere able to observe social interactions between adults, as well as participate in social interactions with older and younger siblings and same-aged peers.

Moore (1973) characterizes the general trajectory of a child, in the Atchalán Mayan community where he works, in terms of stages described by Margaret Mead (Mead, cited in Moore, p. 40). These stages include the "lap baby," "knee baby," and "yard child". Moore adds an additional category of "street child". Each of these stages are characterized by particular relations to other members of the family, as well as dependence and autonomy from adult or older sibling supervision. Moore notes that, in Mayan communities, the "lap baby" might well be termed the "shawl baby" (see figure 2).

Figure 2. Infants and Toddlers in Nebaj are typically carried on their mother or an older sibling's hip or back. They are secured using a *rebozo* or woven shawl and are taken everywhere the mother or older sibling goes. (All photos taken by the author in Nebaj, though the huipil of some of the women indicates they may be from the *municipio* of Chajul). All photos throughout the dissertation taken by the author unless otherwise noted.

"For many months after baptism the lab baby, swaddled and wrapped, spends most of his time cradled in his mother's shawl, carried at her back or hip" (Moore 1973, p. 41). The

placement of a baby on its mother's hip or back has implications for the kinds of interactions mother and baby can have, particularly when one or both are deaf. In a study of a family of homesigners from a Zinacatán community in Chiapas, Mexico, Haviland describes the difficulty of a hearing child being carried by his mother who is deaf. The child wants his mother to look at him so that he can point something out to her. Ultimately, and with great frustration, the child physically redirects his mother's eye gaze to the thing he wants by turning her head with his hand (Haviland, 2013). This physical arrangement means that the infant accompanies their mother or sibling caregiver in all contexts, in all social circumstances, observing from the physical comfort of the rebozo. The hearing infant also has access to all conversation that takes place between their caregiver and others, while the deaf infant does not. The deaf infant does, however, have substantive opportunities to observe the physical behaviors that accompany spoken language conversations, which would not be the case if children were relegated to more distinct child-specific spheres of social interaction.

Largely due to patterns of child birth and child-rearing in Nebaj (and other Mayan communities) the lap baby or shawl baby will transition to a "knee" child and then a "yard" child when their mother gives birth to her next child. Moore notes that this transition can be alarming and somewhat upsetting for the child, but that they typically enter into a lively social group of other slightly older siblings who become caregivers and playmates (Moore, 1973, p. 40). Importantly for children who are deaf, this seems likely to be the first moment in their lives when the fact that they do not speak, or vocalize but do not sound like other children, likely becomes salient. For the first time, they are social actors, and the expectation is that they will actively engage in conversation. Once a child becomes a "yard child" they are free to wander wherever they desire, whenever they want, thus I have observed a two-year-old toddler, who is deaf,

wander into the *milpa* adjacent to his house and not return for an hour or more. Deafness does not seem to impinge dramatically on typical patterns of child behavior or expectations. Deaf children who are girls are still expected to care for younger siblings and assist with household chores like laundry and cooking. The final stage that Moore appends to Mead's taxonomy is the "street child," who, around age seven, is considered old enough to be sent to the store or the neighbor's house on errands (Moore 1973, p.43). As a street child, they may leave the home early in the morning and not return until later in the evening and are likely in the company of other similar-aged children throughout the day. Sometimes they will have started school, boys may begin accompanying their father to the *milpas* at this age to assist with hoeing, planting and harvesting. Children are also sent out to gather firewood to fuel kitchen stoves, which sometimes requires a long walk into the mountains to gather kindling. Again, children who are deaf are not, in my experience, excluded from participation in these activities, in fact, they are expected to contribute in exactly the same way as their hearing siblings.

The absence of child-centric practices is accompanied by the belief that children's development unfolds naturally, and is fairly insulated from any outside intervention on the part of adults or other people in the child's life, "development and socialization are both thought to be ongoing, gradual and continuous processes. Parents are not particularly concerned about monitoring children's developmental progress nor in structuring experiences to improve or hasten it" (Gaskins 1999, p. 34). In a Tsotsil-speaking community, Nabenchauk, (Zinacantán, Chiapas, Mexico), de Leon notes that "Development is described as an ongoing process, *chtal/chul xa xch'ulel* 'its soul (i.e., its understanding) is coming/arriving'" (de León, 1998, p. 136). The notion that children will develop, with or without adult intervention, provides some context for my frequent interactions with parents of deaf children who expressed their belief that

their child was choosing not to speak, rather than being unable to hear. Some adults I spoke with told me that sometimes children just do not speak until they are older, one friend told me that one of her daughters did not talk until age seven. In large families of ten children (or more), one child who lags behind a bit in terms of speech may not be particularly noteworthy, especially if adults believe they can do little to alter the outcomes of their children's developmental trajectory.

Lastly, as Gaskins highlights in her third cultural principle of engagement, although children are involved in directed adult-like work activities, they are also judged to be capable of making decisions for themselves from a very young age. Even young children make decisions about when and where they will sleep or eat, whether they will attend school and if they will take medicine (Gaskins 1999, p. 37). I know of children who do not want to start school, even past the typical starting age of seven years old, and parents have essentially expressed the opinion to me that there is nothing they can do to compel the child to attend against their will. Rogoff (1990) observes that children are "freed from direct supervision by adults by age 3 or 4 and then move around town with a multi-age group of children, amusing themselves by observing ongoing events and imitating their elders in play" (Rogoff 122-3). In a study of children from San Pedro la Laguna, a highland Mayan town, Rogoff used spot observation (Johnson, 1973; Munroe & Munroe, 1971) to track children's activities and conversation partners (Rogoff, 1981). She finds that the amount of time that children are in the company of an adult decreases sharply across childhood, beginning at age one year, when all children were in the company of an adult at every spot observation, to age fourteen, when children were in the company of an adult just 50% of the time. This pattern differed dramatically from the observations in which children were involved in direct interaction with an adult. At age one year, children were involved in direct interaction with an adult only 55% of the time and by age three to four years, this number dropped to less than

10% (Rogoff, 1981, p. 23). Thus, being co-present with an adult did not entail direct, communicative interaction with that adult, a demonstration of Gaskins' principles of the primacy of adult work and lack of child-centered efforts on the part of adult caregivers.

This absence of a direct connection between adult and child relatives, and interaction between related adults and children, is particularly critical for child homesigners. The mere presence of two deaf individuals in a single household does not guarantee that the two relatives will interact with any frequency, especially when one of them is a child.

The Rogoff study also finds a dramatic difference between rates of interaction between adult women and children versus adult men and children. In the San Pedro community, children were far more likely to be in the company of adult women than adult men, a pattern that mirrors my own experience in Nebaj. Men often leave their houses quite early in the morning, if they are walking to their *milpas* which can be miles away from home, or if they have paid work doing construction or as a day laborer. Men are also often away to work on *fincas*, or in the United States[8]. Thus, the gender of the adult who is deaf and related to a child who is deaf will also affects the degree of contact and interaction between two related homesigners. This gender difference also characterizes same-aged interactions, between siblings and peers. Nash reports that in one family he observes, the siblings "operate on the principle of age respect and male dominance. The boy, who is the youngest, is given special privileges within the household in regard to his sisters, and both he and his sisters take it as given that he is somewhat more important than they" (Nash p. 46).

[8] While there are certainly both men and women who migrate to the United States from Guatemala (as well as entire families), it has been my experience that the majority of people who have migrated are young males between 16 and 30 years old.

In families of homesigners in Nebaj, age and gender preferences predominate as guides for interaction, more than deafness. For example, in one family I work with, two siblings, Jose and Juana are both deaf. In my observations of them, however, Jose interacts more with their young brother, Andres, who is hearing, than he does with Juana. Jose and Juana attend the local EOEE school for special education, and here again, Jose is far more likely to engage with the two other male students who are deaf, Tomás and Diego, or other male students who are hearing, than he typically interacts with Juana.

In this section, I have discussed some of the patterns of development and social interaction that characterize a child's social world in Nebaj. These characteristics are shared with many other Mayan communities and are driven, in part, by the belief that a child will develop into an adult without special intervention, support or prompting from adults. This belief is coupled with strongly-held sensibilities about learning and observation, versus direct, pedagogical instruction, which I turn to in the next section.

2.3.2 Styles of Learning and Teaching in Mayan Communities

Nash (1958) conducted a study of factory workers in the K'iche'-speaking town of Cantel. He documents the training process for new factory workers, hired to run mechanized weaving looms, noting that the new worker was assigned a trained worker to observe, which she did for approximately six weeks. She asked almost no questions, sometimes moving in closer to observe when the weaver made adjustments, and sometimes fetching new spools of yarn. After six weeks, she announced that she was ready to begin operating the loom herself, and began running it, almost as efficiently as the weaver she had been observing for six weeks. She had never touched the loom itself, prior to this. Nash suggests that there is a strong prohibition against

asking questions, which might annoy the person teaching or training a novice, and also against attempting a new task until the novice feels confident that they can perform the task without errors. He notes, “This method of learning no doubt has severe limitations and may not function when the learning is symbolic or of purely mental operations, but it works in teaching the simple tasks of running cotton textile machines. Management reports six weeks as about the upper limit of anyone learning to run a loom or a spinning machine” (Nash 27).

This style of silent observation, internally rehearsing and memorizing the steps necessary to complete a task, is characteristic of almost all instruction and training for skills like weaving, farming and domestic chores like making tortillas. “Little verbal instruction accompanies the acquisition of any skill, even in such complex tasks as weaving. Girls watch their mothers and older sisters weave long before they are allowed to try their hand. When they finally do, explicit guidance is rare, but a girl learns quickly about any mistake she has made” (Watanabe, 1992, pp. 96–97).

In addition, the play-as-imitation of adult work, described in the preceding section, functions to give children extensive practice at adult tasks before they attempt them. “Other play imitates work. By the time they are four years old, most boys have miniature hoes. Then, too, their fathers may take them to their cornfields, just to play idly or to follow along imitating their fathers with their tiny hoes. Little girls may play at kitchen work. They are given small bits of cornmeal dough and allowed to shape them into lumpy, inedible tortillas” (Moore, 1973, p. 43). I have observed girls as young as seven who are adept at making tortillas, indistinguishable from those prepared by their mothers and older sisters, this includes young girls who are deaf. Significantly, for a child who is deaf, there is no barrier to learning by observation, since this is likely how they would acquire these skills anyways. In the case of deaf children in Nebaj, their

learning is simply more closely aligned with children who are hearing, who are also not in the habit of receiving explicit verbal instruction or guidance to learn new skills.

Formal education in Nebaj, and other Mayan communities in Guatemala, often introduces a radical departure from this observational style of learning, but it is still possible to see traces of this ideology in the ways that children engage with their work in the classroom. Ochs (1988) describes a similar contradiction for Samoan children, engaged in literacy instruction for the first time (Ochs 1988, pp. 189-209), "The role and behavior of adult and child in the class of events we might call 'literacy classroom instructions' match those characteristic of many adult-child social interactions in Western middle-class society… On the other hand, they do not match certain traditional Samoan beliefs, values and social norms that underlie the relationship between adult and child. We posit that a global effect of literacy instruction is a change in the social identity of the child in Samoan society" (Ochs, 1988, p. 190). I observe a similar tension in the role of children in Nebaj, reflected, again, in observations made by Moore about schools in the village of Atchalán, "These schools do not aim at the incorporation of the individual into his native community, as do the Indian (sic) brotherhoods. Rather, the national schools aim to incorporate the child into the nation. Like the rites of passage… schools act - over an extended period of time - to separate children from their households, isolate them together with their peers, and then incorporate them into the wider Guatemalan citizenry…" (Moore, 1973, p. 122). The general pedagogical strategy in the Guatemalan primary schools that I have observed (both regular and special education) can be described as a process of recitation and replication. The details of a typical day at the EOEE school, where I have worked as an assistant teacher during trips to the field between 2013 and 2017, are described in chapter 4, but the basic structure of most lessons consist of a teacher writing material on the board, which is then copied and

completed by students in blank notebooks that are maintained throughout the year. This is true for writing, including vocabulary words, sentences and fill-in-the-blank exercises, as well as math, with teachers writing a list of arithmetic problems on the board that students then copy down in their notebooks and complete.

Moore describes the process of assigning students to classrooms, "From year to year, the teachers must marshal the children, aged seven to fourteen, and sort them into classes according to age, time served in the schools, and demonstrated skills. It is theoretically possible for a first-grade class to contain a person fourteen years old who has simply started his school career six years late. It is further possible for a first-grade class to contain persons who have been there for all six of their school years because they could not demonstrate the minimal skills necessary for advancement. Such possibilities are extremes. However, no class that I observed followed exactly the ideal pupil timetable. No class was composed either of pupils of exactly like age - within one year of each other - or of pupils perfectly able to respond to the tasks put to them" (Moore, 1973, pp. 132–133).

After a teacher writes material on the board, students race to copy down the material and complete problem sets as quickly as possible, before approaching the teacher to review their work. Here again, Moore's description of a classroom in Atchalán reflects my own experience, "…There is no attempt made to correct each error as it comes before test teacher. There is no minimal standard of comprehension. The minimal standards of behavior that Don Juan does demand concern the ability to copy well, not the ability to comprehend written material or to solve the problems. Children may leave Don Juan's first grade - or any other first grade in Atchalán - good copiers, but little else" (Moore, 1973, p. 147). Although Guatemalan primary schools may incorporate a surprising amount of copying and rote memorization from a Western

perspective, these practices do fundamentally alter the daily routine of the child living in Nebaj, and distinguish their experience of childhood quite radically from that of their parents. Additionally, while students may not be developing the problem-solving or critical thinking skills emphasized in a Western curriculum, their experiences do affect their mental representations and their performance on cognitive tasks. In a study of Zinacanteco children, Greenfield and Childs (1977) find that experience with weaving affected how children conceptualized a pattern presented to them in another format (using wooden sticks to replicate patterns that are common to clothing woven on a backstrap loom). However, only experience with formal education in school seemed to facilitate children's ability to extend a novel pattern in a new context. This pattern was strongly supported by a longitudinal follow-up in the same community, 43 years later (Maynard, Greenfield, & Childs, 2015).

For children who are deaf, the visual nature of material written on the board, which they must copy down, in some ways makes the content more accessible. Additionally, it potentially provides them an avenue into written Spanish that is not accessible to them when instruction is primarily or exclusively oral. Deaf students at the EOEE school are very adept at copying from the board, often outpacing the other students in the class, without access to any of the teacher's verbal instructions (see chapter 3, section 3.5.6). This is not to say that deaf children in regular or the EOEE schools in Nebaj have an ideal learning environment. They are certainly not provided with full access or equal opportunity to engage with the content that is being presented by their teachers. They are, however, in some ways more able to participate equally with their peers, because the tasks demanded of them require less attention or reliance on verbal instruction.

2.3.3 Language Development and Socialization in Mayan Communities

The emergence of the field of language socialization has demonstrated repeatedly the immense variation of trajectories of language learning in childhood (Ochs & Schieffelin, 2011). It is thus unsurprising that there is variation in socialization practices, and acquisition of grammatical forms, within communities of speakers of the Mayan languages (Brown, 2011; Brown & Gaskins, 2014; L. de León, 1998; Pye, 1986a; Pye & Pfeiler, 2014). In an observational study of children acquiring the Mayan language Tseltal in Mexico, Brown describes interactions between adults and infants in the first year of life as limited. The child, as described above, is characteristically transported in a shawl, is rarely set down and thus fairly restricted in their independent movement (Brown 2011, 36-37). She states that adults are fairly non-responsive to infants, most attention given to them is in an effort to soothe or calm them when they are upset (ibid). This echoes Rogoff's finding (described in the preceding section) that although children may be in the company of an adult, this does not automatically translate into direct, face-to-face, or even indirect, interaction or conversation between adult and child.

In contrast, to Brown, de Leon (1998) describes frequent engagement with infants in a Tsotsil-speaking Zinacantán community in Chiapas, Mexico. She documents a dedicated lexicon of "motherese" vocabulary used only with prelinguistic infants (p. 145) and argues that children are frequently engaged as "side participants" in conversation, present for talk about them or adults who voice for them, before they are vocal themselves (ibid 141-142). In contrast to other studies of Mayan communities (Brown, 1998, 2011, Pye, 1986a, 1986b; Pye & Pfeiler, 2014; Wagley, 1941), de Leon observes adults and older sibling caregivers treating preverbal infants as "proto-addressees" (142-143). De Leon clarifies that speech to children does not follow the typical turn-taking, dyadic structure of many Western middle-class parent-child interactions, but

rather pre-verbal infants are implicated in conversation through rhetorical strategies like interactional routines, multiparty teasing, a simplified register and rhetorical questions (144-149). De Leon argues that these strategies contribute to a larger trajectory of developing "participatory competence" in the child, that adults do take seriously their role in facilitating this process and that, rather than being "eavesdroppers," children are "active, non-vocal participants" in conversation (151-2).

I have not conducted rigorous observations of hearing mothers and children in Nebaj, but my informal observations in Nebaj align more closely with Rogoff and Brown's characterizations of adult-child interactions in the San Pedro La Laguna and Tseltal communities (respectively). Though I have observed frequent teasing directed at young children, I have not observed as much talk directed to pre-verbal infants as de Leon reports[9].

This section provides a brief overview of the patterns of language socialization and development that are characteristic of some Mayan communities. They are significant for the child homesigners in this study because these patterns and beliefs about children, how they develop, how they learn and how they acquire language, shape the childhood experience of deaf and hearing children alike. The relative indifference of many parents to their children's progress may permit a child who is deaf to grow up in a context in which they develop their own strategies for communicating with the many hearing adults and peers they encounter in their social lives. Either way, it seems reasonable that the stark differences between parenting in Nebaj and parenting in Western middle-class communities might have significant implications for the

[9] Though again, I would note that this could be due to the informal nature of my observations. It is possible that with a more detailed observational study, I would find that adults address preverbal children and voice for them as pseudo-participants in conversation.

communicative strategies and structure that emerges in child homesign systems. In the next section I briefly introduce the spoken language that deaf children in Nebaj cannot access, due to their hearing loss. Though this project does not go into detail about the relationship between the structure of Ixil and the structure of homesign systems developed in Nebaj, there are researchers who suggest that certain elements of the spoken language in contact with homesign systems will filter into those systems, particularly when there are a significant number of signers using a shared sign system, who also speak the local language (Le Guen forthcoming).

2.4 Contemporary Nebaj

2.4.1 The Community of Nebaj

Figure 3. The main street in Nebaj, leading to the Parque Central and cathedral.

Indigenous Ixil people are the majority of Nebaj's population today (the indigenous population was estimated to be 88.6%, INE 2011). Inhabitants continue to work 'milpas,' or family-owned plots of land, where they grow corn and other crops. Many men, but also entire families, migrate to the coast of Guatemala for weeks or months each year for wage labor on

plantations or *fincas*. This pattern of seasonal migration extends back to the earliest days of the Spanish conquest, when indigenous Mayans were forced to provide free labor under the encomienda system enforced by the conquistadors (Colby and van den Berghe 1969). In the late 1960s, Colby and van den Berghe (1969) estimated that 4,000-5,000 Ixiles continued to migrate to coastal plantations for wage labor each month. The migration routes from Nebaj now extend even farther, to Guatemala City and the United States (Ibáñez-Holtermann, 2011; Stoll, 2013). Many of the families I know have two to four adult relatives who currently live in the US or are in the process of trying to reach America. These women and men work and send back a percentage of their wages, known as remittances, to family still in Nebaj.

On the streets in Nebaj, it is typical to encounter an eclectic amalgam of traditional and contemporary influences. While most younger women maintain the traditional red woven skirt, or corte, they often pair it with a t-shirt from local stores that sell American secondhand clothing, and they can be seen, seated "sidesaddle" on motorcycles and scooters, driving through the center of town. In the local market, vendors sell traditional hand-woven huipils alongside stalls filled with neon-colored plastic bowls, chairs and trashcans and mass-produced backpacks that feature American cartoon characters. The language spoken on the streets and in the market is typically Ixil, but Nebajeños under age 30 are typically bilingual Ixil-Spanish speakers – a consequence of loosely-enforced compulsory school attendance.

2.4.2 Informal survey of deaf people living in Nebaj

During my fieldwork[10], I have met 7 adults and 12 children who are deaf. I have been told about an additional 9 deaf individuals who live in the urban center of Nebaj or in nearby *aldeas.* To protect their identities, all participants are identified by pseudonyms. Some of the children I have worked with received donated hearing aids when they were younger, but none continue to wear them. All participants, children and adults, lack enough residual hearing to learn spoken Ixil or Spanish.

Fourteen of the deaf participants in my study have at least one deaf relative (a parent, sibling or cousin). Of the children who are deaf, three (Sara, Rosa and Andres) have an adult relative who is deaf, either a parent (Lucia) or grandparent (Andres). Six of the child participants have a deaf sibling (Jose, Juana, Rosa, Andres) or cousin (Sara, Jose, Juana, Tomás, Diego) who is approximately the same age. Two of the deaf adult participants (Lucia and Andres) are reported to have a deaf sibling as well. Demographic information from an informal survey of the community, compiled between 2013 and 2017 is presented in Table 1. The local school for special education is identified by the acronym EOEE, for Escuela Oficial para Educación Especial. The school is described in greater detail in the following section and chapter 4.

Table 1. Deaf Individuals in Nebaj and Their Relationships

Child	*Deaf Relatives*	*Age (first interview)*	*School Attendance (year began attending)*
Sara*	*mother*, Lucia; *aunt*; *cousins,* Juana, Jose	8 (2013)	local school
Rosa*	*grandfather*, Andres; *brother*, Andres	7 (2013)	EOEE (2017)
Andres*	*sister*, Rosa; *grandfather*, Andres	1 (2013)	NA
Tomás*	*cousin*, Diego	10 (2013)	EOEE
Diego*	*cousin*, Tomás	13 (2013)	EOEE
Jose*	*sister*, Juana; *cousin*, Sara; *aunt*, Lucia	10 (2016)	EOEE
Juana*	*brother*, Jose, *cousin*, Sara; *aunt*, Lucia	14 (2016)	EOEE
Antonio*		6 (2015)	local school (2017)
Jacinto*		8 (2015)	local school (2016)
Alejandro*		10 (2014)	EOEE (2015)
			local school (2016)
Eduardo✧	unknown	na	attended EOEE, 2013
Sergio✧	unknown	na	attended EOEE, 2013
Alicia	unknown	na	unknown

Adult	*Deaf Relative or Spouse*	*Age (first interview)*	*Employed*	*Married*
Lucia*	*daughter*, Sara; *niece*, Juana, *nephew,* Jose	38 (2013)	Yes	Yes
Marco	*brother*, Andres	na	unknown	unknown
Andres*	*brother*, Marco; *grandchildren*, Rosa, Andres	78 (2013)	Yes	Yes
Jairo*		29 (2013)	Yes†	No
Julio*		26 (2015)	No	No
Francesca✧	*husband*, Ramon	na	unknown	Yes
Ramon✧	*wife*, Francesca	na	unknown	Yes
Ana✧		na	No	No
Sergio	*wife*, Maria	na	unknown	Yes
Maria	*husband*, Sergio	na	unknown	Yes
Miguel	*father*, Jose	na	Yes†	unknown
Jose	*son*, Miguel	na	Yes†	Yes
Emilio	unknown	na	Yes†	unknown
David	*sister*, Paz	na	Yes	No
Paz	*brother*, David	na	Yes	divorced

**Participant in ongoing study of homesign systems in Nebaj*
✧I have met with this person, but they did not ultimately become a participant in the ongoing study
† A group of deaf adult men who work together to transport goods between from vendors' homes and the market

Table 1 includes demographic data about child and adult homesigners from Nebaj. The children who are deaf range in age from 18 months to 18 years of age. Most of the child homesigners I have worked with for the past five years were between the ages of 9 and 12 years

old. I have worked with some children and their families since 2013, but I began working with others as recently as 2016. All of the school-aged children attend a school. Most children in Nebaj begin attending school between ages seven and nine. One child participant (Andres) is too young to attend school. Several of the child homesigners (Juana, Eduardo and Sergio) no longer go to school regularly, either because they are too old or do not want to attend. Four of the homesigners (Sara, Antonio (I), Jacinto (I) and Alejandro (I)) go to local elementary schools near their homes (typically within walking distance). As far as I have been able to tell through informal conversations with their parents, they do not receive any special services at school and attend classes with other hearing students.

Four of the homesigners attend the same school together, the local school for special education (EOEE), described in detail in chapter 3. Currently the four regular attendees are: Rosa, Jose, Diego and Tomás. Rosa just began attending EOEE in 2017, after sporadically going to her local school for two years. Juana, Jose's sister, used to attend EOEE regularly from 2013 through 2017, but she stopped wanting to go to school in 2017, preferring to stay home and help her mother. Diego and Tomás are now almost too old to continue going to school at EOEE. Tomás, who used to attend daily now only goes to school 3-4 days each week and sometimes stays home or works in his father's sewing shop.

There are at least fifteen deaf adult homesigners in Nebaj. I have met eight of the adult homesigners, and have been told about seven additional adult homesigners. In Table 1, I present additional demographic information about each of the adult homesigners, including their marital status and whether they are employed. Most of the adult homesigners I have worked with did not attend school, but approximately half are employed and half are married, in some cases to other

deaf people. I discuss the integration of deaf adults into the larger community further in section 2.5.2.

2.4.3 Formal Education and Literacy in Nebaj

School attendance is widespread across Guatemala; however, a recent survey estimates that 29-35% of people in the *municipio* of Nebaj are illiterate (INE 2014). Based on a report published in 2008, Nebaj had 477 schools of various levels including pre-primary, primary and basic (see figure 4). There were 1,307 teachers and 43,879 students at the time of the report (de la Cruz et al, 2008). Schools include both typical primary schools, as well as normal schools specializing in bilingual education (Maxwell 2009).

Figure 4. Primary schools in Nebaj.

Currently, all of the school-aged deaf children in Nebaj attend school. Four of the deaf children attend the EOEE school for special education together, while four attend regular local schools. The deaf children who attend regular schools do not receive interpreting services and they do not attend the same schools, so they are the only deaf student in their class and sometimes in their school. The deaf adults I have worked with have very low literacy skills,

although some can write their names. Few of the deaf adults in Nebaj attended school, and some family members reported that this was because of their hearing loss.

2.4.4 Guatemalan Sign Language

Based on informal conversations with all of the deaf people I have met and their hearing relatives, deaf people in Nebaj have minimal or no exposure to Guatemalan Sign Language, abbreviated as GSM or LENSEGUA[11]. The first school for the deaf in Guatemala was founded in 1946. Based on a survey from 2008, there are ten schools for the deaf in the country today. Three of these schools use an oral teaching philosophy, focused on teaching their students spoken Spanish. The remaining schools use a version of total communication, including oral training and teaching in sign. I have not been able to visit any of these schools, they are located in Guatemala City, Huehuetenango, Quetzaltenango and other towns at least a half day from Nebaj by bus (Parks & Parks, 2008, p. 8).

The Asociación de Sordos Guatemaltecos (ASORGUA, the national association for the Deaf) has published two illustrated dictionary of LENSEGUA (R. I. de León, Reyes de Ramas, Bámaca, & Mendez, 2001; ASORGUA 2008), and there are copies of these volumes at Nebaj's local school for special education, La Escuela Oficial para Educación Especial de Nebaj (EOEE). Teachers at EOEE refer to these dictionaries sporadically, and some years the manual alphabet of LENSENGUA has been posted at the school (see figure 1a). In the classrooms, teachers use some signs that are illustrated in the LENSENGUA dictionary, but also use signs that are local,

[11] In the only published survey of Guatemalan Sign Language, Parks and Parks (2008) report that in Guatemala City, the association for the deaf, ASORGUA, uses the acronym LENSEGUA (Lengua de Señas de Guatemala). The International Organization for Standardization (ISO) uses GSM (ISO 639-3) as the official acronym.

and familiar to the students at the school, for example, a sign that involves pointing to one's eye to indicate that the student should pay attention to or look at something (see figure 1b). I have observed teachers using these signs supplemental to speech in Ixil or Spanish.

2.5 Deafness and Social Relations

2.5.1 Deaf-Hearing Interactions in Nebaj

In terms of communicative interactions between deaf and hearing people, the microcosm of the EOEE school appears to generalize to the larger community of Nebaj. In the school, deaf students freely interact with other hearing students but also engage in longer exchanges with each other where possible. Deaf people do not generally appear to seek the company of other deaf people over family and neighbors who are hearing[12]. One exception to this is a group of deaf men who work together in the local market to transport vendors goods from their homes to market stalls. When working in the market, the deaf men have abbreviated signed conversations with hearing customers and vendors and are able to negotiate their responsibilities and errands with relative ease. I have observed the group of deaf men to have lengthy conversations with each other, involving teasing and what appears to be rapid, fluent signing.

Gestural exchanges between deaf and hearing Nebajeños is not limited to people who interact regularly, or to adults. I have observed interactions between deaf and hearing people, both adults and children in public and private spaces. Roberto, one of the deaf students at the

[12] This situation is similar to Mayan communities described by Johnson (1991) (in Yucatan) and Fox Tree (2009) (in Nahualá, Guatemala) where they observe a general lack of Deaf solidarity. See Friedner (2014) and Kusters (2014a, 2014b), however, for alternative constructions of deaf communities in Bangalore, India (Friedner) and the Adamorobe village in South-Ghana (Kusters).

EOEE school, used to work as a *lustrador*, or shoe shiner, in the central park in town. One day, while shining a customer's shoes, Roberto had an extended conversation with the man. Although he was hearing, the customer did not hesitate to engage with Roberto using improvised signs and also by acting out parts of his story.

2.5.2 Deaf Employment and Social Integration in Nebaj

Some deaf adult men in Nebaj are employed, with many working in the local market to transport goods from vendors' homes to their market stands. Many of the deaf men also have families with children (see table 1). The deaf adult women primarily stay at home, although one works outside of Nebaj doing seasonal farm labor and one occasionally works outside her home making tortillas and doing laundry. Three of the deaf women have children, although one is unmarried and one is divorced

2.5.3 Attitudes towards deafness in Nebaj

During preliminary interviews with families, I was often told that a child could certainly hear the people around them talking, but chose not to speak. I have heard this echoed for deaf adults as well. When one of my friends who helped to introduce me to families in Nebaj was discussing a neighbor who was deaf, she described him as "not being able to speak" or "choosing not speak," but she appeared puzzled when I asked whether he was deaf.

In some Mayan communities, not-speaking is associated with "spooks" and bad luck. Watanabe, in a study of the Mam-speaking community in Santiago Chimaltenango, notes

"Encounters with a more dangerous type of *siky'puul*[13] called *mib'inaq* invariably presage bad luck. Usually seen late at night on a deserted street, *mib'inaq* always appear as silent women dressed in Chimalteco garb with their long hair hanging loose instead of bound up neatly in the usual fashion… As walking dead, as voices without bodies and bodies without voices, *siky'puul* are anomalous and therefore symbolically appropriate mediators between cultural categories" (Watanabe, 1992, p. 68).

When asked directly about deafness, friends and acquaintances express indifference or a somewhat negative attitude about the social status of Nebajeños who are deaf. Parents typically state that they are concerned for their children's future employment prospects and sometimes for their physical safety – for example, that they will not be able to hear approaching cars on busy roadways. Common explanations for deafness include the presumption that something bad happened to the mother during pregnancy including a physically abusive husband. One person suggested to me that children who are deaf might have been dropped on their heads when they were infants – though I pointed out that this seemed somewhat unlikely to happen multiple times in one family, in the case of a family with several children who were deaf.

The negative attitudes about deafness expressed by many Nebajeños are somewhat diffused by the relative lack of salience of deafness as a coherent social category. I have also observed many hearing people to interact quite freely with deaf people in public spaces, using a combination of pantomime and common gestural emblems to carry on short conversations. Thus, it seems that at least some residents of Nebaj maintain a dual impression of deafness and people who are deaf. They view deafness as a handicap and disability associated with negative

[13] The term *siky'puul*, which Watanabe translates as "spook" is derived from the stem *siky'pu-*, meaning "frighten" in Mam (Watanabe 1992, p. 68)

experiences or premonitions and reduced intelligence, but also, they do not appear to maintain a negative or prohibitive ideology regarding attempted communication with people who are deaf. For male deaf Nebajeños, I have not observed any concerted effort to socially isolate or keep deaf children or adults at home, as sometimes seems to be the case for females who are deaf in Nebaj, and deaf people in other parts of the world (Kisch, 2008; Kusters, 2014b; Nyst, 2015).

3. An Ethnographic Study of Homesign in Nebaj

3.1 Introduction to the Project

This project has given me the unique opportunity to be in transient contact with approximately twenty residents of Nebaj and its surrounding *aldeas* (see table 1 for a summary of all deaf people I contacted or was told lived in Nebaj). My participants have graciously invited me into their homes and classrooms as an observer and (somewhat clumsy) participant in their daily routines and interactions. In many instances, they have extended this hospitality repeatedly, over a period of five years. In this chapter, I will introduce each participant in some detail. For those readers most interested in the demographic facts of each participant (age, relationships, hearing status, etc.), these are presented in table 1. I refer back to this chapter in later sections of the thesis for the detail that is provided here about each person who contributed to this study. I invite you to encounter them as I did - as individuals with distinct personalities, social histories, and impressions about what I, as a visible outsider and visitor to their community, was doing with my toys, books, videos, photos and ever-present video camera.

This chapter illustrates the communicative ecologies that constitute an analytical framework for comparing groups of homesigners who share socio-communicative circumstances in terms of homesign interaction. These ecologies are characterized by different degrees of interaction, density of social networks and frequency of interaction and are discussed in detail in section 3.2 of this chapter. I begin, however, with descriptive vignettes to illustrate the daily rhythms of life in each of the three communicative ecologies – individual, family and peer – in which the participants are members and social actors.

3.2 Introduction to the Fieldwork

I provide a detailed description of the methods used in this project for recruitment, elicitation, documentation and analysis in chapter four. Here I give an overview of my time in the field, including my preparation and training for conducting fieldwork, my reasons for working Nebaj and the dates and duration of my time in Nebaj.

3.2.1 Preparation and Training for Fieldwork

In the summer of 2012, I spent six weeks in Nahualá, Guatemala for a summer language course in the Mayan language K'iche'. I lived with a local family and traveled around the country on Guatemala's elaborate network of "chicken buses" – revamped school buses from the United States – with a group of my classmates. I am grateful for this first summer spent eating homemade corn tortillas and tamals and drinking the watery, sweet coffee provided by my host-mother. She would carefully pour the hot beverage back and forth between two cups to cool it before handing it to me, a common practice for local children under the age of seven – which was apparently where she placed me in my development as a culturally competent, if temporary, member of her family. This preliminary introduction to new social and cultural norms at times subsumed me in the depths of its strangeness, but provided a critical foundational sense of the inner workings of daily life in a contemporary Mayan community.

After the initial summer intensive course in K'iche', I continued a tutorial-style course in K'iche' for the following year, and took preliminary coursework in spoken Mayan (Yucatec). I have not taken any intensive coursework in Ixil, though I have studied the language during my time in the field, working with some with private tutors in Nebaj. I have, however, relied primarily on Spanish while in the field. None of my collaborators are native Spanish speakers,

and neither am I. My informal interviews, and daily conversations and interactions, have been punctuated by moments of confusion and frequent laughter at my regular misunderstandings and clarifications. And indeed, it is my experience that humor and laughter are the forms of sociality that have bonded me most closely to my friends and collaborators in the field, including, and especially, the women and children with whom I share almost no language code – specifically older women who are monolingual Ixil speakers and deaf adults and children who are homesigners.

Additional training and preparation that I did not consciously engage in, but which prepared me for the unanticipated nonetheless, included coursework and training in American Sign Language (ASL). ASL is not widely used in Guatemala outside of Guatemala City, but learning ASL provided me the opportunity to engage with deaf friends and colleagues and to better understand deaf ways of interacting that sometimes transcend cultural and linguistic boundaries (though not in all cases by any stretch).

My background as an elementary special education and substitute teacher has benefitted me in the field in ways I could never have anticipated – and the dedicated patience and flexibility required for the special education classroom in the United States translates remarkably well to the special education classroom in Nebaj. What I lacked in technical training and preparation, I compensated for with a combination of extreme tolerance for spontaneity and unpredictability and an equal commitment to improvisation and self-deprecating humor.

3.2.2 Nebaj as a Fieldsite

I first visited Nebaj in 2013 after learning about Mayan Hope, a local school for special education. During my K'iche' course the prior summer, I was connected with Maria García, a

linguistic anthropologist, and a team of researchers including Jule García, Michael Hughes and Melissa Axelrod, who had worked in Nebaj for over a decade. The team had recently become aware of a local school for special education in Nebaj. They observed multiple deaf students from the school while attending a local funeral. My K'iche' teacher, aware of my background in special education and interest in homesign and sign languages, put me in contact with Dr. García, and the following summer I returned to Guatemala, but this time I traveled 4 hours north of Nahualá, to Nebaj.

3.2.3 Time in Nebaj

Between 2013 and 2017 I have spent more than 5 months in Nebaj. My first trip to Nebaj, in the summer of 2013, occurred in June and August (eight weeks total). I spent 4 weeks in Nebaj in 2014 (the month of June) and in 2015 (August – September). I also visited for two weeks in December of 2015. I spent two weeks in Nebaj in 2016 (June-July) and 2017 (August). During all of my trips, I have stayed in local hostels or hotels within walking distance of the EOEE school (Mayan Hope) and some of the families that I visit. For families that live farther from the center of town, I used tuk-tuk or microbuses for transport.

While in Nebaj, I spend approximately four mornings per week at the EOEE school. I typically arrive around 9:00 in the morning (when most students and teachers also arrive) and stay until after the snack and recess period around 1:00 in the afternoon. I assist in the classrooms and play and chat with students and teachers during snack and recess periods. In the afternoons and on weekends, I visit families and participants in their homes. I try to visit focal families three or four times each year, staying for several hours at each visit. I also travel to visit

some participants and families who live outside of Nebaj in nearby *aldeas* (hamlets). Depending on the length of my stay in Nebaj, I do not always visit these families every year.

I use video cameras (typically two) to record all interactions when I am visiting participants at home. I have some short recordings from classrooms at the school, however, it is often quite busy in the classrooms and difficult to position a camera to film focal students that will not distract or get relocated by students. The classrooms are also frequently too dark for high quality video recordings. For more discussion of my methods as a participant-observer, please see chapter 4. In the subsequent sections, I introduce the focal child homesigner participants and give some detailed examples of their lives and interactions with hearing and deaf family and friends.

3.3 Homesigners with and without Deaf Families

3.3.1 Homesigners with and without deaf families

As a researcher focused on development, language, thought and the relationship between them, I dedicate the most time to the child participants in my study. The children who participated ranged in age from 18 months to 18 years old. Through a network of local women, I was introduced to two families with intergenerational deafness (see chapter 3 for detailed discussion of sampling and recruitment procedures). These families included at least one adult who was deaf (a grandfather and a mother) and at least one child who was deaf (a daughter, granddaughter and grandson) (see family tree diagrams, figures 9 and 12). I was also introduced to three families with only one deaf child. In these households, the child is the only deaf person in their immediate and extended family, as far as I have been able to ascertain. Early in my fieldwork, I also contacted and began to work with the local school for special education, see section 3.5 for a

detailed description of the school. At the school, I met two students who were cousins, but had no other deaf relatives and a pair of siblings (brother and sister) who are both deaf but have no other deaf siblings and hearing parents. I would later discover that the brother and sister who attend EOEE do have deaf relatives in their extended family, these were participants I had visited for four years, without knowing their relation. In total, ten children comprise the focal group of participants for this study. Nine of the children are deaf and one is a hearing sibling of a deaf child homesigner. They are presented (using pseudonym identifiers), with their age during each year that I visited Nebaj and collected data from them, in table 2. The relations between these focal participants are illustrated in figure 5 below.

Table 2. Focal participants and ages each year of participation

Participant	*2013*	*2014*	*2015*	*2015✧*	*2016*	*2017*
Antonio			**5;11**		7;0	8;0
Rosa	**7;4**	8;5	9;5	9;8	10;5	11;5
Jacinto				**8;7**	9;7	10;8
Jose					**10;5**	11;5
Sara	**8;4**	9;5	10;5	10;8	11;5	12;5
Alejandro		**10;11**	11;11			
Tomás	**10;6**		12;7			
Juana					**14;1**	15;1
*Ramon**	**12**	13	14	14	15	16
Diego	**13;7**		15;8		17;8	18;8

**hearing, ✧field trip occurred in the winter (Dec) of 2015 in addition to summer months, participants' ages at enrollment in the study are highlighted in grey*

Most participants were between seven and twelve years old during the first year of their participation in the study (this includes Rosa, Jacinto (I), Jose, Sara (F), Alejandro (I), Tomás and Ramon (F, H) (F)). The exceptions are Antonio (I), who was younger (5;11) than most of the other participants when I first began collecting data from him, and Diego (P) and Juana (F, P), who were substantially older (13;7 and 14;1) than most of the other child homesigners when they

began participating in the study. The most longitudinal data has been collected from Sara (F), Rosa (F), Ramon and Diego (P). Figure 5 illustrates the social and familial connections between the focal participants.

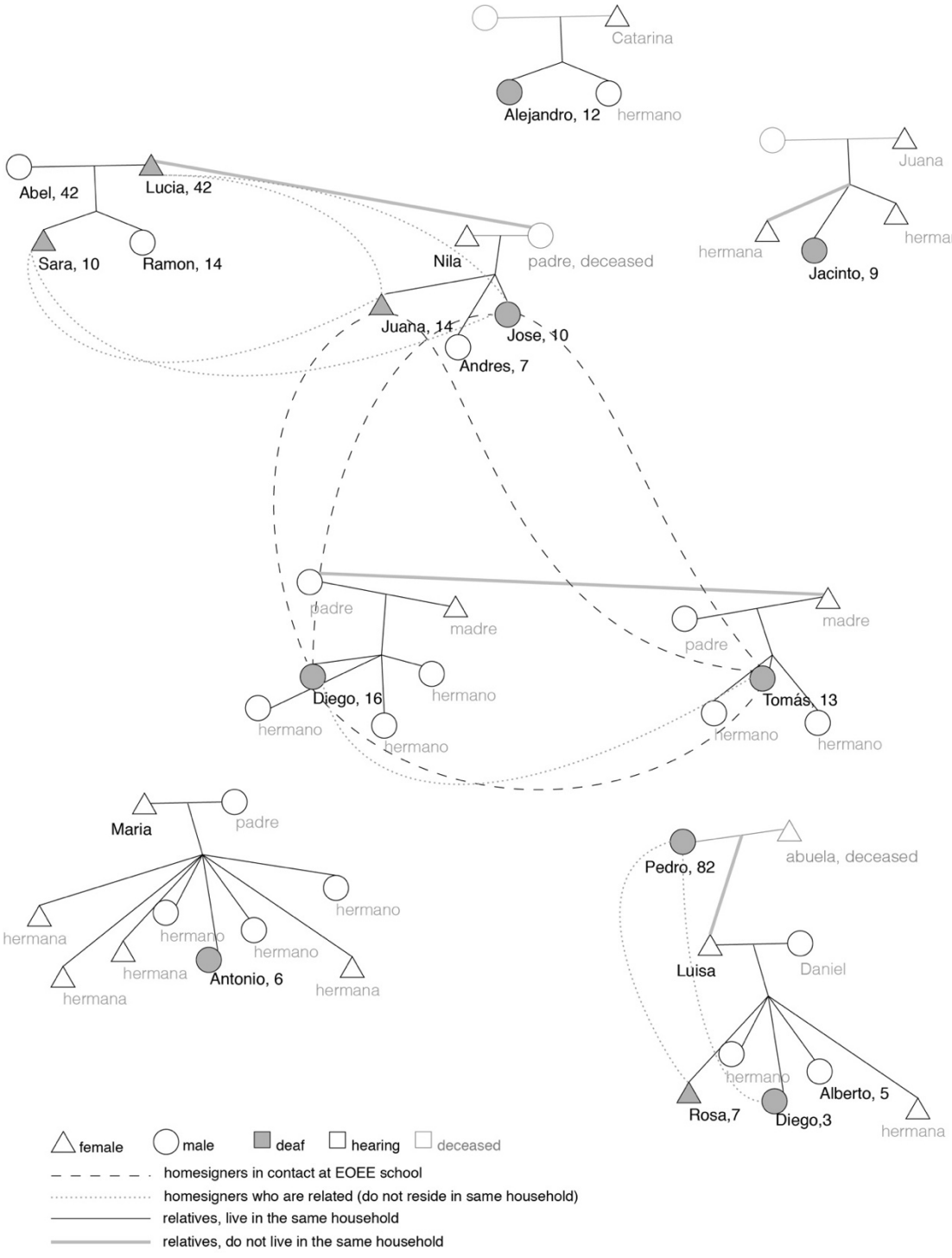

Figure 5. Social and Familial Relationships between hearing and deaf participants from Nebaj. Dashed lines show homesigners who have a social connection. Dotted lines show intermittent interaction between distantly related homesigners (e.g., cousins). Solid thin lines show relatives who live together in the same household. Solid thick grey lines show relatives who do not live in the same household.

I describe the physical and social setting for several participants, and note where it applies to other participants, because I believe that these circumstances shape the frequency and character of the regular interactional routines in which the child homesign participants are engaged (Bourdieu, 1977; Bronfenbrenner, 1994). After the demographic sketches, I propose some categories of communicative ecologies that share properties of input, interaction and context and might be associated with similar kinds of communicative structure in the homesign systems that are developed in that particular ecology.

Figure 6. Photos of daily activities. a) a *milpa* located outside of Nebaj, b) a tall fence and corn provide privacy for a house with tile roof, c) a *molino*, used to grind nixtamalized corn into *masa*, d) a *pila*, a sink and basin used for washing and the only source of running water in many homes, e) removing dried kernels from corn cobs, f) Winding thread to be used for weaving a *huipil*, g) Using a backstrap loom to weave a *huipil*, h) Making tortillas from *masa* in the kitchen.

3.3.2 Families with Multiple Generations of Deafness in Nebaj: The Bernal, Marcos and Cobo Families

The Bernal, Cobo and Marcos families live in Nebaj. Each family has more than one deaf person in the nuclear household (immediate family). In the Bernal and Marcos families, the two deaf people are in distinct generations, parent/grandparent versus child/grandchild, while in the Cobo family, the two deaf family members are siblings with four years difference in age. The presence of multiple deaf family members across generations has several implications for the deaf homesigning child or children in the family. First, the child enters a social world in which their adult relatives and older siblings already have experience using their hands to communicate. Second, even before actively communicating themselves, the child will be able to observe interactions conducted in the manual-visual modality between other members of the family (de León, 1998). In the sections that follow I discuss these implications as well as providing a brief sketch of the physical and social ecology of the child homesigners in each family.

Figure 7. Daily chores, including (a) pouring coffee for guests, (b) washing at the pila, (c) taking care of livestock, (d) feeding chickens

3.3.2.1 The Bernal Family

I met Sara and her family during my first visit to Nebaj in the summer of 2013 (see chapter 4 for detailed discussion of participant recruitment). Sara and her mother, Lucia, are deaf. Abel, Sara's father and Lucia's husband, is a monolingual Ixil speaker. Sara's older brother, Ramon (Lucia and Abel's son) speaks Spanish and Ixil. See figure 8 for a diagram of language use in the Bernal home and figure 9 for a diagram of the Bernal family tree.

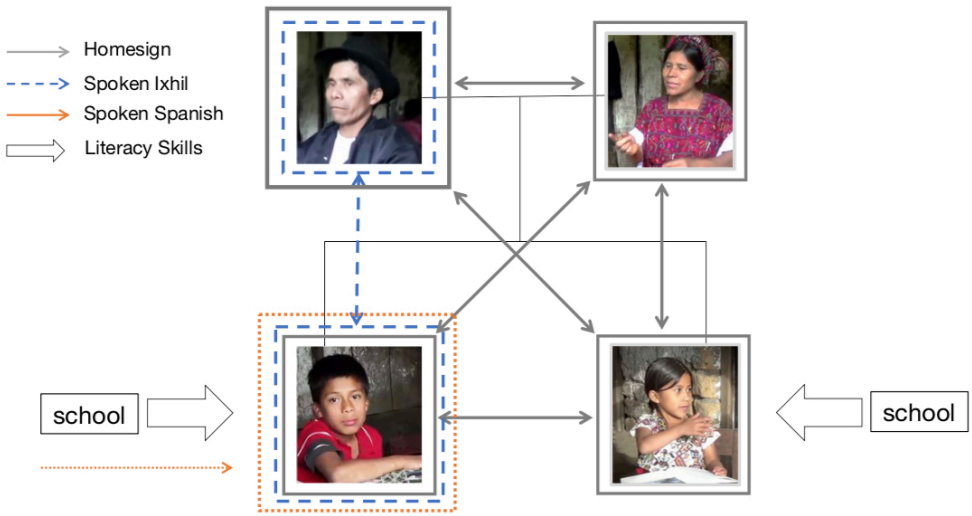

Figure 8. Languages and sign systems in use in Bernal Family

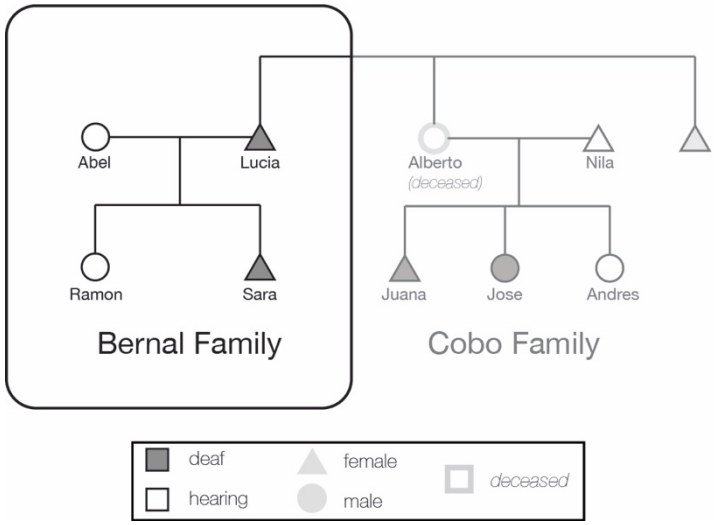

Figure 9. Family tree of Bernal Family

3.3.2.2 The Bernal Home

The Bernal family lives near one of the main roadways into Nebaj. Their yard is surrounded by a fairly tall fence, both for privacy and in an attempt to protect drying laundry and domesticated animals like pigs and chickens from being stolen (see figure 6, b). Despite this, one year Lucia told me that their clothes had been stolen off of the laundry line, and this was why they now had a lock on the door to the house and the gate in the fence around the yard.

The yard slopes steeply and is primarily hard-packed dirt. Several thin, and somewhat sick-looking dogs roam around or curl up in a spot of sun in the dirt. Both Sara and Lucia warn me that the dogs bite, and they are constantly swatting at the dogs with a stick or a hand. One corner of the yard is dedicated to a small vegetable and flower garden, surrounded by a chicken-wire fence. There is a pig in another section of the yard, and a small covered shed for the pig, adjacent to the outhouse, which is afforded privacy by a tarp strung up between several trees. Often the clothesline that stretches from the porch across the yard is filled with clothes drying in the sun, including woven *huipils* and *cortes*, worn by Sara and Lucia, as well as western manufactured t-shirts and jeans, worn primarily by Ramon. The *pila*, a large concrete basin and sink used for doing dishes, laundry, brushing teeth, washing hands and face (see figure 6, d), is at the corner of the porch created by the overhanging roof from the main house.

The Bernal house is typical for most residents of Nebaj and outlying *aldeas*. It is constructed of adobe bricks, painted white, and unpainted boards that surround an additional cooking area, with a roof of corrugated metal. This roof extends over a small area, in front of and adjacent to the house, to create a sheltered area for drying corn and laundry during rainy days. The floor of the patio and interior is packed dirt. The inside of the house is dark, lit primarily by

cracks between the wooden boards that comprise the walls of the main room, as well as a few electric bulbs. There is one room that contains a newer stove, installed during the course of my fieldwork, with a pipe that pulls the smoke from the wood-burning fire out of the main room. On one side of the room there is a concrete block *temascal* or *chuu*, a traditional sweat bath used for bathing. There is a lofted storage area for dried corn and tools that stretches across the top of the *chuu* over part of the main room.

The main room has one shelf for storing cups and plates and food items like rice and sugar. Two low benches run alongside the stove, where every meal is cooked. Pots and pans and other cooking utensils hang from nails in the wooden boards around the cooking area. In the second room there are two beds and one dresser. During the course of my fieldwork, the Bernal family has also acquired their own television, and it is stored in the sleeping room.

3.3.3 Seasonal Patterns

During the late fall and early winter, Abel and Ramon (and sometimes Lucia and Sara as well) harvest corn from their *milpa*, located some distance from the house (see figure 6, a). The ears of corn are hung from the rafters of the porch to dry out, so that the dried corn can be stored for use throughout the year. When Lucia needs more *masa*, a corn dough used for making tortillas, she gathers some of the dried corn ears into a large burlap sack and beats the sack to get the dried kernels off of the cobs (see figure 7, e). She removes any remaining kernels by hand, after the cobs are dumped out on a tarp spread in the yard. Dried corn will later be soaked in alkali water with lye or ash, a process that produces *nixtamal* to be taken next door to be processed by a *molino* into *masa*. The neighbors own a *molino* and charge a fee for women and

children who bring their *nixtamal* to be ground daily, this guarantees regular foot traffic on the gravel road in front of the yard (see figure 6, c).

Like many families in Nebaj, the Bernal's are partly subsistence farmers, living off of the corn they harvest from their *milpa*, but also dependent on intermittent wage labor for necessities like fertilizer, any non-corn food like rice, coffee or sugar, as well as the new stove, school fees and supplies for Sara and Ramon, and any clothes that Lucia does not weave or sew. To supplement their *milpa* harvest, the Bernal's raise pigs from time to time, which they sell, as well as chickens and ducks. The chickens are kept inside the house when they are young, and in a separate chicken coop, immediately adjacent to the house. Lucia has also described traveling to work on coastal plantations, *fincas*, where coffee and sugar are grown and harvested by a large migrant labor population. During my time in the field, Lucia, Sara and Ramon have not migrated to the coast, but Abel leaves Nebaj, sometimes for short trips of two to three weeks, sometimes for longer periods of four to six months, to work on the *fincas* for wage labor. When he is in Nebaj, Abel is away from the home many days working construction jobs when he can find them, or tending the *milpa*.

For Sara, her early social life has consisted primarily of interactions with Lucia, her mother, who is also deaf, and her brother Ramon, who is hearing, but who has communicated with Lucia using manual signs since birth. I have also observed Abel to sign with Lucia and Sara. Neither Ramon nor Abel speak when they are signing with Sara and Lucia. Sara thus has multiple people, experienced with signing, signing to her from a young age. In addition, Sara has been able to observe other members of her family signing to each other. I do not know precisely when Lucia and Abel found out that Sara was deaf, but Abel told me during an early visit in the summer of 2013 that both Sara and Lucia were deaf from birth.

3.3.4 Family Structure in Nebaj Today

Until very recently, Ramon and Sara would likely have spent a great deal of their time supporting Abel and Lucia in their various roles (Moore, 1973; Rogoff, 1981; Wagley, 1941; Watanabe, 1992). Ramon and Sara do go to the *milpa*, for example, to help with the corn harvest. Ramon is also often responsible for gathering firewood to stock the stove, which he carries using a headstrap from the *milpa* back to the house. Unlike their parents, however, both Sara and Ramon attend school every day, and have attended since they were approximately six or seven years old. They have school uniforms, both for classes and sports, and they each have progressed from basic elementary classes into the equivalent of U.S. middle school and high school. They have already had significantly more formal education than either of their parents. When I asked Abel whether he or Lucia had attended school, he said that Lucia did not attend school, because she was deaf, and he attended very little school. Abel can write his name, however, Lucia uses her thumbprint, a common way for non-literate Guatemalans to sign official documents.

Sara and Ramon can both write their names, which they demonstrated for me on one of my first visits. Ramon had to coach Sara a bit, but with his guidance she wrote her full first and last names. During this interaction, Ramon acted as a critical cultural and linguistic broker for Sara (Eksner & Orellana, 2012; Guan, Greenfield, & Orellana, 2014; Kam & Lazarevic, 2014; Katz, 2014). As her older sibling, who is also hearing, he communicates with her using manual signs, but he is also the only person in his family who speaks both Spanish and Ixil, and who reads and writes in Spanish.

I have not observed many adults helping their children with schoolwork in Nebaj, so it is not atypical that Ramon, an older sibling, is the one who demonstrates for Sara how to complete

tasks related to literacy, like reading and writing. He is, however, uniquely positioned to assist within the family at home, because he is the only other person with school experience, and also possibly at school, because he is the only one with homesign experience. Ramon told me that Sara has friends at school and participates in all of the regular activities during a visit in 2013. To my knowledge, Sara does not receive any special accommodations or services at her local school, which she attends students her age who are all hearing[1]. I have not been able to observe Sara interacting with her peers at school, but I have spent time with her, Lucia, Ramon and Abel at home. Below, I offer a brief sketch of a conversation that I observed during a visit to Nebaj in 2015, when Sara was ten years old. This sketch is meant to illustrate the general strategies that Lucia and Sara use for getting attention, managing turns and clarifying interactions when they are engaged in typical activities. I provide this because these practices are in a dialectic relationship with the structure of each of their respective homesign systems. Discursive practices both shape and are shaped by mutual comprehension (or its absence), but are also inflected by the communicative practices of the speaking community as a whole (Green, 2014; Haviland, 2017).

[1] I have not been able to visit Sara's schools in person during my field trips, so I have not verified Ramon's reports that she is fully integrated into her classrooms, but without any specific accommodations

Figure 10. Child homesigners interact with hearing and deaf relatives (siblings and adult relatives) to (a) complete school work like math and writing and (b) talk about toys

3.3.5 The Marcos Family

The Marcos family lives on a small plot of land next to a *milpa* where they have begun construction of a house out of unpainted wooden planks. They moved to this location during the course of fieldwork, having originally lived with Luisa's family in a compound of adobe brick houses a short ten minute walk from their current home. Luisa, Roberto and their five children, Miguel, Rosa, Alberto, Pedro and Ana, now live in this temporary shelter while they save money and supplies to build a house out of adobe brick, uphill from their current house.

When I first visited the family in 2013, Rosa was seven years old, her older brother Miguel was approximately eleven years old[2], her younger brother, Alberto, was four years old and her youngest brother, Pedro, was two years old. Rosa is deaf, as is Pedro, though in 2013 the

[2] Miguel was not officially enrolled in the study as a participant, and I never got his official birthdate from his parents

family did not yet know that Pedro was also deaf. In addition, Luisa's father, and Rosa's grandfather, also named Pedro, is deaf. The senior Pedro was 78 in 2013 and still maintained a small flock of four to six sheep. Pedro was married, but his wife had died before I met the family and in addition to Luisa, had several other sons and daughters. Initially Rosa's family lived in her Uncle's house (one of her mother's brothers) with her grandfather and several other cousins. Rosa's mother and aunt tell me that their father's brother was also deaf and that he had always been deaf. See figure 11, below, for an illustration of the Marcos family.

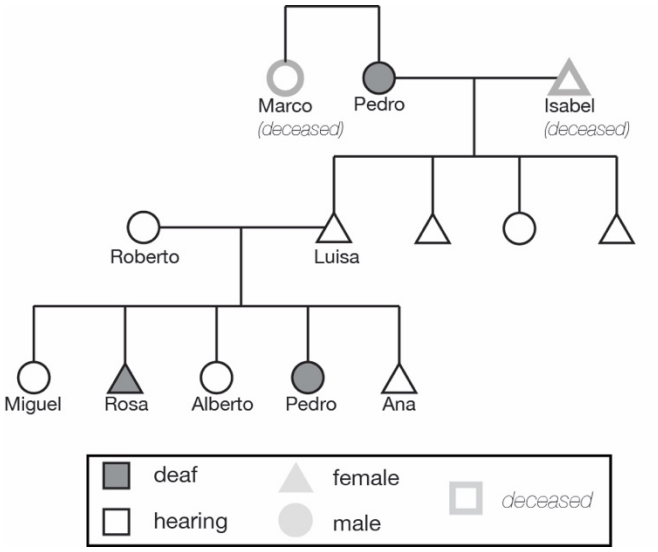

Figure 11. Marcos family tree, showing three generations. Pedro, Luisa's father, and Rosa and Pedro's grandfather, is deaf. Rosa and Pedro are two of Roberto and Luisa's five children and both are deaf

By the summer of 2015, the family had relocated to their current plot of land. They initially lacked running water, and transported water to their house from the relative's compound where they had lived previously. In 2017 Luisa had their fifth child, a little girl, Ana, who she tells me is able to hear. Rosa's father, Roberto, works for wages in other *milpas* with his oldest

son, Rosa's brother. Rosa's older brother attends school, and, during my visits to the family, does not appear to interact with Rosa. At my initial visit, Rosa was quite shy and preferred to interact with people from her family. She vocalized frequently, even when her hearing relatives were signing to her. However, when Rosa interacted with Pedro, her grandfather, she signed rapidly without speaking.

3.3.6 Sibling Caretakers in Nebaj

In 2013, Luisa told me that Rosa would be starting school the following year, but when I asked Luisa about this during visits in 2014 and 2015 she told me that Rosa did not like school and went so infrequently that the teacher said she could not continue attending. When I arrived to visit the family one day in 2015, Luisa told me at first that Rosa was at school that day, but it turned out that she was hiding in a shelf inside the house.

After Ana was born in 2016, Luisa told me that Rosa often stayed home from school to help out around the house and help care for her younger brothers and new younger sister. During another visit in 2015, I arrived at the Marcos home to find only Rosa and Pedro, her younger brother. Rosa was collecting the laundry that was drying on the line and supervising some *atole*, a common hot beverage made of rice or corn, cooking over the fire. Pedro, age 3, wandered in and out of the yard and adjacent *milpa* while Rosa and I did elicitation tasks for an hour or more. This pattern, of sibling caretakers, is a common feature of Mayan family life (Gaskins 1999, Rogoff 1981, see chapter 2, section 2.3.1 for a detailed discussion of patterns of child rearing in Mayan communities). What is interesting to note for this study is that deafness does not seem to alter the expectations for Sara or Rosa, in terms of their responsibilities in each of their households as they age. Sara has been home alone when I have visited on occasion, beginning in

2014 when she was 11 years old. She feeds the family's animals, makes tortillas, and prepares and serves coffee. Rosa cares for her two younger siblings (her third younger sibling is often at their aunt's house, nearby), maintains the cooking fire and prepares corn for rehydration to be taken to the *molino* and ground into *masa*. The circumstances might be different for Rosa and Sara if they were part of larger families with more female children. It is possible that, in the context of many children, the child who is deaf is overlooked as a contributor to household responsibilities. In Nebaj, however, the ideology that prevails is typically a notable lack of accommodations for inability due to age (Gaskins, 1999; Maynard, 2002). If this extends to children who are deaf, then expectations for their contribution to the household are likely no different than the expectations for their hearing siblings. In some ways, the ideology of learning through observation, and without explicit instruction (Nash 1958, Moore 1973) makes traditional activities equally accessible to children both hearing and deaf. The deaf child can observe and imitate as well as any hearing child, and neither are likely to receive extensive instruction in any of these tasks.

3.4 Individual Homesigners

3.4.1 The Ecology of Individual Homesigners

When a child is the first member of their family who is deaf, the hearing family members will have limited experience using their hands to communicate unless they know another person in the community who is deaf. Additionally, family members will likely only sign to the child who is deaf, they are unlikely to sign to each other because everyone else can hear and speak. As a result, the individual child homesigner not only interacts with people who are inexperienced and infrequent signers, but also, they are rarely able to observe two other people signing. This

observation of signed conversations between two other people might provide an important model for observing social interactional practices, as well as providing a more explicit model of how two experienced signers interact with each other. Significantly, in Mayan ideologies of child socialization, observation is a critical aspect of language socialization and learning more generally (see chapter 2, sections 3.2 and 3.3), but a child who does not have deaf relatives or peers does not have opportunity to participate as an observer or "active, non-vocal" participant (de León, 2015; Gaskins, 1999; de León, 1998). In the following section, I discuss the three individual homesigners who participated in this project. They each have unique ecologies, based on the size of their nuclear family, whether they attend school, and their developmental age, but all lack a deaf relative in their home.

3.4.2 Family Size and Individual Homesigners: Antonio

Antonio is the youngest participant in my study. I met him and his family in 2014, but at that time they insisted that he was not deaf, that he was choosing not to talk. They based this belief on his behavior, citing instances when they would ask him to retrieve an item, like a machete, and he would go and get it for them. When I returned to visit Antonio's family in 2015, he was almost six years old and they had received confirmation from a hearing test that he was deaf. He still did not talk, but I would see him sitting on the stoop of one of the *tiendas* in the neighborhood, observing people passing by in the street. He also played with other children his age, according to a family friend with a son approximately the same age as Antonio. Antonio's family is fairly typical for Nebaj. He lives with his mother and father, as well as x older and younger siblings.

In 2016, Antonio began attending his local school. Having seen some of his assignments from school, he does not appear to understand the instructions for many of the homework papers and quizzes. I have encouraged his family to consider enrolling him at the EOEE school, but they are concerned about the distance to the school from their home.

In my project, Antonio is the child who most resembles an individual homesigner, similar to the children studied by Goldin-Meadow in the United States. To my knowledge, he does not interact with any other deaf homesigners and never has. He is one of many children in a large family, and while his mother and older sister were very amenable to participating in one of my tasks – though a bit embarrassed – they do not indicate that they go to any particular effort to engage Antonio any more or less than the other children in the family. When I have observed Antonio's mother interacting with him, she does not pay particular attention to his signing, but she does typically gesture while speaking when she addresses him. I have also had some of Antonio's older siblings and cousins do tasks and play games with him while I was visiting his house. They all sign to him without speaking, and one older sister, in particular, signs to him and appears to use longer strings of signs, relative to his mother's fairly short signed utterances.

Currently, it is difficult to determine whether some of the characteristics of Antonio's signing are a consequence of his young age, or the nature of his communicative ecology. In the future, when he is the same age as some of the other participants in the sample, he will serve as an interesting comparison to homesigners in family and peer ecologies. Additionally, I will be interested to observe whether his homesign system appears to be affected by his attendance at school.

3.4.3 Social Experience and Individual Homesigners: Jacinto

Jacinto (I) is similar to Antonio because he is younger than many of the other participants in my project, however, he comes from a much smaller family, living with his mother and younger sister. He has one older half-sister, who signed fluently with him the first time I visited them at home, but she is often away and lives with her father most of the time. Jacinto's mother typically addresses him by speaking Ixil, and when I asked her to complete a lexical task using the gestures or signs she uses with Jacinto, she used a combination of spoken Ixil and signs.

One of my friends who went with me to visit Jacinto tells me that Jacinto did attend the EOEE school intermittently for approximately one year, but as of 2017, he attends his local elementary school where there are no other deaf students (to my knowledge). Jacinto is often away from his house because he works in the *parque central* in Nebaj as a *lustrador*, or shoe-shiner. This is a common practice for boys in Nebaj between the ages of seven and fourteen. Each boy has a kit with polish, brush and cloth. They approach anyone crossing the square to see whether they will pay one or two quetzales to have their shoes shined. Typically, parents help purchase the kit, and expect their child to bring any earnings home with them at the end of the day. I was at Jacinto's house one day when he returned, however, and the only thing his shoe polish kit contained were two toy cars that he had purchased with his earnings. His mother laughed when she discovered the toys, then lightly scolded him.

Importantly, Jacinto leaves home and is in the *parque* interacting with other children (the other *lustradors*) his age, as well as adults and older children (his customers) throughout the day. The fact that Jacinto is deaf does not seem to alter anyone's expectations about his participation in these activities or his absence from his home. This is a significantly different social experience

than Antonio, who is typically in his house with his relatives, or sitting outside at the corner store, observing pedestrians and customers.

3.4.4 Age, Education and Individual Homesigners: Alejandro

Alejandro is the oldest individual homesigner who participated in this project. During my first summer visiting Nebaj, his mother brought him to attend the EOEE school two days each week. It was a lengthy and expensive journey for them, as they had to catch a local bus early in the morning, ride approximately 20-30 minutes into Nebaj, then either walk or take a tuk-tuk from the center of town to the school. Alejandro's mother would stay at the school while he was there, helping to clean and cook the daily snacks. His mother was very concerned about his development and whether he would be able to attend his regular school. I think she had also been encouraged to bring him to the school by volunteers at a local after-school program near their house in La Pista (the *aldea* where they live). When I did go visit Alejandro at his home, I found that he lived there with his mother, his grandmother and older half-brother. By the following year, he no longer attended the EOEE school, but instead went to his local school and the after-school program every day.

Alejandro, like Jacinto, is part of a much smaller nuclear family than the average family in Nebaj. Unlike Jacinto, he appears to spend more time at home with his mother, but also has had more intensive contact with school, based on his experience at EOEE and the after-school program run by volunteers and local teachers. When I did observe him at the EOEE school, he was much less likely to engage with the other deaf students during recess times and more attentive to the teacher when he was in the classroom. In particular, though he is approximately the same age as Jose (discussed in the next section) and they were in the same classroom at

EOEE, Jose was far more prone to violent outbursts, physical altercations and intense signed arguments and conversations with the other deaf students at the school.

3.5 The Escuela Oficial para Educación Especial in Nebaj

Figure 12. View of EOEE School, (a) front of school, (b) interior view of classroom, (c) materials on wall of classroom, (d) school courtyard, used for recess, snacks, physical education, (e) two students look at a cell phone at school, (f) male students play marbles, (g) inside a classroom during class, (h) student cleaning desks

3.5.1 Mayan Hope, La Escuela Oficial de Educación Especial de Nebaj

Mayan Hope grew out of the efforts of two local teachers in Nebaj, who worked with students with special needs outside of school, beginning in 2002. The Mayan Hope organization was co-founded in 2005 with an American living in Nebaj. Since that time, Mayan Hope has paid the rent for a building for the school, and is now leading a fundraising effort to build a permanent

location for the school. In 2010, the Guatemalan Ministry of Education began paying the teacher salaries at the school. Teachers and an administrator (who typically also teaches one of the classes) are assigned to the school each year, though some of the teachers have been at the school every year since 2013. Between 2014 and 2015, the school received financial support from several local NGO's, as well as the Ministry of Education, and the name of the school was changed to the Escuela Official de Educación Especial, or EOEE, the acronym that I will use to refer to the school. The school is a site of significant interest from local volunteer organizations, which regularly bring groups of college students from the United States to visit during recess or physical education classes.

Total enrollment at the EOEE school is somewhat difficult to establish, but based on enrollment lists that are posted in each classroom, the school had 35 students in 2013. The school was closed for a holiday during my visit in 2014, but in 2015 the director told me that there were 50 students officially enrolled. This number dropped slightly in 2016 and 2017 to approximately 40 students. Additionally, daily attendance varies significantly from the number of students listed on the roster in a given classroom. In one classroom that I assisted in 2013, for example, there were 13 students enrolled. On four days for a given week there were: 5 students, 8 students, 4 students and 9 students in attendance. In 2015, 2016 and 2017, I typically counted between 20 and 25 students at the school during recess periods. The school enrolls any student with a disability. I have observed students who have Downs syndrome, severe autism, physical handicaps as well as global developmental delays in reading, math or communication.

Two teachers, Alicia and Josefina, have been involved with the special education program since 2002 and both have served as the school's director throughout the time that I have worked at the school between 2013 and 2017.

3.5.2 The EOEE School: Physical Context

The EOEE school is on a dirt road, approximately 15 minute walk from the main Cathedral and Parque Central (see figures 4, 12). The school is housed in a rented building, in the layout of a large family home. Four classrooms are arranged in a row, with a covered porch in front that faces an open courtyard. An additional classroom space, kitchen and the bathrooms line another edge of the courtyard. The classrooms are fairly small, with one window and one or two electric lightbulbs. Some years there is a small garden that the school maintains, in a yard behind the main classroom building. Classrooms have one or two shelves with supplies and workbooks, as well as an assortment of tables and small desks. The walls are painted bright colors and decorated with student work and posters, as well as projects hung from the rafters (see figure 13 b, d). One of the rooms is used for physical therapy services, provided by a visiting therapist who is at the school two days per week. Caregivers – typically mothers or older siblings – bring young children and infants to the school for appointments on these days.

There is simultaneously an abundance and extreme deficit of school supplies in each classroom. Government-provided curricula and workbooks form stacks several feet high in many of the rooms. A common literacy activity involves students using these books to find pictures for "letter of the day" activities. They are instructed to search through the workbook for pictures of items for which the Spanish word begins with a certain letter. If the letter that the student is assigned is "P," for example, they might look through the workbook for a picture of a pen (*pluma*), a loaf of bread (*pan*) and a turkey (*pavo*). The student then cuts these pictures out and pastes them into their writing notebook under the letter "P".

Classroom surfaces contain piles of paper, cups of paintbrushes and bottle caps and other arts and crafts supplies scattered on the bookshelves and tables in each room. Many students, however, arrive without a pencil or pencil sharpener. They are forever fighting over a shared eraser, or one of three pairs of scissors. Teachers tell me that any supplies like pens and pencils disappear instantly, students steal them, take them home, and they never see them again. Most students come from families in Nebaj and live close enough to the school to walk or take a tuk-tuk each day.

Fierce fights break out at the school over items like cards or marbles, and these are the arguments that often escalate to the level of adult intervention. In particular, I witnessed the only instance of corporal punishment that I have observed at the school when one deaf student, Jose, accused another deaf student, Andres, of stealing a newly acquired bag of marbles. The bag was discovered in the back garden, where it had been hidden by Andres when he snuck into the classroom during recess and stole the marbles out of Jose's backpack. Jose detailed all of this to Alicia, and his account was corroborated by Tomás and Diego, two of the older, more reliable deaf students (I do not think Jose's story would have been taken seriously otherwise). After consulting with Andres' mother and Jose's mother on her cell phone, Alicia used a thin branch from one of the bushes in the back garden to whip Andres[3]. This seemed to be the culmination of

[3] Though I did not ask Alicia about this directly, I assume she called each mother to try to establish who was the rightful owner of the toys. The teachers at the school have told me repeatedly that the students are not trustworthy, steal from each other and the classrooms, and will lie about where they have obtained larger sums of money or newer toys that occasionally show up at school. These are viewed very skeptically by teachers, who usually will call the parents to ask whether they provided the child with the money/toy. I have seen this happen with both students who are hearing and deaf.

a series of misbehavior from Andres, including violence and almost daily fights with other students, particularly the other deaf students.

3.5.3 Deaf students at EOEE

In 2013, there were two classes with deaf students at EOEE. The older class consisted entirely of deaf students, including four male students who were deaf and one female student who was deaf[4]. The male students, Tomás, Diego, Andres and Jacinto, ranged in age from ten to sixteen. The female student, Juana, was eleven years old. The teacher for this class, Alicia, is the only teacher who has specific training in special education, which she received in Spain. In the other classroom, where I spent most of my time in 2013, there were two deaf students, Jose, age 7 and Alejandro, age 9. Jose is Juana's younger brother, and frequently got into fights while interacting with the group of boys from the older classroom. Alicia later told me that Jose was in a separate classroom from the other deaf students because he and Juana would so frequently get into fights with each other when they were in the same class. Alejandro only attended the school in 2013, as he lives in an *aldea* about 20 minutes outside Nebaj by microbus. His mother came with him to the school two days per week for a year. Based on my observations, he was not as socially integrated with the older male students as Jose, who attended every day, as he and Juana can walk to the school from their home.

The number of deaf students gradually declined during my fieldwork. In 2014, one of the older deaf male students, Jacinto, had stopped attending and started to work in the market with a group of deaf men who transport goods from vendors homes to their market stalls each day.

[4] In 2013, there was an additional older female student with multiple disabilities who signed some, however, she was not in the classroom with other deaf students and I was never able to verify that she was deaf.

Another of the older deaf students, Andres, had also stopped attending the school when I returned in 2015. By 2015, Alejandro had also stopped attending the school. When I visited him at his home outside Nebaj, his mother said he now attends the local elementary school near their house and an after school program run by a local NGO. The composition of the classrooms shifted during this time as well. Jose and Juana, siblings who are both deaf, were placed in the same classroom with Tomás and Diego, the remaining students from the earlier classroom of older deaf students. The older classroom now contained a mix of hearing and deaf students, but most of them have attended school together now for at least the five years that I have been visiting, and some of the hearing students who attend regularly sign with the deaf students.

3.5.4 School Interactions: Teachers and Students

Alicia has known many of the students at the school for two years or more, since they began attending the school. She communicates with the students who are deaf by simultaneously speaking Spanish or Ixil while signing and uses signs that I recognize from the illustrated dictionary of LENSENGUA, of which there was one copy at the school in 2013. I also see Alicia use gestures that are not in the dictionary, but which appear to be comprehensible to the students, like the gesture used by all of the teachers when deaf students are misbehaving and they threaten to send them home early. The sign they use resembles the American Sign Language (ASL) sign TOWN and involves bringing two flat hands together until the finger tips touch to imitate the slope of a roof[5]. The teachers tell me that students know that this sign means "house" and this

[5] The sign that teachers at EOEE use resembles the ASL sign primarily in terms of the handshape and contact between the two hands. It is articulated at chest height, and has a different (often reduplicated) movement from the ASL sign

serves to communicate that they will be sent home if their behavior continues. The sign for house is sometimes combined with a flat hand next to the teacher's face, to indicate sleeping, an activity done at home. This sign resembles the ASL sign BED (see figure 13).

Figure 13. ASL signs TOWN and BED (www.signingsavvy.com)

One teacher, Maria, who began working at the school in 2016, is hearing but has an adult brother and sister who are deaf, and was one of the few teachers I observed to sign without speaking when she communicated with Tomás, Diego, Juana and Jose, all students in her classroom. When I talked to Maria, however, she told me that she does not understand the students' signing and has difficulty communicating with them. I was unable to determine whether the students felt like Maria was easier to understand than their other teachers, and based on my observations, their interactions with Maria proceeded without as many corrections and repetitions as their conversations with other teachers.

Teachers do not make any effort to prevent the students from signing to each other, either during class or during free recess and snack periods. Despite this, I have observed teachers to talk to students who are deaf, as though the students may understand them. Despite some awareness that deaf students at the school only communicate with each other by signing (they

never vocalize), teachers will call out their names in an attempt to get their attention. These kinds of interactions align with the ideology, expressed by some of my other participants, that children and adults may be able to hear and choose not to talk, or understand, what people are saying to them.

3.5.5 School Interactions: Students

The male deaf students, Tomás, Diego and Jose sign with each other most regularly and throughout the day during class and free periods. Juana has always interacted less with the other deaf students, possibly because she is the only female student who is deaf. She has had few other friends at the school, and they have all been other female students.

3.5.6 Ethnographic Sketch: A day at the EOEE School

Students begin arriving at school between 7:00 and 8:00 in the morning. Most students walk to school from home, with commutes ranging from 10 minutes to 45 minutes for students walking from distant *cantones*. After arriving, students wander around the courtyard of the school, sometimes assisting with morning chores like sweeping out the classrooms and covered patio and sprinkling water on the swept floor. Water is obtained from a central *pila* (sink) in the courtyard that is used to wash dishes for snacks, wash hands before eating and brush teeth in the mornings. The students have their own set of cup and bowl, as well as toothbrush and toothpaste. All are stored on hooks in the different classrooms.

Many students play tag, while some older students have cellphones that they play games on while they wait for teachers and the rest of the students to arrive. This is also a time for socialization. The deaf students play with cards and marbles in the courtyard, leading to

arguments and fights that are only occasionally brought to the attention of the teachers. In fact, teachers only intervene in student interactions during these free times in cases of physical aggression. Based on my observations, fighting was more common a few years ago when a larger group of older boys attended the school. Teachers would physically separate fighting students until they calmed down.

Between 8:00 and 9:00 all of the teachers arrive and begin gathering students into classrooms, with frequent breaks to catch up with other teachers and the women who cook the snacks for students. Conversations between adults can be lengthy and during this time they do not interrupt their talk for student requests, whether to resolve a dispute, or ask a question. Some of the older students sit in the classrooms long before the teacher ever enters the room, playing on cell phones or chatting (signing) with each other.

There is not an official time that class starts, but rather the start of the day seems to be based on the inclination of each teacher, signaled by when she[6] calls her students into the class to begin working. Sometime between 9:30 and 10:00 all students are in their classrooms. The day is typically divided in half, each half of the day given to either reading and writing or math. There are stacks of instruction books from the government curriculum in each room, however, they are used for a variety of purposes, including as material to be cut out and pasted into the notebooks that students use for most of their written exercises. Students complete most of their work in blank notebooks that are available for purchase in the many *librerías*, school supply stores, around town. The notebooks are approximately eight inches by six inches with either lined, blank

[6] All of the teachers at the school have been women, during the time that I have worked at the school. This is, however, somewhat uncommon. Unlike the U.S., it is very common to have male teachers at all levels of education in Guatemala.

or graph paper. Students have one notebook per subject area, this typically includes one notebook for math and one for writing. Younger students begin the year with very basic practice using a pen or pencil; they copy and trace lines and simple shapes hundreds of times.

In classes with older students, the teacher begins by telling the students which notebook they need to get out for the morning subject (reading or math). In almost all cases, this is a lengthy process because at least some students have come to school with an empty backpack, or only one of their notebooks. In Alicia's classroom in 2017, for example, she began one day by telling students to get their math books out. The class consisted of four deaf students: Rosa (who began attending EOEE in 2016 or 2017), Jose, Diego and Tomás. Rosa did not have her math book, so, after scolding her, Alicia grabbed another one off of a table in the back of the room. Each classroom has a large inventory of government-provided course workbooks at many levels of instruction. They are all partially filled in by current or former students. Alicia flips to a page and pointed to the exercise that she wanted Rosa to work on. The other students who are working on the same coursework as Rosa – Juan, Jacinto, Pedro, Luis and Jose, who is deaf – eagerly crowd around Rosa's desk to see which page they should be working on and then return to their collective table, formed by pushing six small triangular desks together. For the younger male students in the class, each assignment is a competitive exercise in speedy completion. As soon as one of the group figures out how to accurately fill in the page – whether completing simple sums, or coloring in pictures of balloons with even numbers – the rest of the group is quick to copy that student's work. The student who figures out the objective of the exercise is often either the most experienced student (they repeat exercises throughout the year) or the first one to get the attention of the teacher or any assistant in the room to help them with the assignment. Rosa is largely left out of these activities, partly because she is younger, and newer to attend school, and

possibly because she is female. When Juana, Jose's older sister, attended the school, she too was often left out of the tight circle of male students racing to finish any written assignments.

Not all students are equally invested in completing their activities as quickly as possible. These students often sit at their desk, watching other students, or wander out into the yard after a period of time. Additionally, only certain male students are part of the "complete and copy" circuit. Jose, who has been attending EOEE for at least six years is very quick to finish his work, if he feels inclined to do the assignment, but he only lets certain other hearing students copy his paper when he is finished. He violently covers his paper and steals pencils and crayons from another student, Luis, when he tries to look at Jose's answers. Throughout this time, Alicia has turned her attention to other students. Tomás and Diego, fifteen and seventeen respectively, are completing exercises in an entirely different math book, so Alicia is busy showing them how to do more advanced problems involving comparing quantities of items from a grocery store, presented in word problems written in Spanish. To answer these problems, Tomás and Diego must read and interpret Spanish phrases like "Juan compró cinco manzanas más" (Juan bought five more apples) and "Juana comió tres galletas" (Juana ate three cookies) to answer questions like "¿Quién tiene más?" (Who has more?) and write the eventual amounts as a comparative equation using the greater than (>) or less than (<) symbols. Both Tomás and Diego are fairly accurate at addition and subtraction up to two and three digit numbers, but the word problems give them some trouble. After showing the two of them an example problem, Alicia leaves them to sort it out and turns to Jose, who is frantically pulling at her skirt to get her attention to show her the pages in his math book that he has filled in. Tomás and Diego each work on their problems individually, then consult with each other, to try to determine whether they are doing them correctly. When I check their work, they are remarkably close to the correct answer, and

when I point out places where they have misinterpreted the words in the word problem, they are quick to erase and fix their responses.

Most of the students continue working on the exercises until 11:00 or 11:30. Once they have finished an exercise (whether they complete it individually or copy another student's work), they are free to wander out of the classroom and into the courtyard. Around 11:00 the *refacciónes*, snacks, are cooked for the day. One of the student's jobs each week is to gather all students' plates and cups and take them to the kitchen to get the snacks. The school's cook typically prepares a hot drink, *atole*, either corn or rice-based, and a food item, including a boiled plantain, a boiled egg or a tortilla with salsa. At this time, women who sell snacks also arrive at the front door of the courtyard, and students race to purchase *boxbol*, a local food made of *güiskil* leaves wrapped around masa dough and boiled, or *tamalitos*, plain masa, or masa with beans or a few chunks of meat, wrapped in corn leaves and steamed for one or two quetzals (US$). The students also run out the front of the school to the nearby *venta* – small store run out of a home – down the street. Here they purchase candy and salty snacks like Doritos.

Students are free to wander in and out of classrooms and the courtyard during until approximately 12:00 or 12:30. Some students sit in the classroom to eat the food provided by the school if their parents did not send them with additional money to purchase snacks. After they finish eating the school food, they take their plate and cup to the pila to wash and return it to the shelf in the classroom. Then they engage in activities similar to the morning, including card games, tag and sitting and chatting. Teachers typically talk amongst themselves at this time and make no effort to organize activities for the students. Gradually teachers call students back to the classrooms for an afternoon lesson, typically the subject not covered in the morning.

Back in Alicia's classroom, Rosa still has not finished her math exercise and refuses to sit at her desk and complete the work. Teachers try to convince a student to complete their work only briefly, then move on to another student. Each teacher maintains a log for each student where they mark both attendance and a general "grade" for the day's work. When a student refuses to do their work, as Rosa did on this particular day, they will get a lower score (often out of 10) for that day in the ledger. The afternoon session might consist of a full lesson, or preparation for an assignment to take home. On this afternoon, Alicia carefully writes 4 sentences on the white board at the front of the classroom[7]:

1. Escribo el nombre y apellidos de mi mamá.
2. Escribo el nombre y apellidos de mi papa.
3. Escribo el nombre de mi departamento.
4. Escribo el nombre de mi municipio.

There are specific instructions for how students should copy these sentences and leave spaces to fill in the answers when they take their workbooks home. The experienced students like Diego, Tomás and Jose are very quick at copying material down from the board. They are quite good at identifying letters, and when I work with them, they are able to write words based on the fingerspelled letters from LENGSENGUA[8].

Some students will spend time at the school for up to an hour after most of the formal activities in the classroom have finished. They will help clean up the classroom, though most of

[7] 1. Write my mother's name and last names; 2. Write my father's name and last names; 3. Write the name of my department; 4. Write the name of my municipio

[8] See note about Guatemalan Sign Language, images of the fingerspelled letters of LENGSENGUA are posted at the school some years, but not always. I have provided Tomás and Diego with illustrated alphabet books showing the fingerspelled letters and a picture dictionary of many of the signs from LENGSENGUA.

the cleaning happens in the morning, or play in the courtyard. The older students decide on their own when they will leave for the day, and pack up their backpacks and leave to walk home. Younger students are often picked up by a parent or, more often, an older sibling. By about 2:30, all of the students have left for the day and the teachers chat with each other or leave for meetings.

The daily routine fits into a larger weekly pattern, notably on Wednesdays, the entire school gathers in the courtyard for physical fitness activities. These exercises are frequently opportunities for college-aged volunteers who work with local NGO's to visit the school and play with the kids, sometimes bringing gifts like soccer balls and hula hoops. On Fridays, the students make beaded jewelry that is sold to support the school. The students are paid for each piece of jewelry they make. The tables from classrooms are moved out onto the patio, music plays and students wander in and out of working on their bracelets, earrings and necklaces. Inevitably a bowl of the tiny beads gets knocked over or a student drops a strand of beads, laboriously assembled and they scatter across the patio. Some of the boys play soccer or marbles in the courtyard instead of working on the jewelry, but the older students appear motivated by the money that they receive for their efforts. Once per month, they remove all of the furniture from the classrooms and wash it with soap and water. During this time, the classrooms are emptied and swept and floors washed.

3.6 Shared Homesign Systems: Transmission and Interaction

3.6.1 Communicative Ecologies of Shared Homesign Systems

Each communicative ecology varies on the following dimensions: interaction with other homesigner peers, interaction with other homesigner adults and the contexts of homesign interaction, either at home or at school.

These dimensions combine to form three ecological types: individual homesigners, family homesign systems and peer homesign systems. Characteristics and examples of each ecology are described below and represented diagrammatically in figure 14.

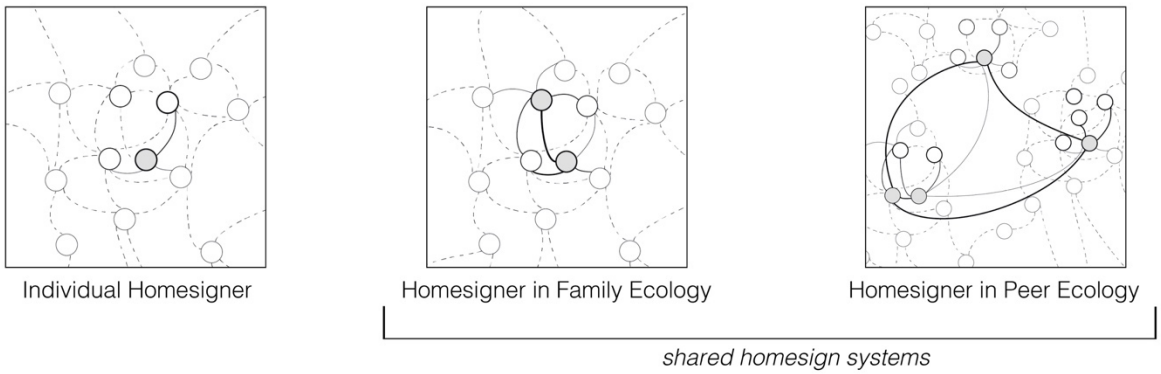

Figure 14. Communicative Ecologies of the types of homesign systems
In figure 15, deaf homesigners are represented by grey-filled circles and hearing individuals by white circles. Communicative interactions in homesign are represented by solid lines, communicative interactions in the spoken languages are represented by dashed lines. In an *Individual Homesign System* (far left), the homesigner has a limited number of solid-line or homesign interactions, and these all occur with a hearing interlocutor. For homesigners in a *Family Communicative Ecology* (center), the homesigner has interactions with another deaf homesigner, and the other members of their family have more interactions using the homesign system, represented by more solid-line connections. For homesigners in a *Peer Communicative Ecology*, the homesigner may have few homesign interactions in the family environment, but they have homesign exchanges with other deaf homesigners in a community setting like school or work.

3.6.2 The Communicative Ecology of Individual Homesigners

Individual homesigners do not have regular interactions with other homesigner peers or homesigner relatives. Although hearing relatives and peers may gesture with them, studies of

individual homesigners demonstrate that even over extended time, adult homesigners and their hearing relatives do not necessarily converge on a shared lexicon (Richie et al., 2014). In a study of adult homesigners in Nicaragua, researchers found that hearing relatives of adult homesigners were not always adept at accurately comprehending homesign descriptions of short events. This appears to be tempered by the age at which the hearing relative or friend began communicating with the homesigner, as hearing siblings who were closer in age had better comprehension than hearing parents (Carrigan & Coppola, 2017).

The individual child homesigner may rarely see a manual communication system that resembles what they produce. Their primary interlocutors communicate predominately using the spoken language(s) in the community. Thus, the interaction that the individual child homesigner engages in is primarily as a producer of their homesign system, and as a recipient of modified co-speech gestures from hearing family and friends.

As child homesigners grow up, friends, siblings or other relatives gain more experience using a manual communication strategy, and their system develops through interaction with the individual homesigner. Thus older individual homesigners have more practice as both a producer and a receiver of signs, though this may vary extensively by individual (Coppola, Spaepen, & Goldin-Meadow, 2013). Significantly for the child homesigner, the parallel development of their own homesign system, and the manual communication strategies used by their hearing communication partners diverges substantially from the typical language learning child. The individual homesigner has the most experience with their emergent communication system, and the most expertise relative to older, hearing siblings and adults in their communicative ecology. They have less experience negotiating an interaction with another person who uses a similarly structured system. The repeated engagement with other less-experienced hearing interlocutors

likely impacts the system that the homesigner gradually develops. They may pursue diverse strategies to make themselves understood, including frequent repetition and clarification. This study includes three children who are individual homesigners and do not interact with other deaf people.

3.6.3 Homesigners in Family Communicative Ecologies

The communicative ecologies of family homesign systems are distinct from those of individual homesign systems on several dimensions, including communicative input, communicative interaction, and immersion in a multi-modal communicative system. Deaf child homesigners who use a family homesign system have accessible input: they interact with a deaf adult who uses a homesign system. The homesigning child thus receives a visual communicative model beginning at birth, from an adult whose only experience communicating is in the manual modality. Whether a homesigning parent knows their child is deaf or not, their only modality for communication is manual-visual, so they will sign to communicate with their child. In the case that their child is deaf, this means that the child sees more communicative input and that input is likely more systematic and structured than an individual homesigning child who is only able to observe the gestures that hearing people in their family produce when they speak.

In addition to receiving a communicative model, a child homesigner in a deaf family has a role as both a producer and receiver of a homesign system. This comes from the adult who is deaf, and also from siblings who have communicated with the deaf adult, presumably using gestures. The presence of more than one deaf person in a single family alters the balance of communication modality for the other hearing people in the family. Communication is more likely to happen in the manual modality, giving the child homesigner more exposure to

interactions not only between themselves and another deaf person, but the opportunity to observe the deaf adult in their family interact with other hearing people in the family and community. The child homesigner in a deaf family has more exposure to what "works" in terms of a communicative strategy, meaning, what is interpretable to hearing interlocutors versus what isn't successful. Child homesigners in Nebaj may interact more with other children, even if they have a deaf parent. If one of the parents or adults in a family is deaf, however, this means that all of the hearing children (the siblings of the child homesigner) have experience communicating with that deaf adult. Thus even the hearing children the child interacts with may have greater fluency with a manual communication system than the hearing children that an individual child homesigner encounters. In a family with deafness across multiple generations, the hearing parent of a child homesigner who has grown up with a deaf parent has a lifetime of experience using a manual communication when their child arrives, because they grew up with one parent who was deaf. This is the circumstance for one of two family homesign participants in this study.

3.6.4 Homesigners in Peer Communicative Ecologies

Deaf students who attend school together are embedded in a communicative ecology that differs from both family homesigners and individual homesigners along dimensions of input and interaction. The students often do not have regular input from a deaf adult homesigner, but they do interact with same-aged peer homesigners daily at school. They are thus producers and receivers of homesign systems, though the contact between homesign systems occurs in the context of school, rather than home. In addition to being both producer and receiver, students at the school encounter more diverse examples of peers who are deaf at school than within the context of a family with two or three deaf members. Though the actual number of homesign

contacts may not be substantially higher than a child homesigner with deaf relatives, having deaf peers may be fundamentally different in quality because it may support an individual homesigner's sense of community and peer network. Deaf homesigning children become aware that there are other individuals who share their communication modality and these are not restricted to people in their household. Additionally, this diversity of deaf peers may support the convergence of formal conventions because of the pressure to increase comprehension between signers on common topics (see also Gagne, 2017, for a discussion of the role inconsistent input for hearing children of deaf adult signers in Nicaragua).

These communicative ecologies are illustrated in the diagrams below, see Figure 3. The diagrams indicate whether the homesigner child receives homesign input from a homesign adult in their family, whether they interact with another homesigning peer or a homesigning sibling. If a homesigner lacks deaf family members or peers, they are primarily a producer of their system, and rarely see another homesign system nor negotiate interactions with another deaf person who relies exclusively on their homesign system to communicate. The diagrams also reflect the relative density of interactions that a homesigner might have, given the number of other deaf people in their local communicative ecology. The density of a communicative ecology interacts with the age of the deaf or hearing homesigners who are interlocutors. In families or communities with multiple deaf individuals of the same age, it is likely that there are more communicative interactions in the homesign system than in families or communities in which the homesigners are a combination of adults and children, reflecting the broader cultural socio-communicative pattern of this community in which adults typically interact with other adults and children typically interact with same-aged peers (Rogoff, 1981).

4. Methods for Documenting and Analyzing Homesign Systems in the Field

4.1 Research as Interaction

My central aim in this study is to document the homesign systems used by children in diverse sociocommunicative ecologies in Nebaj (see chapters one and three for an overview of communicative ecologies). In this chapter I describe the methods that I used to contact and recruit my informants, observe, interact with and elicit sign forms from them, and annotate and analyze the sign forms that I recorded.

4.2 Recruiting Participants

As mentioned in the introduction, and chapter three, I became acquainted with my field site through a colleague, María García. Dr. García has an extensive network of local women and their families. She has collaborated with many of them for over a decade. Before I arrived in Nebaj in the summer of 2013, María circulated the news that a new American researcher was coming who was interested in children and adults who "could not hear" or, more commonly "could not speak." Members of *el grupo de mujeres y hombres por la paz*[1] (see García 2012 for a detailed study of the Grupo and their history) offered to introduce me to individuals and families they knew of who were deaf, and this was how my fieldwork began.

During my first summer of fieldwork, the routine that we established was for a member of the Grupo to accompany me on all visits to participants' homes. These women, and their

[1] I will refer to this community organization as "El Grupo" or the "Grupo"

families, have become my closest friends in the field. They have invited me into their own homes before and after visits to participants' homes, hiked with me out to the homes of more remote participants, and provided me with assistance as translators (both linguistic and cultural), camera assistants and confederates at various points throughout my research. They have been unfailingly supportive and patient with my incessant questions and have granted me insights I could never have gained without their assistance and advice.

4.3 Ethnographic Methods

In my experience, conducting fieldwork as a participant observer contributes to a unique relationship between researcher and participant/informant, and eventually between the researcher and her data. In the sections below, I discuss my activities as a participant observer, followed by the techniques I used to engage with and elicit homesign data from my participants. I then discuss some general issues relating to the coding and analysis of the data, and issues specific to working with homesigners in the field.

4.3.1 Sites of Ethnography: Nebaj

As mentioned above in section 4.2, I was fortunate to be introduced to a large local network of women, members of "El Grupo," and because of my friendship with these women, I was frequently invited to enjoy coffee or meals of *caldo* (soup with meat and vegetables) and tortillas with their families. I attended funerals and birthday parties and celebrations and got to know their children and extended families. They welcomed me at group meetings and days spent clearing a shared plot of land. Because of these activities, I know more about the daily rhythms

of life for Nebaj's families. I pestered them with questions about the schools and about working in Nebaj. We talked about weaving, and also about raising and selling rabbits and pigs. Though I mention it in other places in this dissertation, it bears repeating here, that I remain grateful for the friendship and kindness that these women and their families have showed me.

4.3.2 Sites of Ethnography: The Escuela Oficial para Educación Especial

When I am at the school (see chapter 3, section 3.5 for a detailed introduction to the EOEE school in Nebaj), I work as a teaching assistant in any of the classrooms that need additional help. I have worked in one of the classrooms with deaf students every summer except 2014, when the school was closed for a holiday during my visit. I provide individual instruction and assistance for students (hearing and deaf) and sometimes lead the class if a teacher has to be away for a day to travel for training or a meeting. I have created materials and supervised math and literacy activities, as well as helping with art projects like the creation of posters for a school pageant election[2]. During recess periods, I play tag and card games with students from all of the classes. I also participate, with the other teachers, in any additional activities that take place sporadically, including marching with the school in the annual student parade as part of the *fiesta* week in August.

[2] The EOEE school maintains many of the activities of regular elementary schools in Nebaj. This includes the election of one female student to represent the school during local festivals in parades and pageants. A male student is often selected to wear a sash and carry the Guatemalan flag in similar parades that occur in late August.

4.3.3 Sites of Ethnography: Homes

Sessions with homesigners from family ecologies are typically filmed on the covered porch that is attached to the front of traditional houses in Nebaj. We sit on low wooden stools, plastic chairs, or on wooden benches resting against the wall of adobe houses. I discovered early in my fieldwork that porches are preferable to the interior of houses for filming. Houses are often very dark and smoky inside and even though my visits frequently coincide with the rainy season, the porch provides a sheltered (though chilly!) alternative to the damp, dark and often crowded interior of the house.

4.4 Elicitation Methods

Documenting and describing homesign systems has challenges, some shared with other kinds of linguistic fieldwork, some unique to homesign systems. In theory and in practice, homesigners are the only primary users of their system, and they are monolingual[3]. To break into this system, it becomes imperative, at least at first, to introduce a stable common ground as a topic of conversation. This is why, early in their work with child homesigners in the United States, researchers Goldin-Meadow and Feldman (1978) established a set of toys and books that they would take with them each time they visited one of their participants in their homes.

When I entered the field in 2013, I carried a similar set of toys and some new ones, acquired at local markets across Guatemala, as well as children's books to show my participants in an effort to give them content that they could talk to me or their interlocutor about. I also

[3] Most of the participants in this study do have exposure to written Spanish in the context of school, it is not clear how fluently they are able to read and write Spanish. I hope to explore the potential consequences of this contact with a written standard language in future work.

carried a laptop, with short video clips to show participants. By using a set of materials for all participants, I gained some control over the topics that homesigners talked about, though arguable this was in exchange for conversations that were not as typical as the kinds of conversations homesigner engaged in during their daily activities. A common set of stimulus items did, however, make their utterances more comparable, both within participants (longitudinally) and between different participants.

4.4.1 Elicitation Methods – A Typical Session

A typical session begins with a meet-up between me and a friend from the Grupo who is accompanying me on the visit. My friends are typically women, between the ages of thirty and sixty. Participants are often distantly related to my friend from the Grupo, or live in close proximity to a relative, so they have some gossip or news to catch up when we first arrive.

During the first summer, our visits were sometimes cause for a small crowd of relatives and neighbors. The crowds quickly subsided when it became clear that our activities were the fairly boring stuff of playing with toys and looking at books, though other children who were neighbors or relatives often meandered in and out during sessions. After the initial introductions were complete, and I had described my purpose and obtained consent for filming from a child's parents, I would get out my bags of toys and books and my friend from the Grupo would get out the video camera.

I introduce the toys first, especially for younger participants. The toys consist of a large set of animal figurines as well as small vehicles like trucks and cars. These are available in limited quantities in the local market, though most I found in larger markets in towns near Lake Atitlan. Children and their parents like going through the set of toys, pulling one out of the bag at

a time, labeling each one and then sorting them or arranging them on the surface of the low table that they set up for my visit. After introducing various toys and books, I typically show participants a book of photos that I took of people, places, foods, animals and vehicles in Nebaj during my first visit. The photos are simple, focusing on one object, and are intended to be instantly familiar so that the home signer can provide a ready signed label for the item. Participants love this task, they study the photos quite closely - one participant commented on minor details, like the orientation of each photo (whether horizontally or vertically oriented), and it is clear that participants sometimes provide extended narratives about the items in the photo. Often, however, participants simply give one or two descriptive signs before moving on to the next page. I was initially a bit nervous about this task, since some fieldworkers have reported that populations with less formal school experience may not know how to interact with books or written materials or how to interpret photographs. This was almost never the case for the children I worked with, a testament, I think, to the fact that schooling, while certainly not universally enforced in Guatemala, is at least very common for most children in Nebaj and all of the child participants in my study either had older siblings who attend school, or attend school themselves.

Adults will observe a session for about ten to fifteen minutes, and sometimes they will encourage a shy child to gesture, but they rarely stay to watch for an entire session. Parents and family members often seem amused, and maybe a little puzzled, at my interest in their child. In particular, they are often not sure why I am interested in the fact that their child doesn't speak. One family initially insisted that their son could hear, but was choosing not to speak. Their evidence for this was that they could tell him to go get something, like a machete, and he would go and get it.

Later in my fieldwork (years 4 and 5) I began to ask more hearing family members if they would be willing to do some of my tasks. Female family members were often willing, but very giggly participants. Their data varied from elaborately enacted pantomimes to very non-specific gestures and points. I return to this variation in Chapter 7, as these family members primarily completed the photo book, or lexical elicitation task. After I indicate that we are finished with our recording, families often offer me and my friend coffee, bread or *atole* (a drink of unprocessed corn *nixtamal* or rice, served hot or cold). We then sit and chat for an additional time either inside the house or on the porch. I compensate all participants for their time with a payment of 30 quetzals (roughly $4.00).

4.4.2 Elicitation Tasks

The elicited data for this study are from two tasks in which participants describe a set of stimuli items. Participants described the stimuli to a familiar interlocutor when possible, either a relative or friend. I served as the interlocutor for the homesigner in many cases. In later years, the lexical elicitation task was collected in a director-matcher format instead of simple descriptions (H. Clark & Wilkes-Gibbs, 1986). The majority of the data were collected simply as descriptions of the stimuli, directed either to me or to another interlocutor who could also see the stimuli being described.

While participants were happy to describe the photo book that I used, I had greater difficulty eliciting descriptions of short video clips that I show to participants on my laptop. Younger home signers typically do not provide lengthy descriptions of videos. It is unclear to me whether this is because they do not understand what I am asking them to do (provide a description of what happened in the video), because they do not remember everything that

happened in the video clip, or because they are just too interested to see what will happen in the next video clip. Seven of nine child participants have access to a television, either in their own home or the home of a neighbor, so they have seen television and videos, but they do not give sign descriptions of the short video clips that I show until they are about seven or eight years old.

4.4.3 Classifier Task

The vignettes that I used to elicit descriptions from homesigners for this section used a set of five hand-held items, including lollipops, marbles, pens, toy airplanes, and books (see figure 16). These items are drawn from a larger set of items that were developed by Brentari. These items were selected in the original study because the lexical sign for each of these items from American Sign Language have a particular type of handshape.

The handheld items in the stimulus vignettes provide a comparative sample, as some of the signs for these items have a handshape described as a handling-handshape (in ASL the signs for lollipop, pen and marble, see figure 15) while the signs for the other items have a handshape described as an object-handshape (in ASL the signs for book and airplane, figure 16). While these items have a contrast in handshape type in the lexicon of ASL, these handshape preferences are not universal across standard sign languages (see figure 15 for examples from Nicaraguan Sign Language (NSL) and Hong Kong Sign Language (HKSL)).

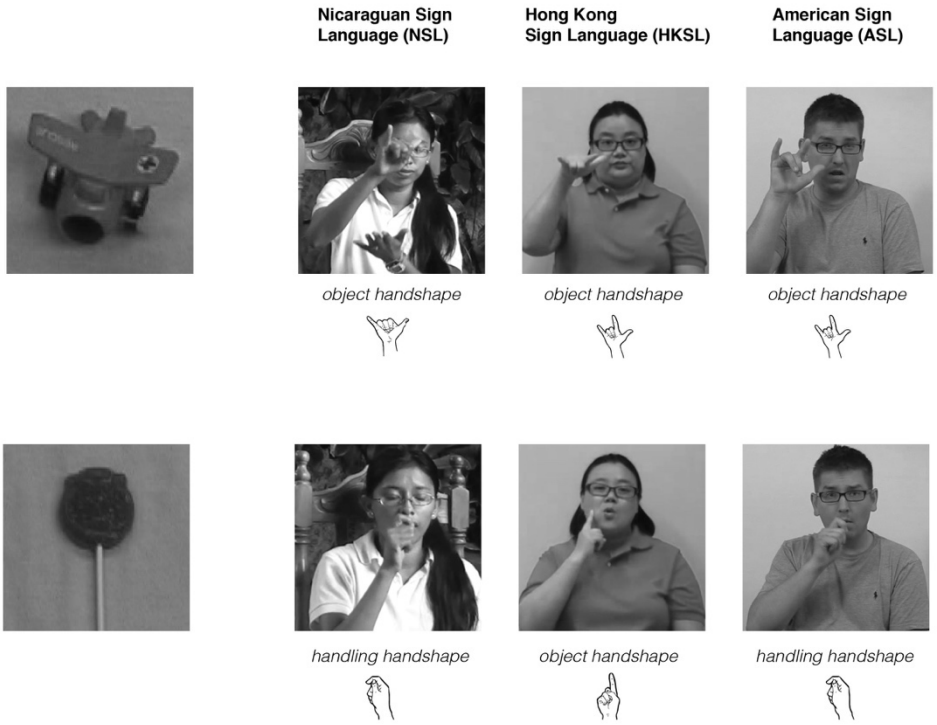

Figure 15. Lexical signs LOLLIPOP and AIRPLANE in Nicaraguan Sign Language (NSL), Hong Kong Sign Language (HKSL) and American Sign Language (ASL). The specific handshape and the handshape representation type (handling or object) varies cross-linguistically.

Each item in the stimulus set was presented in eleven conditions. The events depicted in the conditions varied along multiple dimensions, including the presence or absence of a human agent, acting on the objects, the presence of a single item or multiple items and the typicality of the arrangement or action. There were two types of events in which participants saw an event in which no external agent acted on the item in the vignette. The events that did not have an external agent can be further divided into two types: a still image of a single item or multiple items, in a typical or atypical arrangement or orientation. An example of a typical arrangement of items was a row of books, or a stack of books, while an atypical arrangement would be an image of a pile of books, scattered in different orientations (see figure 16). The second type of events in

which no external agent acted on the item included scenes of the item rolling or falling off of a surface.

Figure 16. Examples of stimulus vignettes, bottom row are still image screenshots from video clips.

Within the events that had a human agent, one group of events showed the full body of the person acting on the objects and the other group showed only the person's hand acting on the objects, each clip lasted approximately 15 seconds. For example, the participant would see a person place a book flat on a surface, or a person placing a book upright on a surface (see figure 17). For the analyses in this dissertation, I use only those conditions in which a hand was visible, and not the vignettes in which the participant could see the full body of the person acting on the objects in the vignette. Table 3 summarizes all of the conditions in which each item appeared.

Table 3. All conditions in the stimulus set

Vignette	**Agent**	**Number**	**Orientation/ Arrangement**
stationary item	no human actor	single item	typical orientation
stationary item	no human actor	single item	atypical orientation
stationary items	no human actor	multiple items	orderly arrangement
stationary items	no human actor	multiple items	messy arrangement
item falls off of a surface	*no human actor*	*single item*	
hand puts item	human actor (hand only)	single item	typical orientation
hand puts item	human actor (hand only)	single item	atypical orientation
hand puts items	human actor (hand only)	multiple items	orderly arrangement
hand puts items	human actor (hand only)	multiple items	messy arrangement
person uses item	*human actor (full body)*	*single item*	*typical action*
person uses item	*human actor (full body)*	*single item*	*atypical action*

Though participants described all of the conditions listed in table 3, as mentioned above, I include descriptions from eight conditions, four events without a human actor and four events in which a human actor acts on the item or items in the vignette, placing or arranging them on a table. In other work, we find that the presence of the full body of a human actor may affect the type of handshape that is used in these descriptions (Rissman et al., 2016; Rissman, Woodward, & Goldin-Meadow, 2018), so vignettes showing the full body of the human actor were excluded.

4.4.4 Lexical Elicitation Task

As mentioned above, the lexical elicitation task is a book of photos of local exemplars of food, tools, landmarks and locations, animals, vehicles, furniture, clothing, people, and plants. The full

set contains 61 photos, with 14 food items, 10 tools/instruments, 9 landmarks, 9 animals, 7 vehicles, 6 furniture items, 2 clothing items, 2 people, and 2 plants (for examples see figure 17, for the full set of items see appendix a).

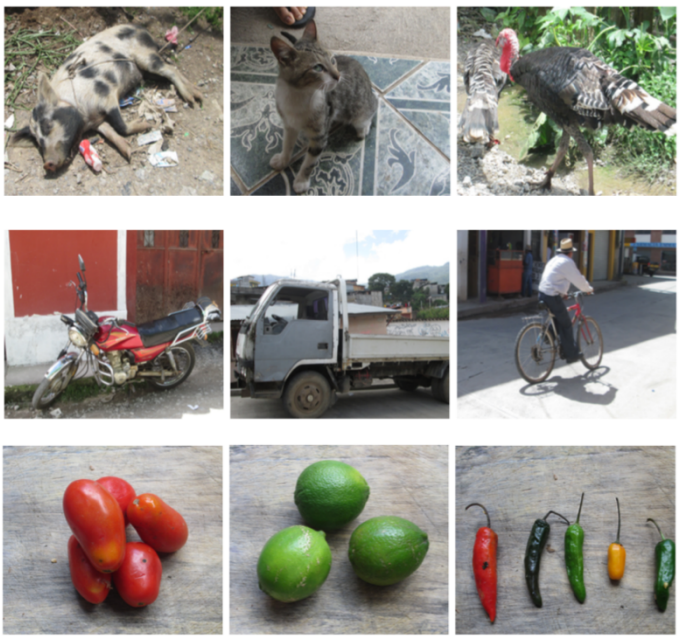

Figure 17. Examples of photos from elicitation task including animals (top row), vehicles (middle row) and food (bottom row). All photos available in Appendix A.

The task was completed seventy times total by nineteen participants across five years[4] (3 adult home signers, 5 hearing adults, 9 child home signers, 2 hearing children). We coded each sign produced during the lexical task for the following dimensions: sign type, handshape representation type, specific handshape, place of articulation, non-manual markers, conversational turn and a gloss for the form of the sign, as well as a gloss for the meaning of the sign.

[4] Some participants only completed the task once per year, but occasionally participants completed the task multiple times during the same month-long fieldtrip, typically about a week passed between the sessions when they completed the task.

4.5 Annotation

Sign forms produced by the participants were annotated by hand using ELAN, an annotation software developed at the Max Planck Institute for Psycholinguistics in Nijmegen (Brugman & Russel, 2004).The system for annotation is based on coding systems used for homesign systems and emerging sign languages described in Brentari et al (2016) and Goldin-Meadow (2003).

All of the communicative signs elicited for a vignette were annotated. For a sign to be considered communicative, it must have been directed to an interlocutor and it must not have been an imitation of the preceding form produced by the interlocutor or a functional act performed on a toy or tool.

All data were coded by Horton or a trained research assistant in the Sign Language Linguistics lab at the University of Chicago. The first step for annotating a response was identification of the signs in an utterance. We began annotating a sign when the handshape becomes tense and stop when the handshape became lax or was removed from the signing space in front of the signer's body (e.g., hand came to rest in the signer's lap).

4.5.1 Annotating Signs

4.5.1.1 Classifier Task: Annotating Response Portions (Events, Labels, Extra Information)

In the classifier task, homesigners produced responses that included signs describing the objects in the vignette (label-signs) and signs that described the arrangement of objects in the vignette or what happened in the vignette (event-signs). This coding decision was primarily based on the place of articulation of the sign. Signs that were produced in a neutral space or articulated on the signer's body (particularly common for the item "lollipop" in the stimulus set), were identified as

labels. Signs that were articulated in the signing plane (Brentari, 1998) – the space extending out, in front of the signer's torso[5] – were identified as *event descriptions*. See figure 18 below for examples of this distinction.

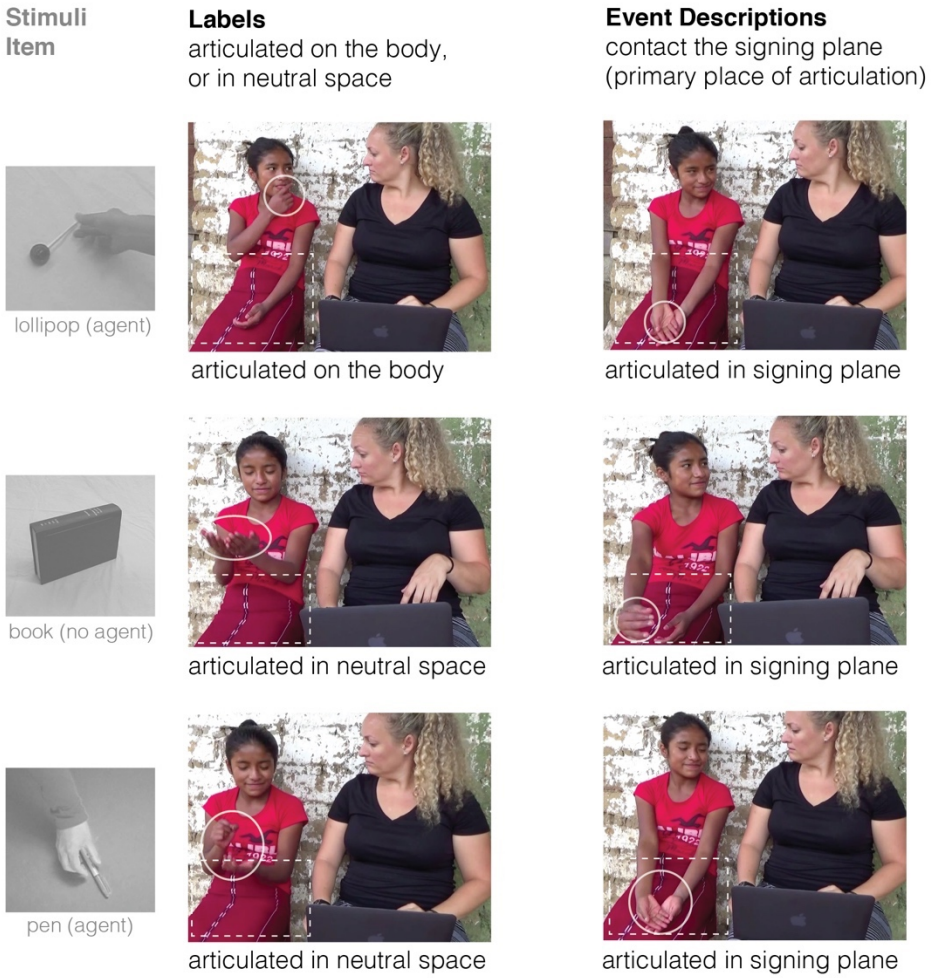

Figure 18. Signs were coded as labels or event descriptions. This decision was primarily based on the place of articulation of the sign. The homesigner above describes a lollipop (top row), book (middle row) and pen (bottom row). She signs the labels for these items either in neutral space (typically higher than the signing plane) or on her body (as in lollipop). She produces signs that mimetically represent the events in the vignette (the object being placed or the object

[5] The neutral signing plane in the examples below is lower on the signer's body than described for standard sign languages. This aligns with observations of other young sign languages (Nicaraguan Sign Language; Kegl, Senghas, and Coppola 1999, Flaherty, Stewart and Kirby 2018) and sign languages used in rural communities (Adamorobe Sign Language; Nyst 2007) that signers using younger sign systems may make use of a larger sign space than standard sign languages.

existing on a surface) in the signing plane in front of her body. This space is indicated in the photos with a dashed white line. Her signs are circled with a solid white line.

Annotators also used iconicity to make this coding decision. Signs that resembled the events in the stimulus vignette (signs that mimetically recreated placing an item on a surface) were considered *event descriptions*. All other signs were coded as *extra information*.

4.5.1.2 Annotating Handshape Representation Type

In both the classifier task and the lexical task, signs were coded for their handshape representation type. Handshape representation type is the iconic relationship between a handshape and its referent. The two primary categories of handshape type are handling handshapes and object handshapes.

Handling handshapes iconically resemble the handshape that would occur if someone manipulated an item with their hands. *Object* handshapes iconically represent a dimension of an item, typically its shape. In the sign language literature, these have sometimes been called whole entity classifiers (Benedicto & Brentari, 2004; Engberg-Pedersen, 2010; Supalla, 1983; Zwitserlood, 2012). Homesigners also produced other handshape types, these included *size and shape specifiers*, which represented a size dimension of an individual object or the extent of the space occupied by multiple objects (see Nyst, 2016 for a taxonomy of size and shape specifiers and their distribution in Adamorobe Sign Language, also Horton, forthcoming, for examples of size and shape specifiers produced by child homesigners). Homesigners occasionally used their bodies to represent objects, and occasionally produced handshapes that were not considered iconic or handshapes for which the iconic relationship between the handshape and the referent

could not be determined. Examples of a handling handshape and an object handshape for each of the stimulus items in the vignettes are presented in figure 19 below.

Figure 19. The five items from the stimulus set and examples of object handshapes (left column) and handling handshapes (right column) that were produced by the homesigners in this study in their labels and descriptions of these objects.

The decision to code a handshape as having a handling or object representation type depended on the properties of the item being represented and on how the handshape combined with the movement parameter of the sign. It was possible for the same specific handshape to sometimes be coded as having a handling representation type and sometimes be coded as having an object representation type. Importantly, a given specific handshape configuration is not

always a handling handshape or always an object handshape. The distinction is based on properties of the referent, the movement parameter of the sign, and the relationship to the non-dominant hand. An example of a handshape that was sometimes annotated as a handling handshape and sometimes as an object handshape is presented in figure 20 below.

Figure 20. Examples of the handshape BTx as an Object handshape (left image) and a Handling handshape (right image)

Although homesigners produced other types of handshapes, the most common handshape types were handling or object handshapes.

4.5.1.3 Annotating Specific Handshape

The annotation system for specific handshape is based on Eccarius and Brentari (2008). They propose a system grounded in Brentari's Prosodic Model that captures handshapes that are contrastive in a diverse set of standard sign languages[6]. The annotation system uses a set of base symbols and joint symbols that are combined in unique codes organized by primary, secondary and non-selected finger groups. The 13 base symbols encode the quantity of fingers that are

[6] American Sign Language, German Sign Language and Hong Kong Sign Language were used by Eccarius (2008) to develop the system, additional crosslinguistic frequency data comes from Hara (2003) from Japanese Sign Language

selected (active) in the handshape as well as the point of reference for these fingers (For a list of these Selected Finger Groups see appendix b). The default point of reference is the radial, or thumb side of the hand, while the marked point of reference is the ulnar or pinky side of the hand. Base symbols are concatenated with one of ten joint configuration symbols. As mentioned above, Joint Configuration refers to the degree of flexion of the lower and middle joints of the finger, as well as feature nodes from the prosodic model (for a list of these specifications from Eccarius and Brentari see appendix b).

The set of handshape codes that was used as a reference for the coding of this data contained 209 possible handshapes, all attested in at least one standard sign language. To apply this coding system, annotators used a reference manual with photos of the handshapes associated with each of the 209 codes. For each sign, the annotator selected the photo that best matched that handshape and entered the corresponding transcription code, an example is given in figure 21 below. A sample transcription code is provided in figure 21 below, with a photograph of an example handshape.

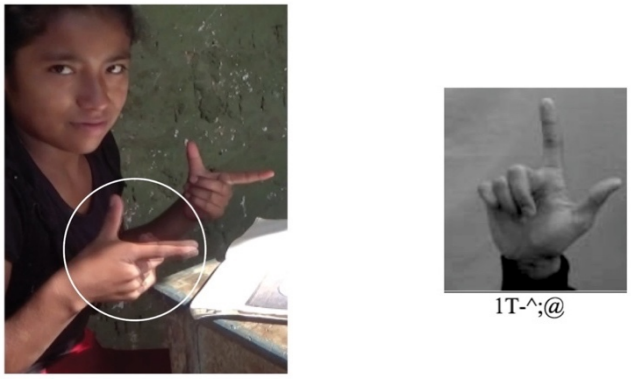

Figure 21. Example of a specific handshape from the data and the corresponding code that was selected from the coding manual

4.5.1.4 Annotating Form Glosses

After coding the sign type, the annotator (trained research assistants in the Goldin-Meadow Lab or Sign Language Linguistics Lab at the University of Chicago), assigned a form gloss to the sign (see figure 23 for examples).

**These forms are also conventional gestural emblems in Nebaj, see appendix d for further discussion.*

Figure 22. Examples of sign form glosses from the data.

Form gloss conventions were based on the movement and iconicity of the sign. If the sign included a path movement or a contact movement, the sign was glossed with an English or Spanish verb that described the action being enacted or pantomimed by the signer (e.g., PAINT, CHOP or PEEL, see figure 23 for examples). If the sign did not include a path or contact movement, the sign was glossed with a two-three word description of the form of the sign and any movement that was interpreted by the coder to represent the extent of an object or a tracing of the outline of the object (e.g., ROUND-LARGE, ROUND-SMALL).

The mixed methods approach adopted for this study combines ethnographic methods from anthropology and field documentation and elicitation methods from linguistics in an effort to understand the structure and form of homesign systems embedded in a particular social context. The ethnographic methods inform the theoretical notion of a communicative ecology, and help explain many of the patterns that are identified in the data collected from the elicitation tasks. While the elicitation tasks are not as grounded in daily talk as naturalistic or spontaneous data, they provide a common ground on which to compare the signs produced by homesigners, their communication partners, and hearing Ixiles who do not know any homesigners. The use of these elicitation tools in particular also makes this work compatible with other studies of young and established sign languages.

5. The Distribution of Complexity in Handshape Inventories: Phonology in Homesign

5.1 Perceptible Entities

> But just as chess is based entirely on the combinations afforded by the various pieces, so too a language has the character of a system based entirely on the contrasts between its concrete units. One cannot dispense with identifying them, nor move a step without having recourse to them. And yet delimiting them is such a tricky problem that one is led to ask whether they are really there.
>
> A language thus has this curious and striking feature. It has no immediately perceptible entities. And yet one cannot doubt that they exist, or that the interplay of these units is what constitutes linguistic structure. That is undoubtedly a characteristic which distinguishes language from all other semiological institutions (Saussure, 1986, p. 105).

Languages are semiotic systems of contrastive units. At the phonological level, these units are not meaningful – in the sense that they predictably contribute to the referential denotation of an utterance – but they reliably serve as the minimal difference between two distinct referential tokens[1]. The organization of these contrastive units is the focus of phonological analysis. The point noted by Saussure (above), however, is that these units are not immediately apparent when beginning the study of a semiotic system. Debates about the status of phonemic units, even in standard sign languages, remains contested in contemporary work (see Morgan, 2017, pp. 141–143, for a discussion of which features of handshape are contrastive in Kenyan Sign Language). In this chapter, I begin with the premise that handshapes constitute a

[1] However, see Occhino (2016) for an alternative perspective on sign language phonology – a cognitive model – that allows for handshapes to accrue semantic associations (i.e., contribute to the referential denotation of an utterance) because formational units emerge across usage events.

basic unit in homesign systems[2]. I describe and analyze the distribution of handshape and handshape complexity in the sets of signs produced by homesigners in two elicitation tasks.

The chapter begins with a descriptive analysis of the inventory of unique handshapes produced by each participant and a discussion of possible explanations for variation in the size of the inventory of unique handshapes. The study provides one of the first detailed analyses of the phonological inventory of multiple child homesigners (though see Goldin-Meadow, 2003, for an analysis of handshape in four American child homesigners). I discuss how the size and variation of an individual's phonological inventory might relate to the distribution of complexity, and how the distribution of handshape types, handshape tokens and handshape complexity offers new insights to better understand the phonological level of organization in an emergent sign system.

5.2 Phonology and Handshape Complexity

5.2.1 Phonology in Standard and Emerging Sign Languages

The existence of phonology in sign languages, generally, and in newly emerged sign languages, in particular, has been contested in recent research. Sandler et al (2011b), for example, assert that a young village sign system used in the Negyev desert in Israel, Al-Sayyid Bedouin Sign Language (ABSL) lacks phonology. Sandler et al do not find evidence for duality of patterning (specifically, minimal pairs of signs, distinguished by only one feature) in ABSL and report that traditionally strict formational constraints on signs are "fuzzy" even for common items, like dog.

[2] A traditional phonological analysis might proceed by identifying minimal sign pairs in each homesigner's system, to determine whether handshapes, or smaller features of handshape like selected fingers or joint configuration, are sources of contrast in the system. This approach is not adopted here because of anticipated difficulties establishing and checking minimal pairs with homesigners.

They suggest that, although there is no evidence for a phonological level of structure in ABSL, signs are guided by an "iconic prototype" with greater tolerance for differences in articulation. In older, standard sign languages, these differences in articulation would violate phonological rules (pp. 520-523). Brentari (forthcoming), however, suggests that duality of patterning need not be the only criteria for the existence of a phonological level of structure in new languages. She argues that, even when there is no evidence for minimal pairs in a system, handshape complexity could be analyzed as an indicator of emergent phonological organization.

5.2.2 Handshape Complexity

Handshape was identified as a phonological parameter in early research on American Sign Language (ASL) (Stokoe, 1960). In ASL, minimal pairs frequently have the same movement, place of articulation, and orientation, differing only in handshape. Later work demonstrated that handshapes could be further analyzed as configurations of features (Brentari 1990, discussed in detail in section 5.2.4 below). For the analyses in study 2, I characterize handshapes – configurations of features – in terms of their complexity. The handshape complexity scores used in the study were developed in Brentari and Eccarius (2008) and Brentari et al (2012) and apply to two features of the handshape parameter: selected fingers and joint configuration.

The Selected Fingers of a handshape refer to those fingers that are active, the fingers that are involved in sign-internal movement, or make contact with another body part or the signing plane (Mandel, 1981). The Joint Configuration of a handshape refers to the degree of flexion in the metacarpophalangeal joints (MCP) – the joint at the base of the finger – and the proximal interphalangeal joints (PIP) – the joints in the middle of the finger (see Brentari 1998, pp. 106-110 for an overview). In the next section, I discuss the theoretical and empirical grounding of these scores.

5.2.3 Handshape Complexity: Frequency within and across Sign Languages

The complexity of a given form can be characterized in terms of the amount of information it contains, relative to all of the forms in the inventory. One way to quantify the amount of information is by determining the frequency of a form. The assumption is that forms occurring more often (higher frequency) in the inventory are less informative than forms occurring infrequently (Goldsmith, 2009).

In a study of handshapes in American Sign Language (ASL) and Japanese Sign Language (JSL), Hara (2003) reports that some handshapes are similar in frequency across the two languages[3]. For example, in both languages the most frequent handshape is the "B-handshape"  , which is also articulatory easy to produce (Ann, 1996), and appears early in children acquiring ASL natively (Boyes Braem, 1990; McIntire, 1977; Siedlecki & Bonvillian, 1993). Hara (2003) also finds differences cross-linguistically between ASL and JSL. The least frequent handshape in the lexicon of ASL, is a bent-H handshape  (maximally informative), while the least frequent handshape in JSL is a similarly bent, but different, 3-finger handshape:  . In each of the examples above, the complexity based on frequency aligns with articulatory complexity, the  handshape is less informative and is minimally difficult to articulate. The  and handshapes are maximally informative and more difficult to articulate. This is not always the case, however. For example, the L-handshape  is relatively easy to articulate (low articulatory complexity), but is infrequent in the lexicon of ASL (higher complexity, based on frequency). The frequency of handshapes cross-linguistically, based on the analysis in Hara (2003) and Eccarius and Brentari (2008) contributes to the overall complexity score assigned to selected

[3] Hara (2003) used a dictionary of American Sign Language (Stokoe, 1965/1972) and a dictionary of Japanese Sign Language (Japan Institute for Sign Language Studies, 1997) to evaluate handshape frequency in the lexicon.

finger groups and joint configurations. Handshapes that are frequent cross-linguistically are assigned low complexity scores, while handshapes that are infrequent cross-linguistically are assigned high complexity scores.

5.2.4 Handshape Complexity: Representation in Theoretical Models of Sign Language Phonology

There are several theoretical models of sign language phonology, however all agree on the principle feature classes of handshape. These feature classes include selected finger group, joint configuration and orientation (Brentari, 1998; der Hulst, 1993; Liddell & Johnson, 1989; Sandler, 1989; Sandler & Lillo-Martin, 2006; van der Hulst, 1995; van der Kooij, 2002; van der Kooij & Crasborn, 2008 see Morgan, 2017 for a detailed overview and comparison of these models). The complexity scores used in this analysis are based on the representation of the handshape in the Prosodic Model of sign language phonology (PM), proposed by Brentari (1998), but other models would predict approximately the same representation of handshapes. Brentari's Prosodic Model is a feature geometry based on ASL, with binary branches for selected finger group, joints and other features. (see figure 23 for an illustration of the model).

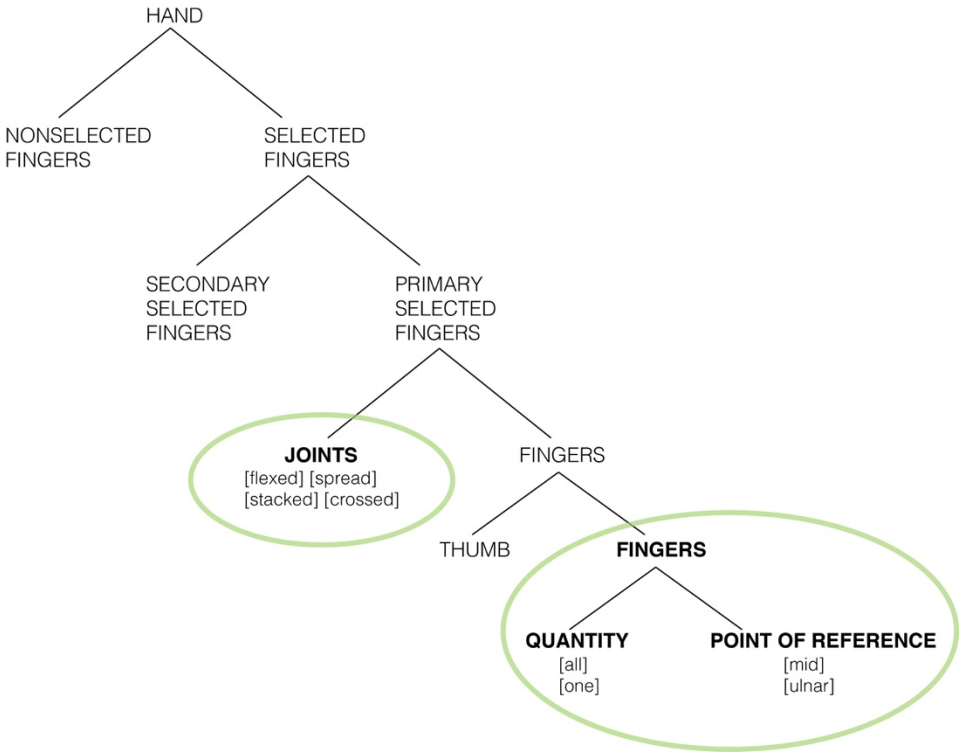

Figure 23. Prosodic Model, schematic representation, based on Eccarius and Brentari 2009, Eccarius 2002, Brentari 1998

Complexity scores are based on the number of branches in the model, handshapes with 0 branches are low complexity, handshapes with 1 branch are medium complexity and handshapes with 2 or more branches in their structure are considered high complexity. For example, joint configurations that are extended or fully flexed are considered low complexity, and receive a score of 1, selected finger groups that included all four of the fingers, only one finger, or only the thumb, are considered low complexity and receive a score of 1 (see figure 24 for examples of handshapes and their representation in the prosodic model).

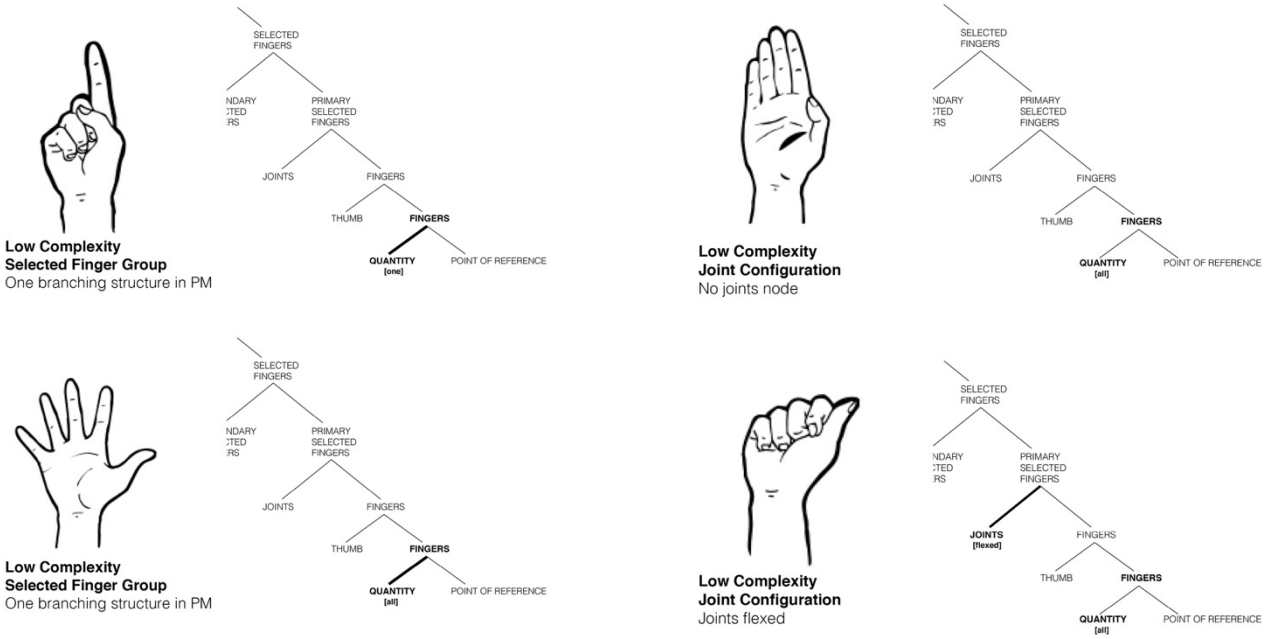

Figure 24. Complexity scores based on representation in the Prosodic Model (PM) (Brentari 1998). Complexity is based on structural representation in the model. Representations shown (left) for two low complexity selected finger group handshapes and for two low complexity joint configuration handshapes.

5.2.5 Handshape Complexity: Order of Acquisition

The final dimension that contributes to the complexity score of a specific handshape is the order of acquisition of handshapes in children who are acquiring a sign language natively. Handshapes that are consistently produced earlier in development are assumed to be less complex than handshapes that either do not appear in children's early sign productions, or are frequently articulated with an alternative handshape by children in earlier stages of development. Based on several case studies (Boyes Braem, 1990; Clibbens & Harris, 1993; McIntire, 1977) as well as studies based on parental reports (Bonvillian, Orlansky, & Lazin Novack, 1983; Orlansky & Bonvillian, 1988) and longitudinal observations of children with one or two deaf parents (Siedlecki & Bonvillian, 1993), Boyes-Braem (1990) developed a model of handshape acquisition with five stages. Some aspects of Boyes-Braem's model were born out in later

studies of acquisition, but many children did not follow the stages precisely. Marentette and Mayberry (2000), for example, found frequent handshape substitutions, with a child between ages 1;0 and 2;0 producing signs accurate to an adult target at a rate of only 27%. However, most studies of sign language acquisition support the claim that children acquire the "5" handshape 🖐 and the "1" handshape ☝ earliest, thus these are assumed to be lower complexity.

Each of the three dimensions discussed above: cross-linguistic frequency, representation in the PM feature tree and order of acquisition, contribute to the complexity scores for selected finger group and joint configuration. The full list of complexity scores for all handshape codes are provided in appendix b.

5.2.6 Handshape Complexity in Standard and Young Sign Languages

In a study of handshape complexity in Nicaraguan Sign Language (less than 50 years old), Italian Sign Language (LIS) and American Sign Language (ASL), (Brentari et al., 2017) find that, relative to hearing gesturers from Nicaragua, Italy and the United States, signers show distinct patterns of Selected Finger complexity and Joint Configuration complexity.

Using the same complexity scores described above, they report that signers have higher Selected Finger group complexity scores for handshapes that iconically resemble the size or shape of the referent – object handshapes – and higher Joint Complexity scores for handshapes that iconically resemble how the referent would be manipulated – handling handshapes – in classifier predicates. Brentari et al argue that the presence of this pattern in standard sign language and adult homesigner participants, and its absence in hearing people who were also tested, suggests that this is a linguistic pattern that reflects a phonological level of organization absent in non-linguistic systems.

5.3 Methods

5.3.1 Elicitation tasks and methods

The elicitation tasks for this data are described in detail in Chapter 4. The signs that were analyzed for this chapter were produced in the context of two elicitation tasks – the classifier task and the lexical task – at a single timepoint for each child. Participants were encouraged to describe the short vignettes (from the Classifier Task) or photos (from the Lexical Task) using as many signs as they wanted.

In general, I elicited these forms from participants, though other family members, friends and neighbors were often around during the sessions which took place at the participants' homes. I showed participants the stimulus items on a laptop (the Classifier Task) or with a small book of photos (the Lexical Task). All participants appeared to understand the task and described the stimuli items with relative ease.

5.3.2 Participants

The data for this chapter are from ten focal participants. Nine of the participants are deaf and one of the participants (Ramon) is hearing. Ramon's mother and sister (Sara) are deaf and he communicates with them using their homesign systems. A brief overview of the participants is provided in table 7 below. Half of the participants completed the Classifier and Lexical tasks in the same year, however half of the participants completed the tasks in separate years. The age in parentheses indicates that participants who completed the task in separate years. In some cases, I have data from the two tasks in the same year for these participants, as all participants complete the lexical elicitation task every year, but it has not yet been annotated.

Table 4. Participants' ages when they completed the classifier and lexical tasks

Ecology	*Participant*	*Age**
Individual	Antonio	7;0 (6;0)
Individual	Jacinto	9;7
Individual	Alejandro	11;11
Family	Rosa	10;7 (9;7)
Family	Sara	11;5 (10;5)
Family	Ramon	12 (14)
Community	Jose	11;5 (10;5)
Community	Tomás	12;7
Community	Juana	14;1
Community	Diego	15;8

**some participants completed the classifier task and lexical task in different years, their age for the lexical task is in parentheses if this is the case*

The timepoints for these analyses (this chapter and the preceding chapter) were selected to try to control the age of participants. Most participants were approximately 11-12 years old at the time that this data was collected. A detailed portrait of each participant and their communicative environment is presented in chapter 3.

5.3.3 Data Annotation

5.3.3.1 Annotating Handshape Type

Signs were coded for their iconic handshape representation type. The majority of signs were annotated as having a *handling handshape*, in which the hand represented how the object would be manipulated, or an *object handshape*, in which the hand represented a size or shape dimension of the object. See chapter 4, section 4.5 for a detailed overview of how handshape type was annotated.

5.3.3.2 Annotating Specific Handshape

Handshapes were annotated for their specific handshape using a system developed in Eccarius and Brentari (2008). The system is described in chapter 4 in detail. Coders chose from a set of 209 handshape codes that describe the selected fingers, joint configuration and non-selected fingers of the handshape. An example of a handshape from the data and the code that it was given is illustrated in figure 25.

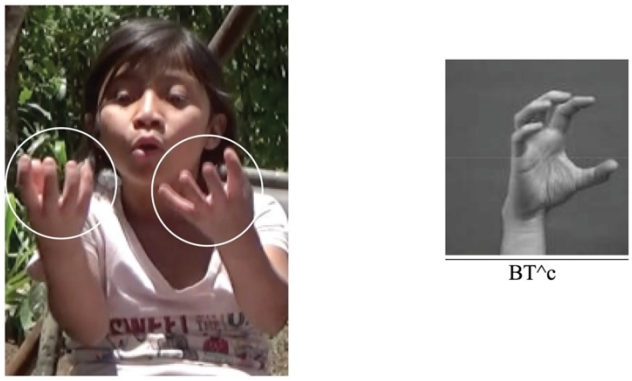

Figure 25. Example of specific handshapes from the data and the corresponding codes that were selected from the coding manual

5.4 Results

5.4.1 Overview of Results

A total of 1,739 signs were annotated using the coding system described above in section 5.3.3 and in chapter 4, section 4.5. The distribution of these signs for all participants is presented in table 8 below. There was a substantial range in the number of signs per task, however, with individual signers producing between 62 and 131 signs for the Classifier Task and between 54 and 146 signs for the Lexical Task. On average, most participants produced approximately 90 signs in their descriptions for the Classifier Task (40 vignettes) and 130 signs in their

descriptions for the Lexical Task (62 photos), most participants produced more than one sign per stimulus item.

Table 5. Rate of Signing and Number of Signs in Analysis: All Participants

Task	*Min signs per Participant*	*Max signs per Participant*	*Average Signs per Participant*	*Total Signs Analyzed*
Classifier	62	131	90	898
Lexical	54	146	84	841
All	137	222	174	1739

To better understand the significant range of responses per participant for each task, the rates of signing by individual are presented in table 6 below.

Table 6. Rate of Signing and Number of Signs* per Participant

	Participant	*Classifier Task*	*Lexical Task*	*Total*
Individual	Antonio	62	56	118
	Jacinto	93	104	197
	Alejandro	100	54	154
Family Ecology	Rosa	96	126	222
	Sara	108	95	203
	Ramon	69	146	215
Peer Ecology	Jose	65	59	124
	Tomás	93	55	148
	Juana	81	56	137
	Diego	131	90	221

**Handling and Object Handshapes only*

The rate of responses to the elicitation task does not appear to be associated with age or communicative ecology. The range of total signs produced for the Classifier Task is much smaller than the range of signs produced for the Lexical Class, Ramon (F, H) , for example, produced 69 signs when completing the Classifier Task, but 146 signs when completing the

Lexical Task. The Lexical Task, in addition to having more stimulus items in the set, offered more opportunities for signers to provide additional description than the Classifier Task, which consisted of vignettes with the same five items across multiple conditions. The differences in the rates of signing are controlled, in the analysis of the Classifier Task, by computing means for individual items (book, pen, plane, lollipop and marble) and then averaging those means. For the Lexical Task, all signs were analyzed as one set.

5.4.1.1 Total Handshape Inventory

Handshapes were coded using the handshape coding system described in section 5.3.3. As noted above, this system generates 209 possible handshapes[4] that are a combination of Selected Fingers and Joint Configuration, but none of the sign languages documented thus far have even half of the full set. ASL, according to Stokoe et al (1965) has 31. In this dataset, across all participants, 90 unique handshapes were attested. The distribution of these handshapes is presented in figure 33 below, excluding handshapes that appeared only once or twice in the dataset (for a chart including these handshapes, see appendix b).

[4] The annotation system is designed to accommodate new handshape configurations as they are encountered (i.e., selected finger and joint configurations can be assembled if a handshape not already in the inventory is attested in a new sign system) however, that was not necessary in our data.

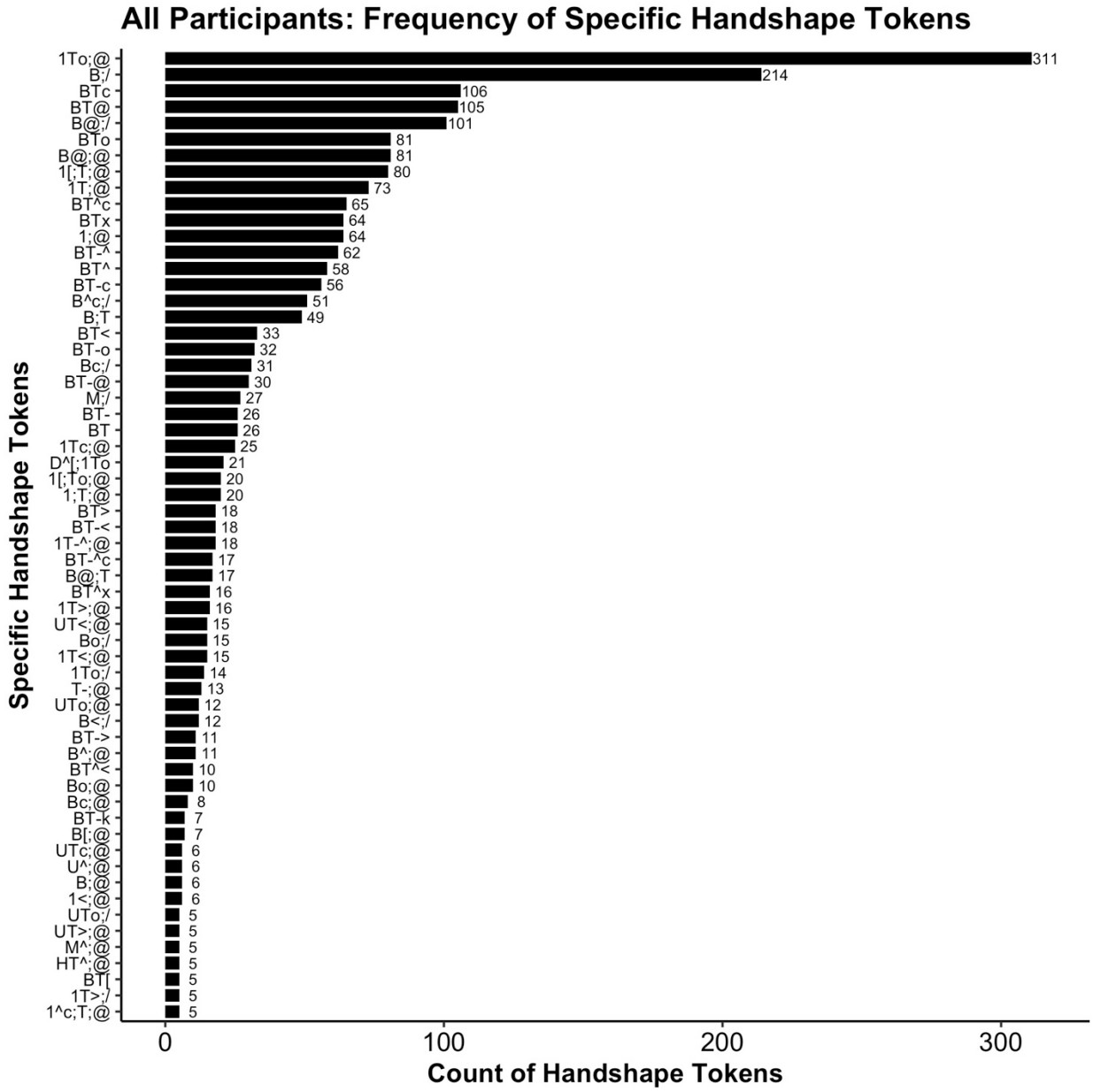

Figure 26. Frequency of Specific Handshapes in the dataset, excluding handshapes that were produced fewer than five times. The full set of all handshapes is provided in appendix x.

The most frequent handshape from the set of signs produced by all participants across both tasks was 1To;@ , which was produced 310 times, almost one third of the data. The next most common handshape was B;/  which appeared 187 times in the dataset. The distribution in

figure 26 illustrates that a small set of handshapes were very frequent in the dataset, and a larger set of handshapes appeared fewer than ten times in the dataset. This variation in frequency supports an analysis of complexity that is partially based on the frequency with which handshapes appear in the lexicons of standard sign languages.

Handshapes were coded for both their specific handshape and the handshape representation type. Table 7 shows the distribution of signs within each of these handshape types in the Classifier and Lexical tasks.

Table 7. Number of Signs in each Handshape Type by Task

		Classifier Task				*Lexical Task*	
		Label		*Event*			
	Participant	Handling	Object	Handling	Object	Handling	Object
Individual	Antonio	24	4	32	2	39	17
	Jacinto	31	6	40	16	74	30
	Alejandro	23	18	47	12	40	14
Family Ecology	Rosa	42	10	32	12	73	53
	Sara	26	10	44	28	49	46
	Ramon	18	14	21	16	49	97
Peer Ecology	Jose	14	14	10	27	41	18
	Tomás	16	7	57	13	28	27
	Juana	19	17	40	5	23	33
	Diego	43	4	70	14	45	45

There is substantial variation in the number of signs with an object representation type. In particular, Antonio (I)[5], Jacinto (I), Tomás (P), Juana (P, F), Diego (P) each produce fewer than eight object handshapes. For these signers, it is difficult to compare the complexity scores of handling handshapes and object handshapes in later analyses.

[5] In the following chapters, participants are identified with their communicative ecology after their name, I = Individual homesigners, F = homesigner in a family ecology, P = homesigner in a peer ecology. Some participants (Jose and Juana) are part of multiple ecologies, both are indicated in parentheses.

The other significant trend observable in the data above is the strong tendency for many signers (Antonio (I), Rosa (F), Jacinto (I), Sara (F), Alejandro (I), Tomás (P) and Diego (P)) to produce more handshapes with a handling representation type than an object representation type in the Classifier Task. The proportion of handshapes with a handling versus an object representation type is more balanced in the Lexical Task. These patterns reflect differences in stimulus items in the tasks, particularly the range of items presented in the lexical task (more than sixty items), relative to the limited number of items presented in the classifier task (five unique items).

Across all participants, 90 unique handshapes were attested; however, individual participants produced a subset of these, typically producing only half of the handshapes that appeared across both tasks by all participants. In table 11 below, I present the number of unique handshapes for specific sign types (signs with Handling representation type or Object representation type) in the Classifier Task and in the Lexical Task. I also present the number of unique handshapes within each of these tasks and the total number of unique handshapes for each participant, across both tasks.

Table 8. Number of Unique Handshapes across and within Tasks and Handshape Type

		Classifier Task		*Lexical Task*		*Classifier Task*	*Lexical Task*	*Both Tasks*
	Participant	*Handling*	*Object*	*Handling*	*Object*			
Individual	Antonio	16	3	14	11	18	23	33
	Jacinto	18	16	25	12	30	29	44
	Alejandro	22	10	24	17	31	35	50
Family Ecology	Rosa	19	8	25	23	25	35	41
	Sara	17	16	24	25	27	39	45
	Ramon	14	10	13	24	22	29	42
Peer Ecology	Jose	13	12	13	11	23	18	30
	Tomás	13	10	12	15	19	24	34
	Juana	11	7	11	14	17	21	29
	Diego	18	4	21	20	20	33	45

The first section of table 11, above, illustrates that specific handshapes could appear only as handling handshapes, only as object handshapes or as both an object and a handling handshape.

5.4.1.2 Individual Homesigner Handshape Inventories

5.4.1.2.1 The distribution of complexity in homesigner inventories: All Participants

As discussed above, Selected Finger complexity scores were assigned based on the initial Base symbol of the handshape code. The Base symbol indicated which fingers were part of the selected (or active) fingers of the sign. Selected Finger complexity scores ranged from 1-3 relative to the Base symbol, but an additional point was added if the Selected Finger group changed from the initial to final handshape, giving a range of 1-4 for any individual sign. In figure 27 below, I present the distribution of low, medium and high complexity handshapes for the Selected Finger feature across the entire dataset. The darker bars represent medium and high complexity handshapes, thus it is clear that the majority of handshapes in the dataset had a low Selected Finger complexity score of 1, if there was no sign-internal Selected Finger change, or 2, if the Selected Fingers changed between the initial and final handshape. The most common handshapes with high Selected Finger complexity were M;/  and D^[;1To  . The most common handshapes with medium Selected Finger complexity were “U” handshapes.

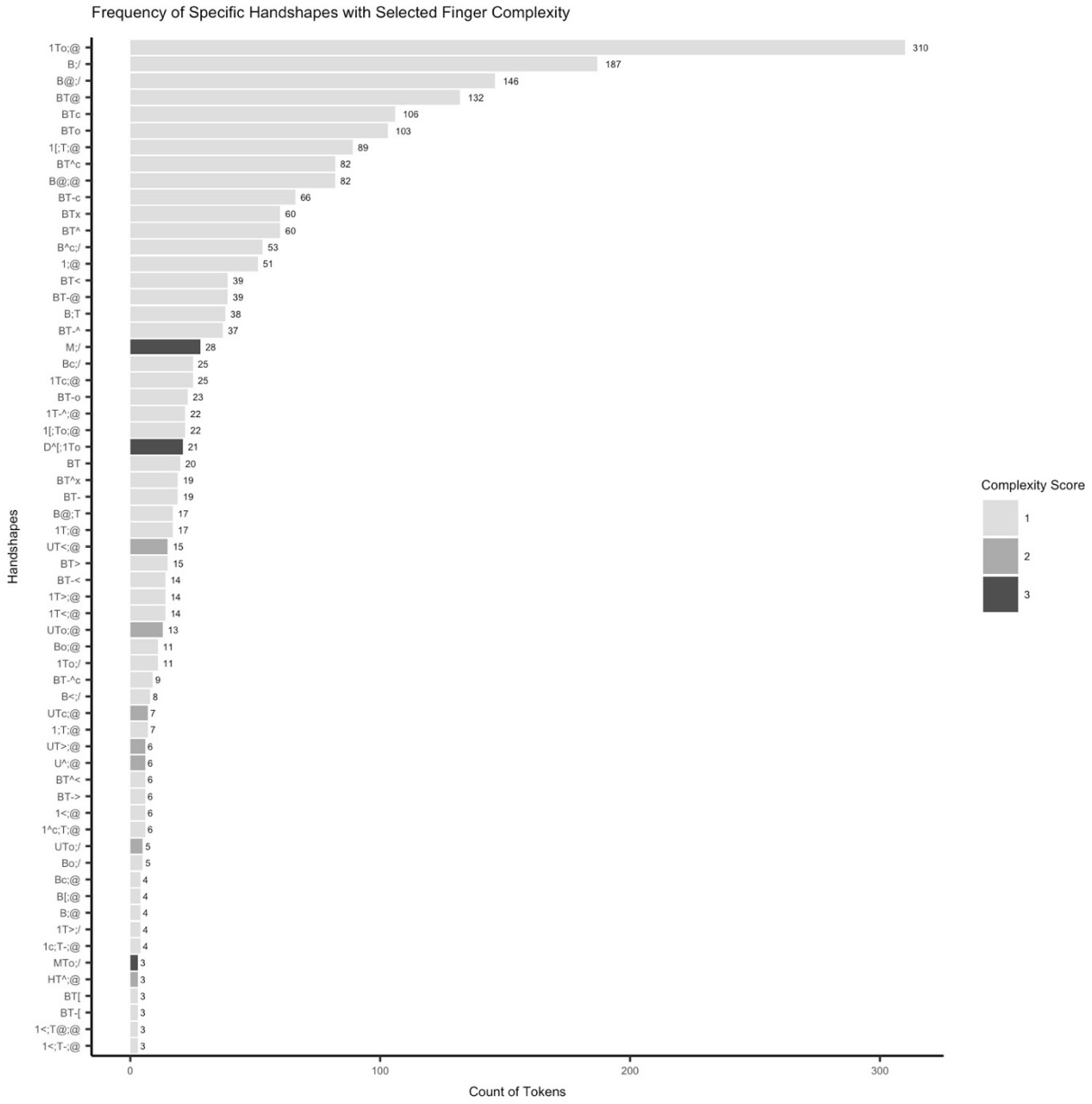

Figure 27. The frequency of all specific handshapes produced at least 3 times across the entire dataset. Shading indicates the Selected Finger complexity score assigned to the specific handshape (dark grey is high complexity (3), grey is medium complexity (2), and light grey is low complexity (1).

5.4.1.2.2 The distribution of complexity in homesigner inventories

The data in this section are from four participants: Juana (P, F), Rosa (F), Alejandro (I) and

Antonio (I). The patterns in their handshape inventories are common to multiple participants.

The figures below include the frequency of all of the unique handshapes that the signer produced. The color of the bar reflects the selected finger complexity score (left chart) or the joint configuration complexity for the specific handshape (lighter colored bars are low complexity; darker bars are higher complexity).

It was possible for the same handshape to receive one complexity score in some instances – if there was no sign-internal handshape change – and a different, higher, complexity score in other instances. The handshape received an additional complexity "point" if there was a sign-internal handshape change that resulted in a change in the selected fingers or joint configuration. This is why some bars in the figures below are partially filled with a lighter color, indicating a lower complexity score, and partially filled with a darker color, indicating a higher complexity score. In these examples, a handshape with a lower selected finger or joint configuration complexity score was counted as higher complexity in specific signs, because the sign included a handshape change, resulting in an additional complexity point. For Juana, for example, all higher-complexity handshapes are based on a handshape change, not on handshapes that have higher complexity selected fingers.

The charts include an illustration of the top three most frequent handshapes, and any handshapes that are higher complexity handshapes for selected fingers[6]. For a detailed description of complexity coding, see section 6.2.2. In most cases, the more complex forms were handshapes that would receive a selected finger complexity score of 2. I draw attention to these handshapes because these are the sources of increased complexity in the inventory, and are sparsely distributed for most signers.

[6] Where illustrations of a specific handshape were not available, I provide an illustration of a handshape with the same selected finger group, but in a different configuration, these are indicated with a light grey border around the handshape icon.

5.4.1.2.3 Small Inventory of Unique Handshapes and Low Complexity Forms: Juana

Figure 28 includes the inventory of handshapes produced by Juana (P, F) for the classifier and lexical tasks. On the horizontal axis, the unique handshape tokens that Juana produced are listed. On the vertical axis, the height of the bars reflects the frequency of each handshape token. Juana produced 29 unique handshape tokens across both of the elicitation tasks (range for all participants was 29-50 unique handshapes). She had the smallest inventory of unique handshape tokens and produced very few handshapes with higher selected finger complexity (only four handshapes had a selected finger complexity score of 2, "medium").

Juana (P, F) produced 137 signs total, but the most frequent handshape token that she produced (1To;@ ) was far more common than any other token, a point I return to in section 5.4.2 when I discuss the relationship between inventory size and mean handshape complexity.

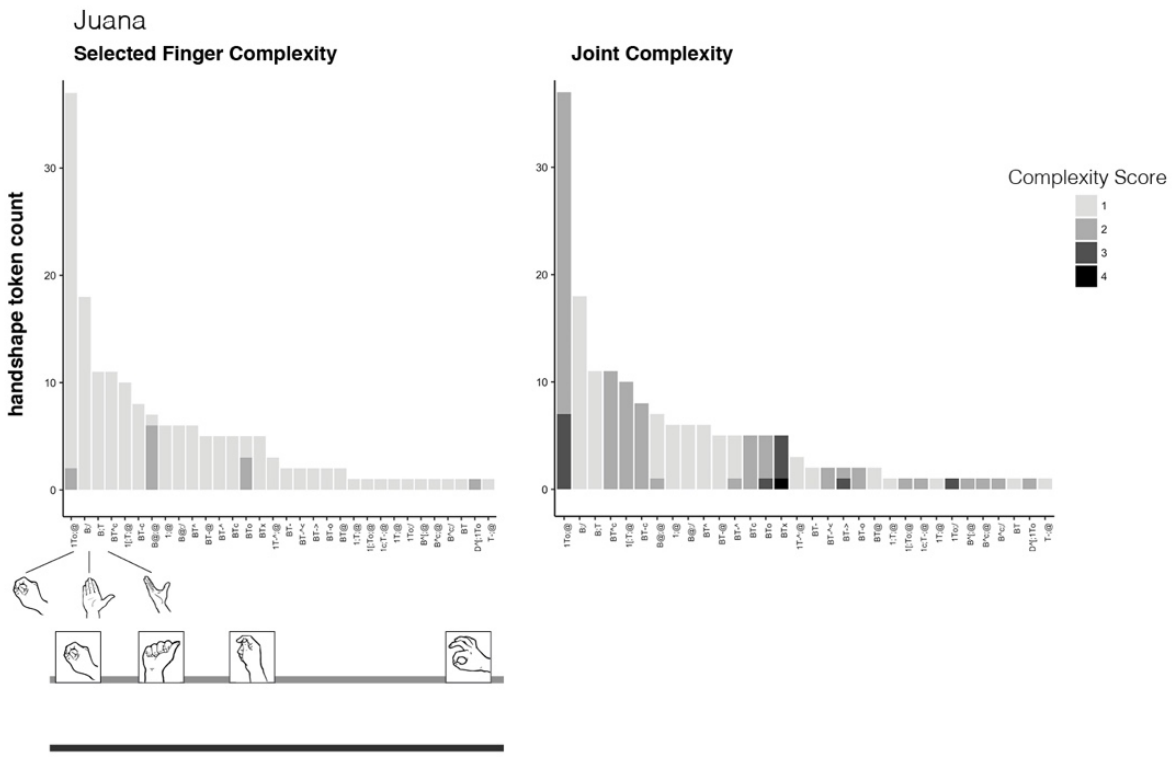

Figure 28. The frequency of unique handshape tokens produced by Juana in the classifier and lexical elicitation tasks. On the left, darker bars indicate handshapes with higher selected finger complexity scores. On the right, darker bars indicate handshapes with higher joint configuration complexity scores. Handshapes with higher selected finger complexity are illustrated below the left chart, as are the three most frequent handshape tokens.

5.4.1.2.4 Large Inventory of Unique Handshapes and Low Complexity forms: Rosa

Similar to Juana (P, F), Rosa (F) produced very few handshapes with a selected finger complexity score higher than 1 (the lowest possible complexity score), however, unlike Juana (F, P), she had a large inventory of unique handshapes (41 handshapes) and a high rate of signing (222 signs for both tasks). Additionally, the distribution of frequency for Rosa (F)'s signs differs from Juana (F, P). In figure 29, below, we observe that she has multiple handshapes that she uses frequently, rather than a single handshape that occurs more than other handshapes. Rosa (F) produces more handshapes with high selected finger complexity than Juana (F, P), but relative to the number of she signs overall, she primarily uses low complexity handshapes.

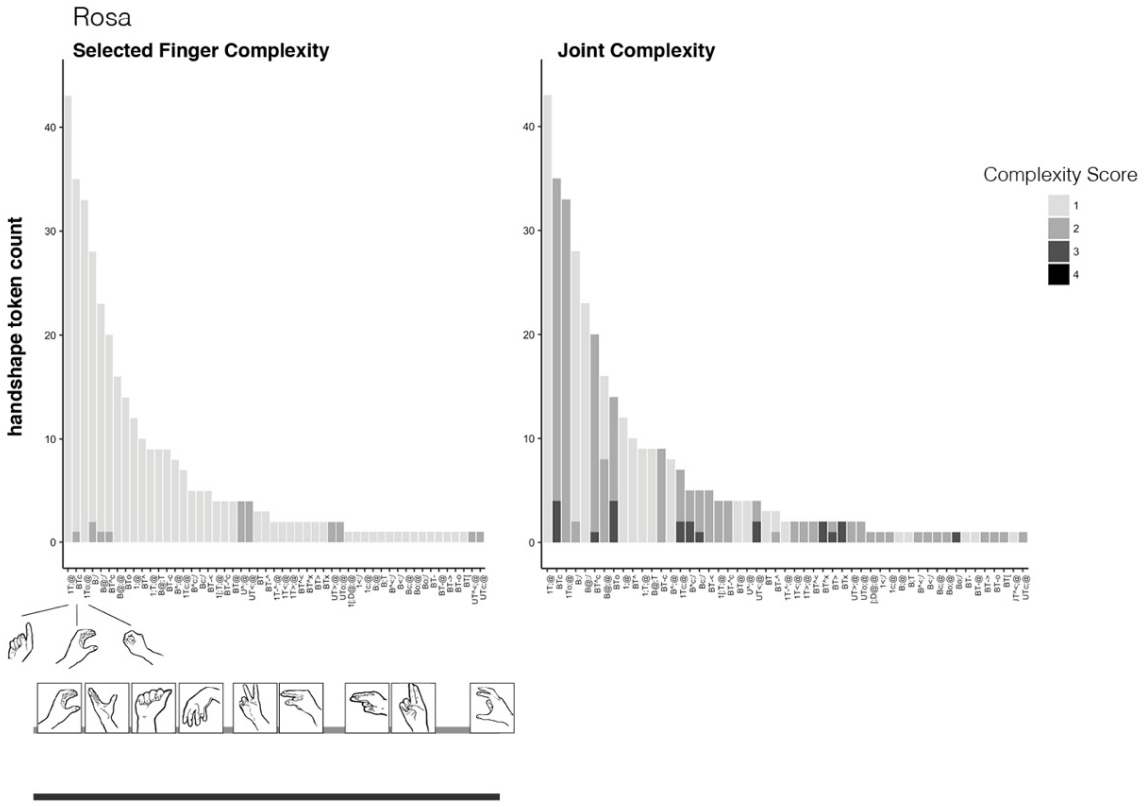

Figure 29. The frequency of unique handshape tokens produced by Rosa (F) in the classifier and lexical elicitation tasks. On the left, darker bars indicate handshapes with higher selected finger complexity scores. On the right, darker bars indicate handshapes with higher joint configuration complexity scores. Handshapes with higher selected finger complexity are illustrated below the left chart, as are the three most frequent handshape tokens.

If we compare Rosa (F) and Juana (F, P), we see that complexity is not directly related to frequency or the overall size of the handshape inventory for a given signer. Though Rosa (F) has a large inventory, and multiple handshapes that are frequent, and Juana (F, P) has a small inventory and only one or two handshapes that are frequent, both signers rarely produce handshapes with high selected finger complexity. Additionally, when we consider the specific handshapes that Rosa (F) uses, she produced several handshapes that have medium selected finger complexity score. Juana (F, P)'s higher selected finger scores appear to be driven by sign-internal handshape changes, which led to an additional complexity point. The handshapes themselves, however, did not have higher selected finger complexity.

5.4.1.2.5 Small Inventory of Unique Handshapes and High Complexity Forms: Antonio

Antonio (I) produced one of the lowest rates of signing, with only 118 total signs across the two elicitation tasks. He had a small inventory of unique handshapes as well, at 33. He did, however, produce some handshapes with higher selected finger complexity scores, illustrated in figure 30 below. Unlike Juana (F, P) and Rosa (F), Antonio (I)'s inventory includes handshapes with the highest level of selected finger complexity, as well as forms that received a higher score due to sign-internal handshape changes. In terms of frequency, the distribution of Antonio (I)'s handshapes resembles Juana (F, P)'s inventory more than Rosa's. He uses one handshape across many signs, and also has multiple handshapes that are produced infrequently.

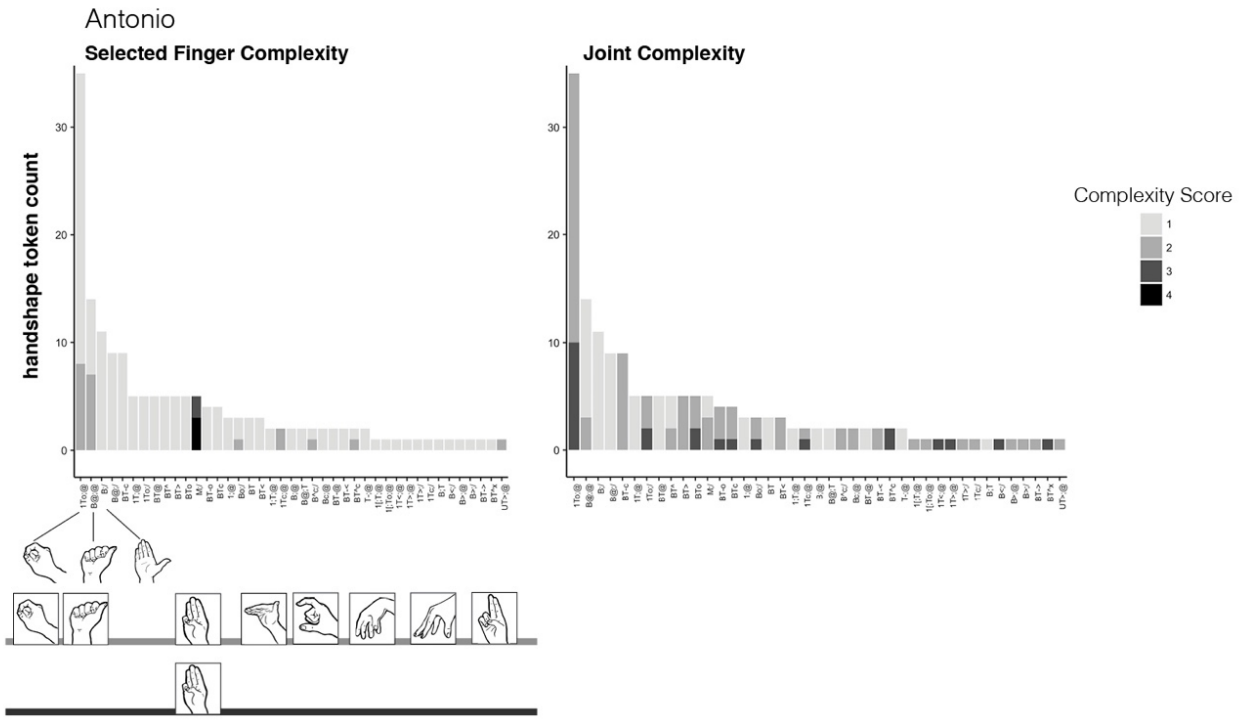

Figure 30. The frequency of unique handshape tokens produced by Antonio in the classifier and lexical elicitation tasks. On the left, darker bars indicate handshapes with higher selected finger complexity scores. On the right, darker bars indicate handshapes with higher joint configuration complexity scores. Handshapes with higher selected finger complexity are illustrated below the left chart, as are the three most frequent handshape tokens.

5.4.1.2.6 Large Inventory of Unique Handshapes and High Complexity Forms: Alejandro

Alejandro (I) did not produce as many signs as Rosa (F) (154 signs), but he has the largest inventory of unique handshapes of all participants. Alejandro (I) also uses more high complexity handshapes than Juana (P, F), Rosa (F) or Antonio (I). In this case, the size of the inventory does seem to be associated with an increase in the number of higher complexity handshapes.

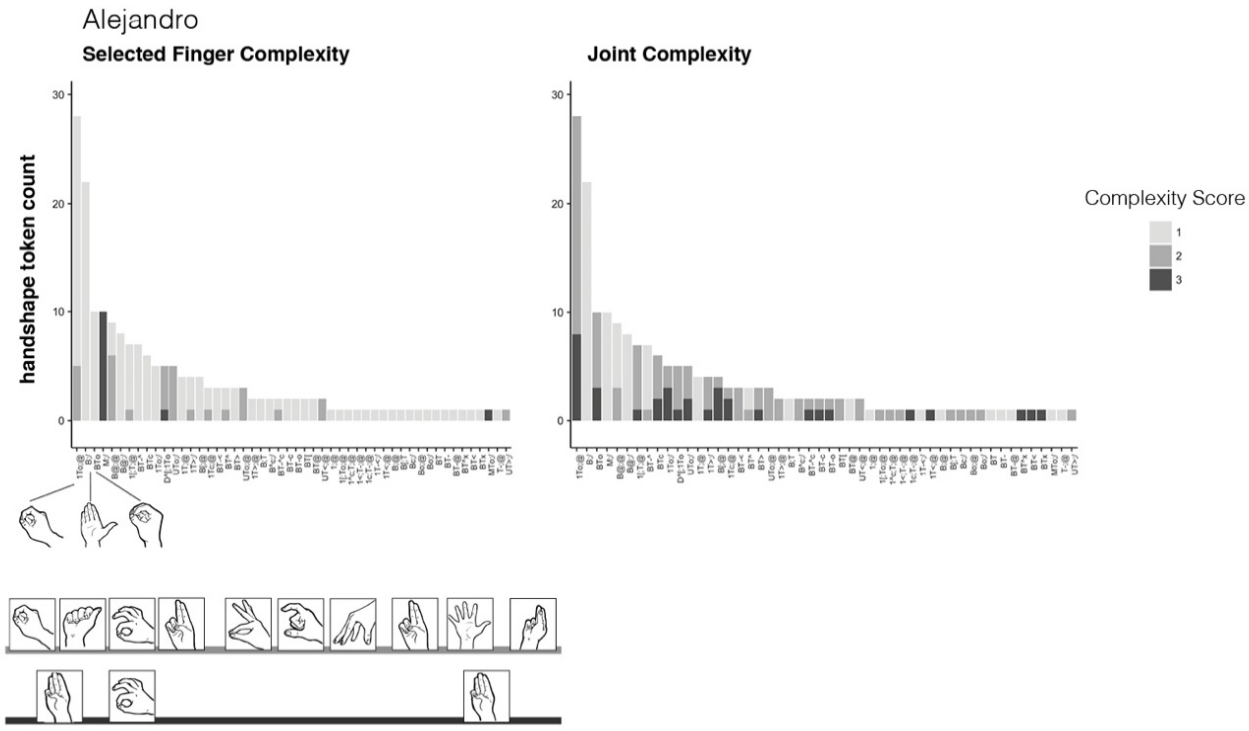

Figure 31. The frequency of unique handshape tokens produced by Alejandro in the classifier and lexical elicitation tasks. On the left, darker bars indicate handshapes with higher selected finger complexity scores. On the right, darker bars indicate handshapes with higher joint configuration complexity scores. Handshapes with higher selected finger complexity are illustrated below the left chart, as are the three most frequent handshape tokens.

This section illustrates the variability in both the size of homesigner handshape inventories and the distribution of complexity within those inventories. I do not find straightforward relationships between the size of the inventory and the presence or absence of high complexity selected finger handshapes. In each participant, there appears to be a different balance between the number of different handshapes that they use and the proportion of those handshapes that are higher complexity. I investigate possible trends across all participants in inventory size and the distribution of complexity in the next section.

5.4.2 Complexity and Inventory Size

5.4.2.1 Sign Tokens, Handshape Types and Dispersion Ratio

One way to think about an emerging phonological level of structure is in terms of the distribution of discrete units within a small corpus of signs, we can think of this as the dispersion of units which might ultimately be contrastive in the system. In this section, I analyze a proxy for dispersion of handshape in homesign systems. I consider the relationship between the number of sign tokens a participant produced – their rate of signing – and the number of unique handshape types within the set of tokens. The rate of signing and the dispersion ratio (the number of unique handshape types divided by the number of handshape tokens) are presented in table 9 below.

Table 9. Number of Sign Tokens and Dispersion Ratio for all Participants

	Participant	*Dispersion Ratio*	*Total Sign Tokens*
Individuals	Antonio	0.247	166
	Jacinto	0.182	280
	Alejandro	0.266	188
Family Ecologies	Rosa	0.145	352
	Sara	0.183	262
	Ramon	0.170	277
Peer Ecology	Jose	0.216	176
	Tomás	0.226	186
	Juana	0.189	169
	Diego	0.197	264

The values in table 9 are plotted in figure 32. We can see that individual homesigners (except for Jacinto) have the highest dispersion ratio, while homesigners in family ecologies have the lowest dispersion ratios (red bars).

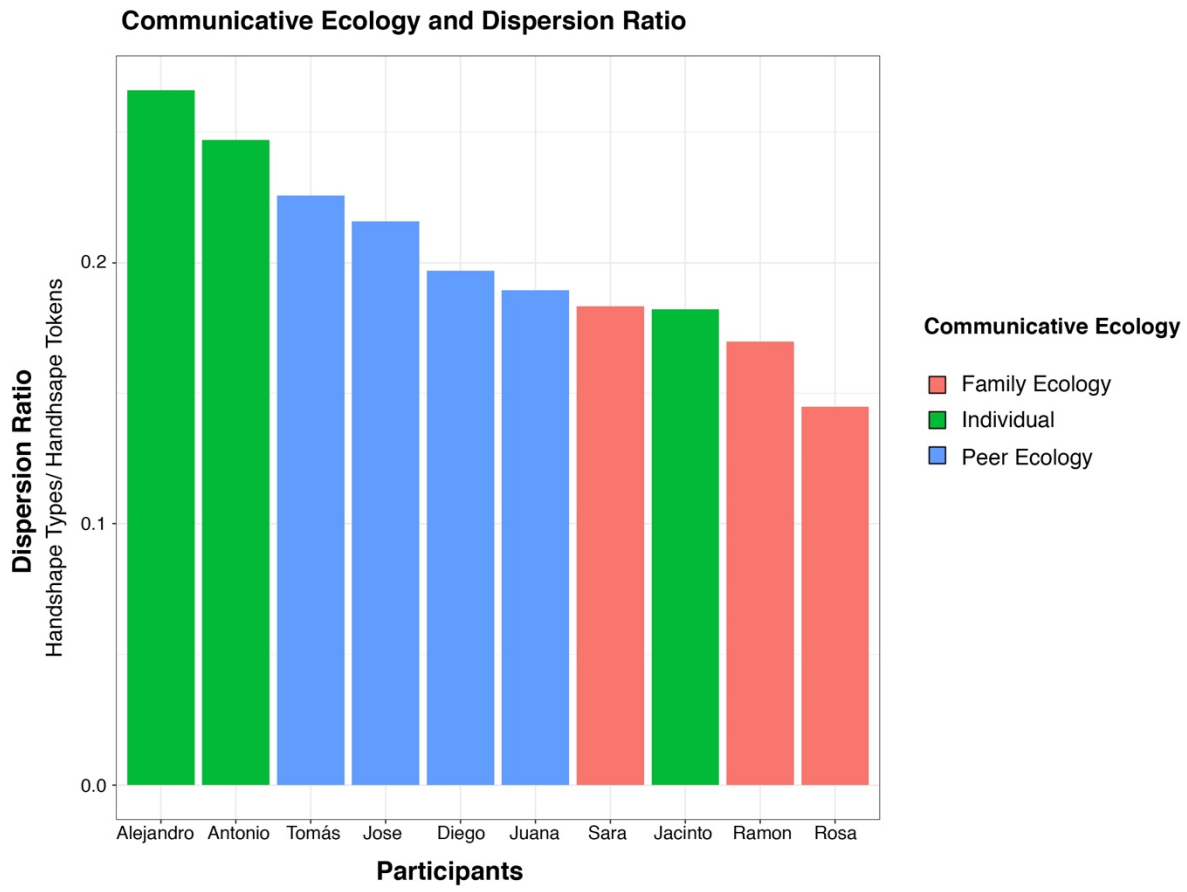

Figure 32. Dispersion ratio and communicative ecology. Individual homesigners have high dispersion ratio, homesigners in family ecologies have low dispersion ratios.

The relationship between signing rate (total number of signs produced across both tasks) and dispersion ratio (number of unique handshape types divided by total number of signs) is plotted in figure 33, with the signing rate, on the vertical axis as a function of the dispersion ratio, on the horizontal axis. There is a significant trend for inventory size to predict the proportion of higher complexity SF handshapes ($F(1, 8) = 14.71$, $p < .01$).

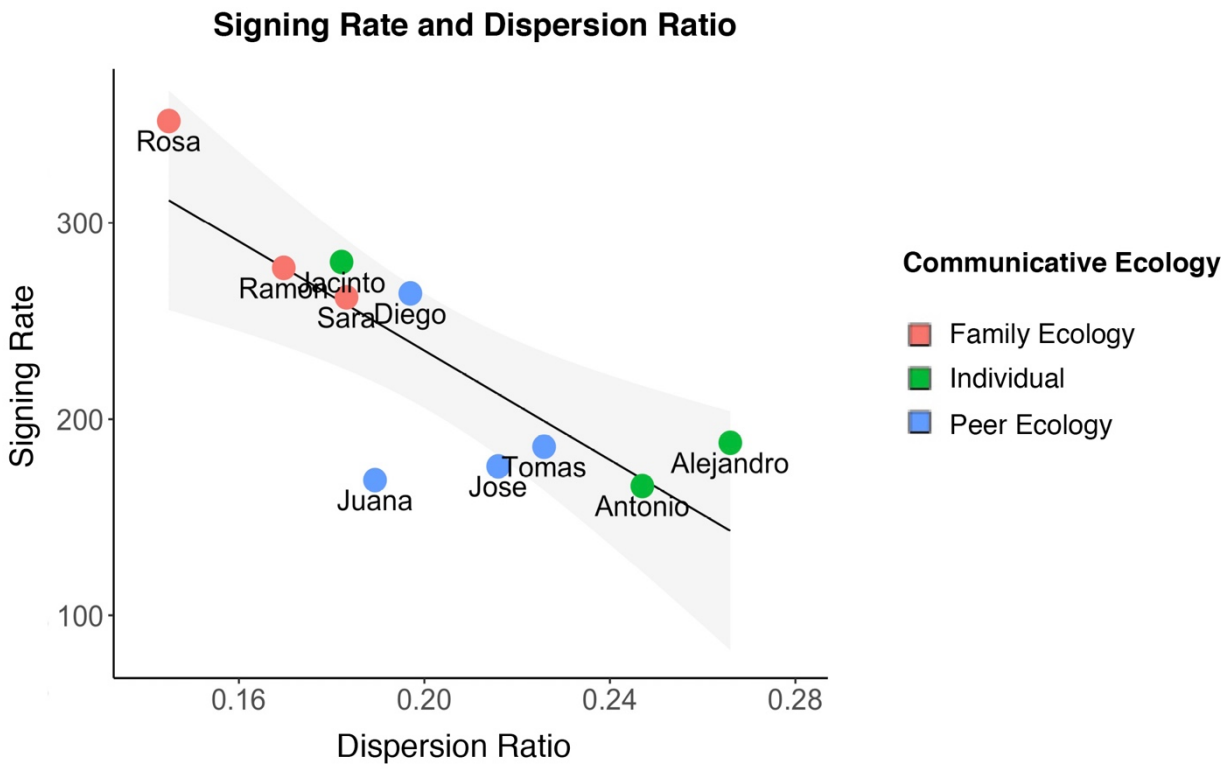

Figure 33. The distribution of signing rate (number of sign tokens) and dispersion (number of unique handshape types divided by total handshape tokens). The distribution suggests that participants cluster by communicative ecology.

There are three clusters of signers on this chart, Rosa (F), has a high number of sign tokens and a handshape types, Diego (P), Jacinto (I), Sara (F) and Ramon (F) have a moderate signing rate (number of sign tokens) and a moderate to high dispersion ratio. Antonio (I), Tomás (P) and Jose (P, F) have relatively low sign rates, but moderate inventories of handshape types, while Alejandro (I) has a large inventory of handshape types and Juana (P, F) has a small inventory of handshape types. Thus we see that although the dispersion ratio clusters by communicative ecology (figure 32), there are different factors driving this ratio for different homesigners (e.g., Juana (P, F) and Diego (P) have a similar dispersion ratio, but different characteristics in terms of signing rate).

The difference between the distributions suggests that perhaps certain ecologies promote or accommodate particular distributions of phonological units. Homesigners in a peer ecology, for example, have a mid-range dispersion ratio, regardless of the size of the inventory, thus even though Diego (P) produces more signs, overall, than Juana (F, P), Tomás and Jose (P, F), he also has a larger inventory of unique handshapes, and his productions are characterized by a similar ratio to the other homesigners in a peer ecology. Individual homesigners, Antonio, Alejandro and Jacinto have a larger inventory of unique handshapes. They also, on average produce fewer signs than many of the other participants, thus we can think of their handshape types as more "densely" distributed within the homesign system.

5.4.2.2 Handshape Inventory and Handshape Selected Finger (SF) Complexity

In the previous analysis, handshapes were treated as a uniform class of units within a sample corpus of signs. This analysis includes only the set of unique handshape types produced on the lexical task, since the classifier task included only a restricted set of items (5 handheld items including books, pens, lollipops, toy airplanes and marbles, for a detailed overview see chapter 4), repeated across diverse conditions. The lexical task included 63 different items, and thus I anticipated that these items might elicit a more diverse range of signs, and unique handshape types. I ask whether there is a fixed ratio of complexity in participants' inventory of unique handshapes, or whether the proportion of middle and high Selected Finger (SF) complexity handshapes changes as the size of the inventory changes. In the context of the classifier task, the distribution of higher complexity SF handshapes in handling and object signs appears to be one

marker of an emerging phonological system (Brentari et al., 2017, 2012b). The inventory size and the proportion of medium/high SF complexity signs are presented in table 10 below.

Table 10. Inventory size and proportion of medium and high SF complexity handshapes

	Participant	*Inventory of Handshapes*	*Proportion of medium/ high SF complexity handshapes*
Individual	Antonio	23	0.00
	Jacinto	29	0.10
	Alejandro	30	0.07
Family Ecologies	Rosa	31	0.13
	Sara	30	0.10
	Ramon	29	0.07
Peer Ecology	Jose	19	0.05
	Tomás	24	0.04
	Juana	21	0.00
	Diego	24	0.13

Note that two participants (Antonio (I) and Juana (F, P)) never produce medium SF complexity or high SF complexity handshapes in the lexical task. Additionally, Jose (P, F) and Juana (F, P), who are siblings have a smaller inventory of handshapes than the other participants. These data are presented in figure 34 below, there is a marginally significant trend for inventory size to predict the proportion of higher complexity SF handshapes ($F(1, 8) = 5.202$, $p = .05$).

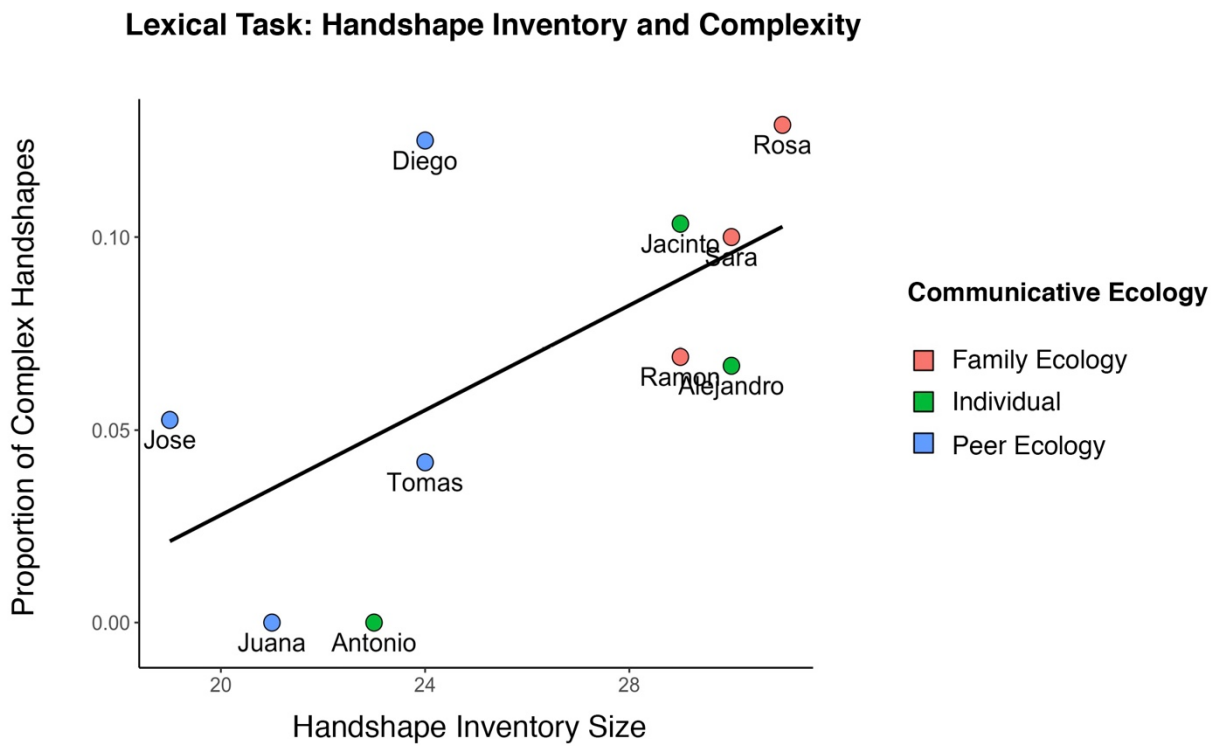

Figure 34. The relationship between handshape inventory and the proportion of medium and high SF complexity signs in the lexical task for all participants. Homesigners in family ecologies are red, Individual homesigners are green and homesigners in peer ecologies are blue.

In figure 34, homesigners from *family ecologies* (Sara, Rosa and Ramon)

tend to have a large inventory of handshapes and a higher proportion of medium and high complexity handshapes. As inventory size increases, so does proportion of medium and high complexity handshapes for all signers. Homesigners in *peer ecologies* (Juana (F, P), Jose, Tomás and Diego) have smaller inventories of unique handshapes, and also have a lower proportion of medium and high complexity handshapes, relative to inventory size. There is not a stable or consistent proportion of signs in the inventory that are high complexity.

5.4.3 Selected Finger Complexity across Two Tasks

5.4.3.1 Selected Finger Complexity in Handling handshapes and Object handshapes

In multiple standard sign languages, signers tend to produce object handshapes with an average higher selected finger complexity and handling handshapes with an average higher joint configuration complexity (Brentari et al., 2017). Brentari (forthcoming) suggests that reorganization of complexity within handshape representation types, may be an indicator of a phonological level of structure in younger sign systems. In this analysis, I ask whether child homesigners produce a set of signs with a similar distribution of complexity.

To calculate a mean Selected Finger complexity score for each participant, I first computed the average Selected Finger complexity score for the Handling handshapes that the signer produced for each item in from the Classifier Task (book, lollipop, pen, toy airplane, marble) and for each photo in the Lexical Task (64 stim items, see appendix a) and the average Selected Finger complexity score for the Object handshapes that the signer produced for each stimuli item. This partially controlled for the significant variation in the rate of signing. The final means are presented in figure 35. The average Selected Finger complexity score for Handling handshapes is indicated by a circle and the average Selected Finger complexity score for Object handshapes is indicated by a triangle.

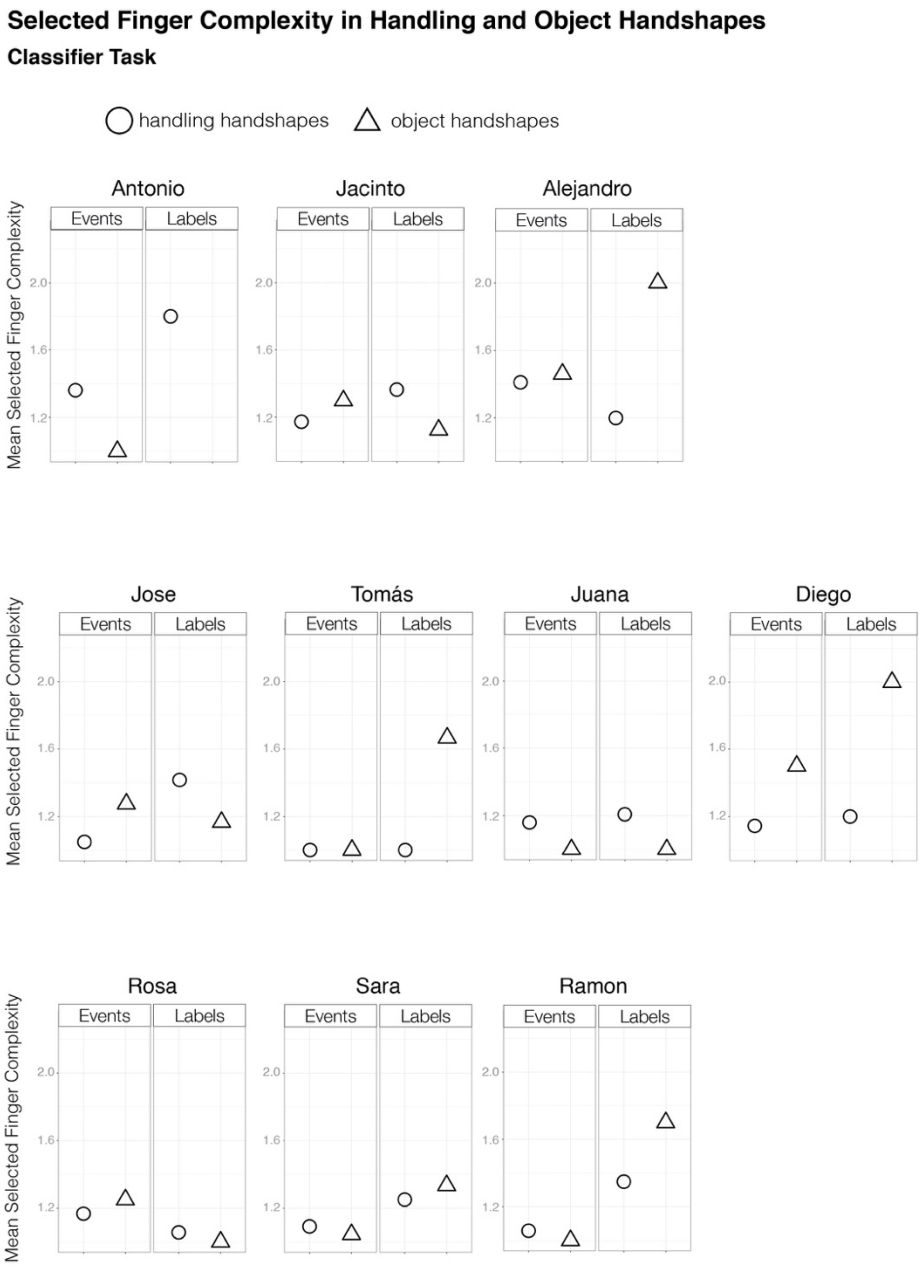

Figure 35. Selected Finger complexity scores for handling (circles) and object (triangles) handshapes in event signs and label signs (in the Classifier Task) and in the Lexical Task

Recall that the pattern described for standard sign languages, including American Sign Language (ASL) and Italian Sign Language (LIS) as well as Nicaraguan Sign Language (NSL), in Brentari et al 2017 is for signers to produce handshapes with higher Selected Finger complexity for signs

that use an Object representation type (represented by triangles in figure 35, above) and to produce handshapes with a lower Selected Finger complexity for signs that use a Handling representation type (represented by circles in figure 35, above).

All of the homesigners showed equal levels of Selected Finger complexity for signs with an Object and signs with a Handling representation type in the context of the Lexical Task (see appendix e). This constitutes evidence that handshape complexity may only surface as a phonological contrast when it aligns with a morphological process. Clements (2001) characterizes these kinds of phonological patterns as prominent contrasts.

In this analysis, when we consider the distribution of Selected Finger complexity *within* these handshape representation types, I find that some signers show differentiation between handshapes with Handling representation type and handshapes with Object representation type, indexed by the average complexity score. Jose (P, F) and Diego (P) produce object handshapes with higher selected finger complexity in Event signs, Jacinto (I) and Rosa (F) show a slight trend towards this pattern as well. Alejandro (I), Tomás, Diego (P) and Ramon produce object handshapes with higher selected finger complexity for Label signs. Rosa (F), Sara (F) and Juana (F, P) show marginal or almost no distinction in the Selected Finger complexity scores between Handling and Object handshapes.

5.4.4 Joint Configuration Complexity across Two Tasks

5.4.4.1 Joint Configuration Complexity in Handling handshapes and Object handshapes

As discussed in section 6.3.3 above, Joint Configuration complexity scores were assigned based on the Joint symbol for the Selected Fingers in the handshape code. The Joint symbol indicated the configuration of the Selected Fingers, out of ten possible configurations (see

appendix b for a list of all Joint Configuration codes). The Joint Configuration complexity score could range from 1 (low complexity) to 3 (high complexity) based on the Joint symbol. Similar to the Selected Finger complexity score, an additional point was added if the Joint Configuration changed from the initial to final handshape, giving a range of 1-4 for any individual sign. In figure 36 below, I present the distribution of low, medium and high complexity handshapes for the Joint Configuration feature across the entire dataset. The darker bars represent medium and high complexity handshapes. Compared to the Selected Finger complexity distribution (see figure 27), the homesigners produced more handshapes with medium and high Joint Configuration complexity. This contributed to a higher average Joint Configuration complexity score than Selected Finger complexity.

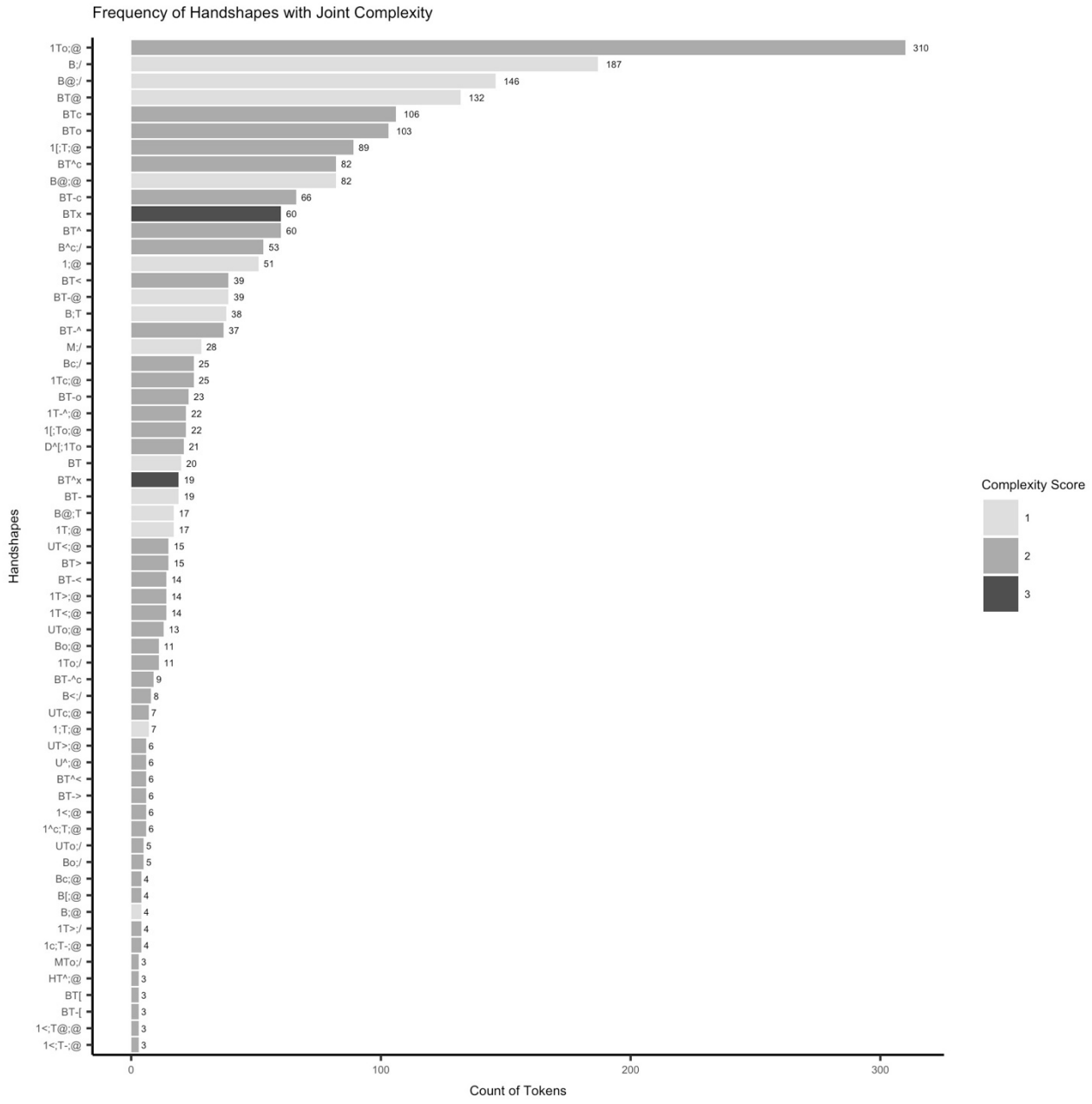

Figure 36. The frequency of all specific handshapes produced at least 3 times across the entire dataset. Shading indicates the Joint Configuration complexity score assigned to the specific handshape (dark grey is high complexity (3), grey is medium complexity (2), and light grey is low complexity (1).

The average Joint Configuration complexity scores were calculated using the same method as the Selected Finger complexity scores (see section 3.4 above), with means calculated within stimuli items, and then averaged across stimuli items within the Classifier Task (for Event and Label signs) and within the Lexical Task. The mean Joint Configuration complexity scores are presented in figure 37 below. Note that the scale for Joint Configuration complexity scores is adjusted to accommodate the higher mean scores (scale from 1-3). As in the Selected Finger complexity analysis, circles indicate the value of the mean Joint Configuration complexity score for Handling handshapes and triangles indicate the value of the mean Joint Configuration complexity score for Object handshapes.

The Joint Configuration complexity scores are higher, on average, than the Selected Finger complexity scores for signs produced in the Lexical elicitation task (bottom row of charts). Similar to the Selected Finger complexity scores for the Lexical task, however, we do not observe significant differences between the Joint Configuration complexity scores for Handling handshapes and Object handshapes in the Lexical task (see appendix e). In the Classifier Task (figure 45) we see remarkable consistency across almost all of the participants, for both Event signs and Labels signs. The Joint Configuration complexity scores are higher for Handling handshapes than Object handshapes. The only exception to this pattern are the Joint Configuration complexity scores for Label signs produced by Rosa (F) and Sara (F), They each produced higher Joint Configuration complexity handshapes in Object signs than Handling signs.

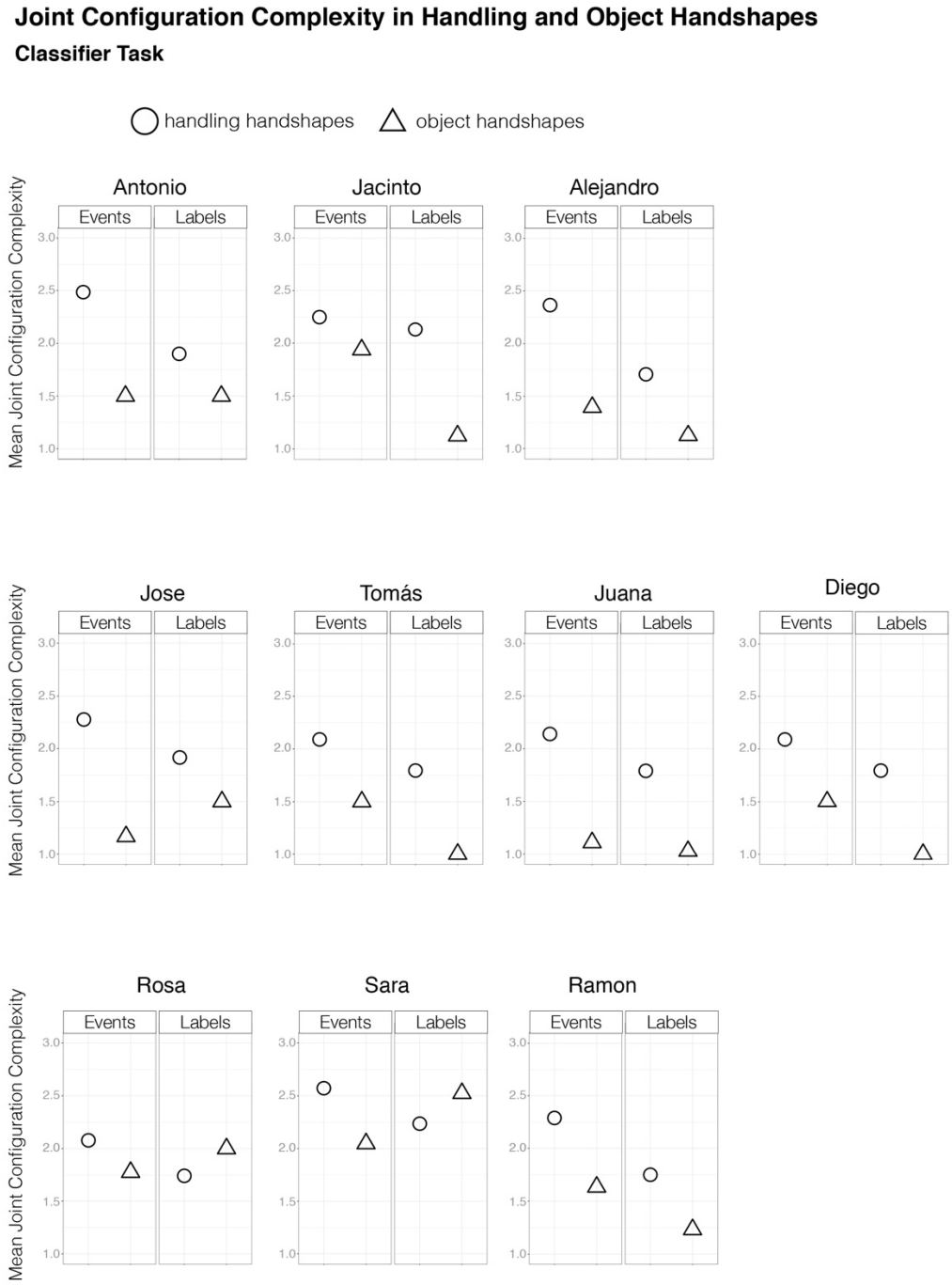

Figure 37. Joint Configuration complexity scores for handling (circles) and object (triangles) handshapes in event signs and label signs (in the Classifier Task) and in the Lexical Task

5.5 Discussion of Handshape Complexity Results

5.5.1 Homesigner Handshape Inventories

I began this analysis by presenting an overview of the inventory of handshapes produced by child homesigners as a group and as individuals. I characterize each inventory on three dimensions: the rate of signing, the size of the handshape inventory, and the distribution of complexity. Sign rate is the total number of sign tokens produced by an individual across both tasks. There is substantial variation in sign rate, but it is associated with dispersion ratio (figure 33). Additionally, the size of a participant's inventory of handshapes is positively associated with the proportion of medium and high complexity handshapes (figure 34). Thus, complexity and diversity of basic units (handshapes) seem to increase as signers are more productive or verbose, rather than a stable ratio of dispersion relative to sign rate or complexity relative to inventory. In terms of communicative ecology, homesigners from family ecologies tended to have higher rates of signing, and homesigners from peer ecologies, as well as individual homesigners, tended to provide shorter responses. I do not, however, have adequate evidence to demonstrate that this is exclusively tied to ecology. There are two additional factors, in particular, that I think also contribute to differences in rates of signing. First, I visit the homesigners from family ecologies more often, and have known them longer than some of the other participants. It is possible (likely, even) that Sara (F), Ramon and Rosa (F) are more comfortable with me and more familiar with the elicitation tasks than the other homesigners, and this is part of the reason that they provide more detailed and lengthy descriptions during elicitation sessions. It is also possible that there is a relationship between developmental age or school experience and rates of signing, as all of the participants in the study now attend school, this will be an interesting question to address in future studies with longitudinal data.

5.5.2 Selected Finger Complexity versus Joint Configuration Complexity

In the second study in this chapter, I asked whether child homesigners show the distribution of complexity found in standard sign languages, and which Brentari suggests is characteristic of a phonological level of structure in sign languages. I did not find that most homesigners in this sample showed the pattern found in other studies. Many participants have very low rates of complexity in general (as discussed in section 5.3.3) and particularly in the lexical task, homesigners rarely produced either handling or object handshapes with high selected finger or joint complexity. In the classifier task, some homesigners use signs with higher complexity handshapes, but few participants show the pattern found in standard sign languages. Three homesigners who are embedded in peer ecologies did have higher complexity selected finger groups for object handshapes than handling handshapes and higher joint complexity for handling handshapes than object handshapes, illustrating the reorganization and symmetry described by Brentari et al (2017, also Brentari, forthcoming) for standard sign languages. The other participants, however, produced handshapes with equivalent complexity across the two handshape representation types (object and handling).

5.5.3 Comparative Analysis of Selected Finger complexity and Joint Configuration complexity

In other studies of selected finger and joint complexity, Brentari et al (2017) report that all of the groups tested show higher joint complexity for handling than object handshapes. This pattern is true for this sample of child homesigners as well, particularly in the classifier elicitation task. In the lexical elicitation task, the contrast between joint complexity in handling and object handshapes was more diffuse (see appendix e), and it would be interesting to examine

this in standard sign languages as well. It seems that the particular constructions that are used to describe the events in the classifier task stimulus vignettes – the placement of small objects or arrangements of objects on a surface – are a particularly rich area to explore this contrast. When considering a larger corpus, like a subset of a signer's entire lexicon, it is possible that this relationship is "drowned out" but the high frequency of low complexity handshapes in general.

This finding lends support to Clements' notion of a "prominent" contrast that aligns with a morphological category (2001). The handshape representation type contrast, marked in sign languages with particular patterns of handshape complexity, is morphological (Benedicto & Brentari, 2004; Benedicto et al., 2007). Handling and object handshapes are also present throughout the lexicon, but they do not mark argument structure in lexical items that are not classifier verbs. It appears that it is primarily in the context of a morphological contrast that the phonological contrast also emerges. Returning to homesign systems, it is possible that in the absence of the morphological contrast of handshape, the phonological contrast marked by differences in handshape complexity is also not apparent.

This prediction is not born out, however, in a longitudinal study of an individual child homesigner from Nicaragua. Coppola and Brentari (2014b) report that, for this homesigner, the phonological pattern: higher selected finger complexity in object than handling handshapes does emerge before the morphological pattern of handling handshapes to mark agentive events and object handshapes to mark non-agentive events. This demonstrates that it is at least possible for the phonological contrast to emerge first. In this sample, however, there are multiple child homesigners who demonstrate the opposite pattern: they do show evidence for the morphological pattern, but not the phonological pattern (including Juana (P, F), Rosa (F), Jacinto (I) and Alejandro (I)).

6 The Distribution of Meaningful Units: Morphology in Homesign

6.1 Introduction

This chapter is an analysis of emergent morphological structure in child homesign systems and builds on current theories about the hierarchical structure and organization of standard sign languages The analysis addresses the relationship between communicative ecology and emergent morphological structure, asking whether homesign systems used within particular communicative ecologies (*individual*, *adult* or *peer* ecologies, see chapters 1, 3 for discussion) are different in the degree to which they exhibit similarities to standard sign languages. Two morphological patterns are explored, first, the distribution of iconic handshapes, demonstrated to be classifier morphemes on polymorphemic verbs in standard sign languages (Benedicto & Brentari, 2004; Benedicto et al., 2007) and second, a study of emergent lexical classes corresponding to nominals and predicates.

6.2 Morphology and the Lexicon

Morphology, the systematic co-variation of form and meaning(Aronoff, 1976; Hay & Baayen, 2005; Jackendoff, 1975), functions across the lexicon in multiple ways, but here I focus on two approaches to characterize morphology in homesign systems – sign classes defined by the distribution of morphological processes and a variation in sign form that is associated with a change in the meaning of signs that describe spatial or movement events. I start by describing models of sign classes in the lexicons of sign languages, followed by a discussion of prior research on morphological structure in homesign systems.

6.2.1 Componential Structure in Homesign Forms

This study is an analysis of iconic handshape representation type. As discussed in chapter 4, there are two common handshape types – handling handshapes and object handshapes – in standard sign languages that license an ergative-unaccusative alternation in classifier predicates (Benedicto & Brentari, 2004; Benedicto et al., 2007). Classifier predicates are poly-componential forms, traditionally analyzed as consisting of a verbal root, the movement of the sign, with productive handshape morpheme affixes (see Zwitserlood, 2012 for an overview). The handshape morphemes correspond to the agentive features of events. In standard sign languages, the same verbal root can typically[1] take either a handling classifier handshape (agentive) or a whole entity (here referred to as "object") classifier handshape (non-agentive). The handshape morpheme in these constructions is productive, its use licenses an external agent (if the handshape is handling) or not (if the handshape is a whole entity). This analysis considers whether this pattern is also found in child homesign systems.

6.2.2 Sign Classes in the Lexicon

One model of sign classes in sign language lexicons comes from Brentari and Padden, 2001. Similar models have been proposed for multiple sign languages (Cormier, Quinto-Pozos, Sevcikova, & Schembri, 2012; Johnston & Schembri, 1999). The Brentari and Padden (2001) model is illustrated in figure 38, below, as two overlapping sets of forms. The first class of forms ("Native Lexicon 2", right circle, grey, figure 38) consists of classifier predicates and spatial

[1] There are restrictions on the combination of verbal roots and classifier morphemes, see Benedicto and Brentari 2004 for further discussion.

language. Cross-linguistically, in many sign languages, spatial language and classifier predicates are extensively modified based on iconic properties of objects and events.

The category of spatial predicates that are the focus of this chapter are classifier predicates. The second class of forms in the Brentari and Padden model ("Foreign Lexicon", left circle, yellow, figure 38) consists of signs in ASL that incorporate fingerspelling or handshapes from the manual alphabet. These forms are not relevant for the current project, because the homesigners that I work with do not, to my knowledge, use fingerspelling or handshapes associated with specific written letters. Signs in the overlapping section of the model constitute the core lexicon. These are described as "frozen" – signs whose forms are not productively, gradiently, modified by signers based on the sentential context or denotational (referential) content of the utterance. Brentari notes, here and elsewhere, that these are the forms that are likely to be found in citation forms in printed dictionaries (Brentari and Padden 2001, Brentari forthcoming).

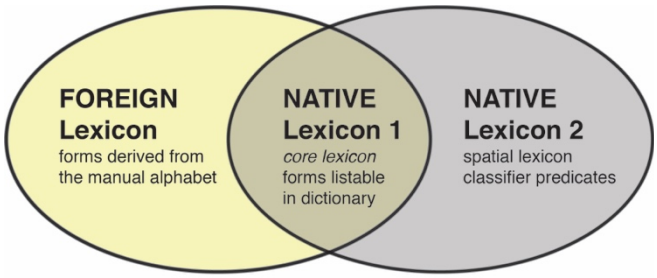

Figure 38. Model of sign language lexicon, based on Brentari and Padden 2001.

This study considers whether there is distributional evidence that homesign systems have emergent lexical classes, similar to the classes of signs observed in standard sign languages. Lexical classes in standard sign languages are characterized by fixed or "frozen" forms (in the

Native Lexicon 1) and gradiently modified forms (Native Lexicon 2). Signs in Native Lexicon 1 (see figure 38) often have iconic handshape types, including handling and object, but these handshapes do not change the interpretation of the utterance, and they do not alter the syntax of the construction. For example, the lexical sign for toothbrush might be signed with a handshape that iconically represents how a person holds a toothbrush, or with one finger extended, to represent the size and shape of a toothbrush, but this would not necessarily reflect an interpretation of brushing one's teeth versus referring to a toothbrush. In general, prior work with these stimuli find that signers use the same handshape type for lexical items (Brentari et al., 2016). Signs in Native Lexicon 2 also have iconic handshapes, including handling and object handshapes, but in these signs the handshape encodes the agentive status of an event. For example, if a spatial classifier is produced with an object handshape, that is likely a description of static objects and their arrangement. If the same spatial classifier is produced with a handling handshape, then this indicates that a person placed or moved the objects. Lexical classes are thus distinguished by more handshape variation (in the Native Lexicon 2, or spatial lexicon) and less handshape variation (in the Native Lexicon 1, or core lexicon) and by meaningful variation, in the spatial lexicon, where changes in handshape contribute to a change in interpretation of the utterance. This study considers whether homesign lexicons appear to be similarly organized based on more variation in handshape type in one class of signs, analogous to spatial predicates, and less variation in handshape type in a second class of signs, analogous to lexical core items.

6.3 Methods

6.3.1 Elicitation Methods

The elicitation task is described in detail in chapter 4, and includes a set of 40 short video clips and photos, vignettes, featuring five hand-held objects (marble, pen, book, lollipop, toy airplane). The objects are presented as a static image, arranged on a surface, or are placed by a human hand on a surface. There are several features of these events that contrast in the stimuli set, but the feature relevant for this analysis is the presence or absence of a human agent. By eliciting descriptions from homesigners using a controlled stimuli set of vignettes, we have some level of confidence that they will provide a description of the vignette they have just viewed[2].

[2] It is likely, however, that different homesigners had different interpretations of this descriptive task.

6.3.2 Annotating Signs

The annotation system for all of the data is described in chapter 4, section 4.5. Signs were first segmented from the stream of gestures. Subsequently, signs were annotated for the following characteristics: response portion, handshapes representation type and specific handshape. Signs produced in the lexical task were also assigned a form gloss. For this analysis, I use only the response portion and handshape representation type annotations. Each sign was coded for its response portion, which included a label, event or other. This decision was made primarily based on place of articulation (see figure 39).

Figure 39. Signs were coded as labels or event descriptions. This decision was primarily based on the place of articulation of the sign.

Signs were also annotated for representation type. The handshape representation type of a sign is the iconic relationship between the handshape and the referent and was primarily of two types: handling handshapes and object handshapes (see figure 40).

Figure 40. Example of an object handshape and handling handshape in descriptions of stimulus vignettes with a marble.

6.3.3 Participants

All participants in this project are introduced in detail in chapter 3. Most of these participants have completed the elicitation task more than one time, across multiple years. For this chapter, I selected a single timepoint closest to the mean age (11;8) for all participants who had done the task. Participant characteristics specific to this task, including when they first completed the task, and their age at the time the task for this analysis was completed, are presented in table 11 below.

Table 11. Participant characteristics for elicitation task

	Participant	*Source of homesign input*	*Age, year of enrollment*	*Age, year at time of task*	*Number of times task completed*
Individual	Antonio	none	7;0 (2016)	7;0 (2016)	2
	Jacinto	none	9;7 (2016)	9;7 (2016)	2
	Alejandro	none	10;11 (2014)	10;11 (2014)	2
Family Ecology	Rosa	deaf adult	7;5 (2013)	10;5 (2016)	1
	Sara	deaf adult, peer	8;4 (2013)	11;5 (2016)	5
	Ramon	deaf adult, peer	12 (2013)	12 (2013)	2
Peer Ecology	Jose	deaf peer	10;5 (2016)	11;5 (2017)	2
	Tomás	deaf peer	10;6 (2013)	12;7 (2015)	2
	Juana	deaf peer	14;1 (2016)	14;1 (2016)	2
	Diego	deaf peer	13;8 (2013)	15;8 (2015)	3

6.4 Results

6.4.1. Introduction to the Results

As described in section 6.3.1 above, this task was semi-structured, so homesigners were encouraged to describe each vignette in the stimuli, but they were free provide descriptions as brief or detailed as they wanted. In the following sections, I begin by describing how participants responded to this task, including the rate of signing – the average number of signs per response – and the rates of different handshape types. I then present the results from study 1, an

investigation of form classes based on the distribution of handshape types across trial type in two types classes of signs defined by formal properties (place of articulation). In the following section, I present the results from study 2, an investigation of patterned variation, or a predictable relationship between handshape type (handling or object) and the type of vignette (agent or no agent) being described.

6.4.2 Trial Types and Rate of Signing

Participants' descriptions included four types of signs – *event descriptions*, *labels*, *extra information* and *deictic signs*, described in section 6.3.2, above. I begin by showing the trial types produced by each participant. I exclude extra information and deictic signs in this analysis, thus there were three possible trial types: responses with a *label-only*, responses with an *event description-only* and responses with *both a label and an event description*. The rates of each of these types for all participants responses are shown in table 5 below.

The number of total trials ranges from 31 trials (for Jose (P, F)[3]) to 40 trials. Participants were shown 40 vignettes total (five items: marbles, lollipops, books, pens, toy airplanes, in eight conditions: 2 conditions with one object, no agent; 2 conditions with one object and an agent; 2 conditions with multiple objects and no agent; 2 conditions with multiple objects and an agent), thus a participant who responded in all trials would have 40 coded responses. Ramon (F, H), Diego (P) and Antonio (I) have fewer than 40 trials because they either skipped a trial, or

[3] As noted earlier in this chapter, Jose saw only four (books, pens, toy airplanes and lollipops) of the five items in eight conditions (2 conditions with one object, no agent; 2 conditions with one object and an agent; 2 conditions with multiple objects and no agent; 2 conditions with multiple objects and an agent)

produced a description which contained only extra information and/or deictic signs. In general, all participants appeared to understand the task, and were able to describe all of the vignettes that they viewed.

While all participants provided descriptions of all of the vignettes, there is substantial variation in the length of the responses provided by participants. In table 12, below, this is indicated in the mean number of signs per trial, which ranged from 3.2 signs per trial (Juana (F, P)) to 9.1 signs per trial (Diego (P)). In general, younger homesigners (Antonio (I), Jacinto (I), Rosa (F), Sara (F), mean rate = 6 signs per trial) seem to give shorter responses, but Juana (F, P) (14;1, mean rate = 3.2 signs per trial) and Diego (P) (15;8, mean rate = 9.1 signs per trial) are both older participants, so there does not appear to be a strict relationship between developmental age and length of response. Additionally, this length does not include signs that were considered extra information or deictic signs. In other work (Horton, forthcoming), I have reported that younger homesigners are more likely to use deictic signs to point out referents in the immediate or distant physical context, relative to older homesigners. The rates of signs per response would be affected if these signs were included.

All homesigners produced some trials of each type (*label-only*, *event-only*, *both label and event*). Rosa (F) and Antonio (I) are noteworthy, however, because they have a higher proportion of descriptions that include only a label for the item in the vignette (40% of Rosa (F)'s responses, 53% of Antonio (I)'s responses). For example, if Antonio (I) saw a vignette of a person placing multiple books on a table, he might produce only a sign for "book". This was a relatively less common strategy for the remaining participants, who produced minimally one description of the events in the vignette in at least 70% of all of their responses.

Table 12. Response rates for all participants in the classifier task, including the rate of trial types (label only, event description only, label and event description), the total number of responses and the mean number of signs per response.

		Proportion of All Trials				
	Participant	*Trials with only a label*	*Trials with only an event description*	*Trials with label and event description*	*Total Responses*	*Mean signs per trial*
Individual	Antonio	0.53	0.45	0.03	38	3.7
	Jacinto	0.18	0.48	0.35	40	7.2
	Alejandro	0.15	0.23	0.63	40	7.1
Family	Rosa	0.40	0.15	0.45	40	6.5
Ecology	Sara	0.05	0.50	0.45	40	7.1
	Ramon	0.26	0.33	0.41	39	5.3
Peer	Jose	0.28	0.30	0.43	31	5.5
Ecology	Tomás	0.08	0.70	0.23	40	5.9
	Juana	0.06	0.10	0.84	40	3.2
	Diego	0.03	0.33	0.64	39	9.1

Because of the variability in the number of signs per response (3.7-9.1), illustrated in table 12, all analyses for this study are based on a proportion of total responses (31-40 responses). This provides a measure of control for signers who produced longer descriptions (Diego (P), 9 signs per response or Sara (F), 7 signs per response) relative to signers who typically had shorter descriptions (Juana (F, P), 3 signs per response or Ramon, 5 signs per response).

6.4.3 Study 1: Variation in Handshape Type as Morphological Productivity

This study is an analysis of the handshape types that homesigners use in descriptions of vignettes without a human actor (No Agent conditions) and vignettes with a human actor (Agent conditions. The study considers whether homesigners show patterned variation in event-signs, produced as part of their descriptions. I use the term patterned variation to describe the reliable

association between a sign form in the language or system and a feature of the event that the sign describes. The patterned variation identified in many standard sign languages is the use of object handshapes in event signs describing vignettes without a human actor and handling handshapes in event signs describing vignettes with a human actor (Brentari et al., 2017). In descriptions of vignettes with a human actor, signers were also found to produce responses that included signs with a handling handshape and signs with an object handshape (Goldin-Meadow et al., 2015). This analysis compares the rates of handling and object responses, in the context of Agent and No Agent trials. A possible distribution of handing and object responses is illustrated in figure 41, below.

Figure 41. A Sample Distribution for Handling-Handshapes (black bars) and Object-Handshapes (white bars) in No Agent (left chart) and Agent (right chart) trials.

In the example illustrated in figure 41, there is a higher proportion of *object* responses (white bars) in the No Agent condition (left chart) and a higher proportion of *handling* responses (black bars) in the Agent condition (right chart). In this hypothetical example, there is a strong association between *handling* responses in Agent conditions and *object* responses in No Agent

conditions. Figure 42 shows the distribution of handling and object responses in No Agent and Agent trials for individual homesigners Antonio, Jacinto and Alejandro.

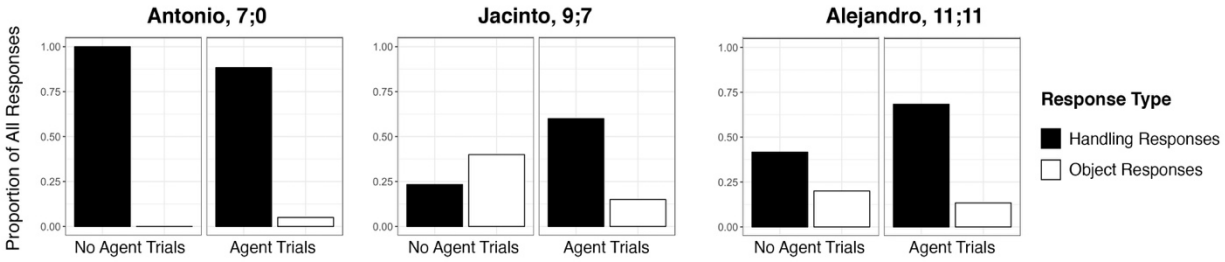

Figure 42. Results for study 1 for individual homesigners. Each chart compares the proportion of all trials that are handling responses (black bars) or object responses (white bars), in agent (right charts) or no agent (left charts) conditions. Homesigners are organized in order of age at the first time they participated in the study, with the youngest signer (Antonio, age 7) on the far left. Jacinto and Alejandro show the pattern observed in standard sign languages while Antonio does not.

Jacinto and Alejandro show the patterned variation reported for standard sign languages, particularly in their use of event signs with a handling handshape. Both Jacinto and Alejandro were more likely to use a sign with a handling handshape (black bars) to describe a vignette with a human actor (right charts) than they were to use a sign with a handling handshape in a description of a vignette without a human actor (left charts). Jacinto was also more likely to use a sign with an object handshape (white bar) to describe a vignette without a human actor (left chart). Antonio, the youngest participant, does not show significant variation in handshape type for any of his responses. He tended to use signs with handling handshapes for all types of responses, including in descriptions of vignettes with no human actor.

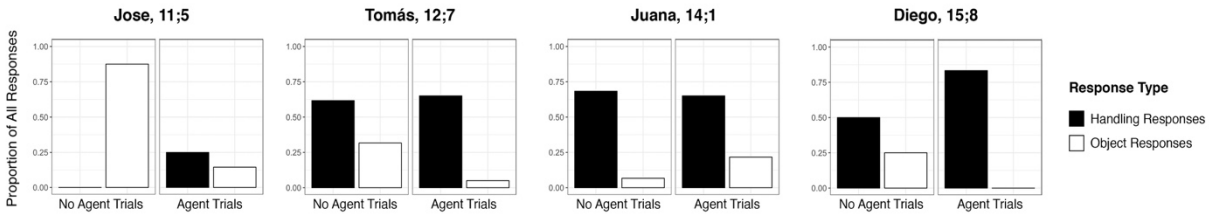

Figure 43. Results for study 1 for homesigners in peer ecologies. Each chart compares the proportion of all trials that are handling responses (black bars) or object responses (white bars), in agent (right charts) or no agent (left charts) conditions. Homesigners are organized in order of age at the first time they participated in the study, with the youngest signer (Jose, age 11) on the far left. Jose and Diego show the pattern observed for standard sign languages.

Responses from Jose, Tomás, Juana and Diego, homesigners in the peer ecology of the EOEE school, are illustrated in figure 43. Jose (P) and Diego (P), similar to Jacinto (I) and Alejandro (I), produce more responses including signs with a handling handshape (black bars) for descriptions of vignettes with a human actor (right charts). They produce more responses including signs with an object handshape (white bars) for descriptions of vignettes without a human actor (left charts). Tomás produced signs with a handling handshape at an equal rate for no agent and agent vignettes, but he was more likely to produce signs with an object handshape in descriptions of no agent vignettes. Juana is the only signer who shows an inverse pattern, she produced more signs with handling handshapes in descriptions of no agent vignettes and more signs with an object handshape in descriptions of agent vignettes.

Rosa, Sara, and Ramon, the homesigners from family ecologies are presented in figure 44. They produce more responses including signs with a handling handshape (black bars) for descriptions of vignettes with a human actor (right chart). Rosa and Sara produce more object responses in descriptions of vignettes without a human actor (left chart). The alternation between

these conditions – more handling responses for descriptions in agent conditions and more object responses in no agent conditions – is most apparent in the data from Rosa (F), Sara (F).

Figure 44. Results for study 1 for homesigners in family ecologies. Each chart compares the proportion of all trials that are handling responses (black bars) or object responses (white bars), in agent (right charts) or no agent (left charts) conditions. Homesigners are organized in order of age at the first time they participated in the study, with the youngest signer (Rosa, age 10) on the far left. All three signers show the pattern observed for standard sign languages.

The finding, that Rosa (F), Sara (F) and Ramon (F) show the clearest alternation in handshape type for agent and no agent trials, is partly attributable to the presence of both handling and object responses in their elicited descriptions (see table 6). With the exception of Jose (P, F), a community homesigner, and Jacinto (I), an individual homesigner, Rosa (F), Sara (F) and Ramon (F) produce object responses at substantially higher rates than any of the other homesigners, who all produce primarily handling responses. The use of predominately handling responses mirrors what was reported by Coppola and Brentari (2014) in a longitudinal study of a single child homesigner, Julio, who lives in Nicaragua. Although Julio produced more signs with object handshapes in descriptions of no agent vignettes at two timepoints (ages 7;4 and 9;11), he produced more signs with handling handshapes in descriptions of no agent vignettes at later timepoints (ages 11;4 and 12;8).

In contrast to the first analysis, in which only Rosa (F), Sara (F), Ramon (F) and Diego (P) show evidence for distinct sign classes based on the distribution of variation in handshape type, seven of ten homesigners (Jacinto (I), Alejandro (I), Jose (P, F), Diego (P), Rosa (F), Sara (F) and Ramon (F)) show evidence of reliably using one handshape type (handling handshape) in signs to describe one type of event (events with a human actor) and a different handshape type (object handshape) in signs to describe a different kind of event (events without a human actor). One additional homesigner (Tomás) shows a trend towards this same pattern. Thus it appears that this patterned variation is a strategy used by homesigners in significantly different ecologies and can emerge with or without access to homesign input.

6.4.4 Study 1: Lexical class distinctions

Responses codes were based on the handshape representation type of all signs in the response. Responses could be coded as either a "handling" response, an "object" response, a "both handling and object" response and an "other" response. If all of the signs had a handling-handshape, then this was considered a "handling" response. If all of the signs in the response had an object-handshape, then this was coded as an "object" response. If the participant produced some signs with a handling handshape and some signs with an object handshape, then this was coded as a "both" response. If the participant did not produce any signs that had either a handling or an object handshape, then this was coded as an "other" response. The rates of response types are presented in table 13 below.

Table 13. The proportion of each response type (handling, object, both, other) as a proportion of all descriptions provided for each participant in the classifier task.

		Proportion of All Responses				
	Participant	*Handling Responses*	*Object Responses*	*Both Responses*	*Other Responses*	*Total Responses with event description*
Individuals	Antonio	0.89	0.06	0.06	0.00	0.47 (18)
	Jacinto	0.45	0.24	0.15	0.15	0.83 (33)
	Alejandro	0.59	0.15	0.21	0.06	0.85 (34)
Family Ecology	Rosa	0.63	0.25	0.13	0.00	0.60 (24)
	Sara	0.39	0.29	0.26	0.05	0.95 (38)
	Ramon	0.24	0.55	0.03	0.17	0.74 (29)
Peer Ecology	Jose	0.14	0.48	0.17	0.21	0.94 (29)
	Tomás	0.65	0.16	0.19	0.00	0.93 (37)
	Juana	0.72	0.14	0.07	0.07	0.73 (29)
	Diego	0.66	0.13	0.08	0.13	0.97 (38)

All participants produced primarily handling responses or object responses. Sara (F) also produces a substantial number of responses with both a handling and an object handshape (26 percent of her responses, 10 responses), a pattern discussed in the concluding section of this chapter. Two participants, Ramon and Jose (P, F) are unusual because they produce predominately object responses (55% or 21 of Ramon (F, H)'s responses and 48% or 15 of Jose (P, F)'s responses). All other participants tend to produce more handling responses than any other response type, in particular Juana (F, P) and Antonio (I)[4] produce handling responses in more than 70% of all of their descriptions.

The remaining participants did regularly describe what happened in the vignettes that they watched, and the trials in which they only signed a label for the item were typically the first

[4] Antonio's distribution of responses may be affected by how few trials he had with an event description (48% or 18 trials). Antonio is the youngest participant. Frequently, his responses only included a sign that indicated what the item in the vignette was, such as his sign for PEN, when he saw a short vignette of someone putting pens down in a row.

condition in the stimulus set, which is a still image of one lollipop, one book, etc (see figure 17). Thus participants often interpreted this condition by providing only a signed label for that item. In the following section, we consider how handshape type was distributed in the two types of signs identified in the coding: *labels* for the item in the vignette versus *event descriptions* of what happened in the vignette. I ask whether the handshape representation type for labels varies in the two types of vignettes that homesigners described and compare the rate of variation in handshape type for labels to the rate of variation in handshape type for event descriptions.

6.4.5 Analysis of Variation in Labels and Events: Emergent lexical classes

Difference scores were calculated by subtracting the number of object responses from the number of handling responses for the following groups of signs: event signs in agent trials, event signs in no agent trials, label signs in agent trials and label signs in no agent trials. The raw difference score was divided by the total number of label or event signs for that group to give the difference as a proportion of all of the signs. Positive difference scores indicate that there were more handling than object responses, negative scores that the signer produced more object than handling responses.

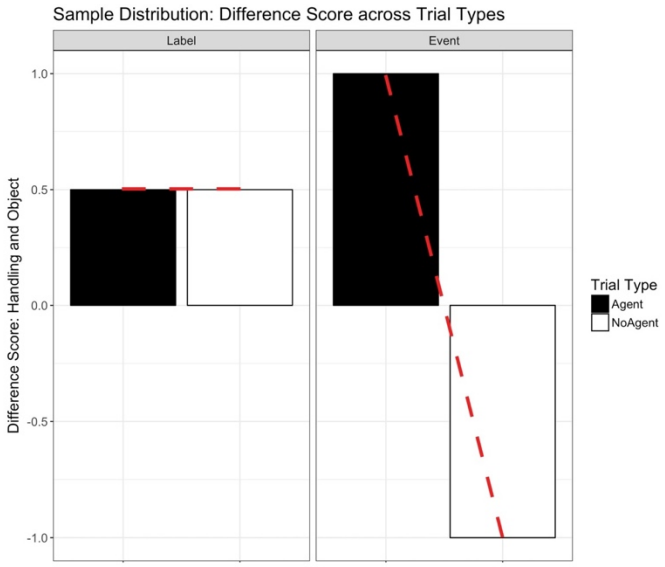

Figure 45. A possible distribution of difference scores in events and labels in signed descriptions of agent and no agent events, constructed by the author. In this sample illustration, difference scores for agent events and no agent events are maximally different, the signer would have a categorical distinction between the handshape type in agent events (produced only handling event descriptions in all agent trials) and the handshape type in no agent events (produced only object event descriptions in all no agent trials).

In figure 45, left chart, I provide an idealized, categorical, distribution of difference scores for event descriptions produced in agent trials versus event descriptions produced in no agent trials. In the left chart of this example, labels with handling representation type and labels with object representation type were produced at identical rates in agent trials (left bar, black) and no agent trials (right bar, white). In the black bar of the right chart, event descriptions with a handling representation type are 100% of the responses produced for event descriptions in agent trials. In the white bar in the right chart, event descriptions with an object representation type are 100% of the responses produced for event descriptions in no agent trials. In this idealized example, representation type is a "perfect" indicator of the presence or absence of a human actor in an event that is being described – a handling handshape is always produced when the event

included a human actor and an object handshape is always produced when the event did not include an a human actor.

If homesigners have some signs that are more stable in their representation type, meaning the representation type does not change across different event types, then this could indicate that handshape type serves as a marker of classes of signs. In standard sign languages, handshape type is not generally productive or variable in nominal signs (lexemes), though see Padden et al (2014) for evidence that handshape type and specific handshape in ASL lexemes may be more flexible than has been reported elsewhere (Goldin-Meadow et al., 2015). Stability of handshape type thus serves to mark the category of signs that are nominals, while variation of handshape type, relative to agentive characteristics of events, marks the category of signs that are predicates.

In the following sections, I present the difference scores of handling responses and object responses in signs that were event descriptions and in signs that were labels (see section 5.3.2 for a discussion of the coding criteria for labels versus events). The red bars show the difference between the number of handling responses and the number of object responses in descriptions of vignettes with a human actor. The green bars show the difference between the number of handling responses and object responses in descriptions of vignettes without a human actor. Positive bars reflect a distribution of more handling handshapes than object handshapes. Each chart shows the difference score for an individual homesigner. Homesigners are grouped by their communicative ecology type.

I begin by discussing the three individual homesigners, Antonio, Jacinto and Alejandro. Antonio, Jacinto and Alejandro do not receive homesign input or interact with other deaf adults or peers.

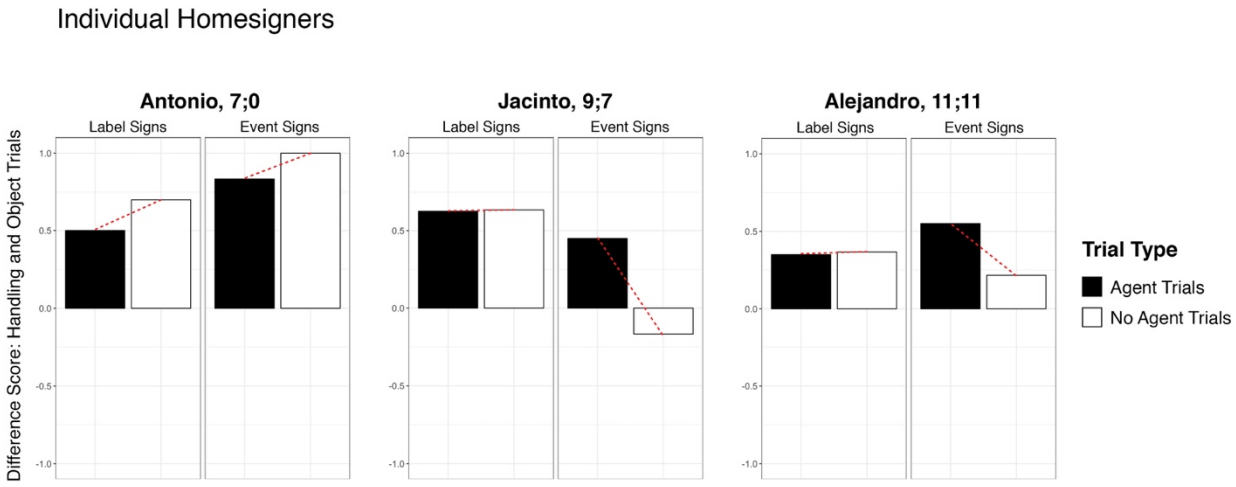

Figure 46. Charts showing the difference between the number of handling and object responses for label signs (left chart) and event signs (right chart) in responses to vignettes with a human actor (agent - black bars) and without a human actor (no agent - white bars) for individual homesigners

Antonio (I), the youngest individual homesigner (age 7;0) does not show a difference in the amount of variation in event signs and label signs, the difference between object and handling handshapes in descriptions of agent and no agent trials is roughly the same. Jacinto (I), who does not have deaf relatives and attends his local school, does show a consistent difference score for label signs in agent trials and label signs in no agent trials, and variation in the difference score for event signs in agent trials versus no agent trials. Alejandro (I), like Jacinto (I), has a similar difference score for label signs, and variable difference scores for event signs in agent trials versus event signs in no agent trials.

The four homesign participants in a peer communicative ecology are presented in figure 47 below. Jose, Tomás, Juana and Diego each receive homesign input from same-aged peers, either at school, or at home and at school (Jose and Juana are siblings).

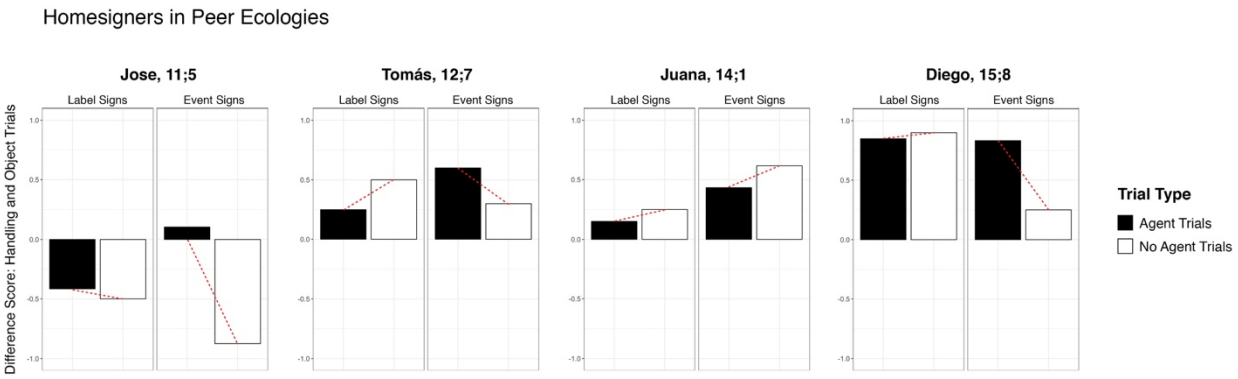

Figure 47. Charts showing the difference between the number of handling and object responses for event descriptions (left chart) and labels (right chart) in responses to vignettes with a human actor (agent - red bars) and without a human actor (no agent - green bars) for homesigners in a peer ecology

When we compare the difference scores for labels and event descriptions produced by Jose (P, F), Juana (F, P) and Tomás (P), we find that, similar to Jacinto (I) and Alejandro (I), Jose (P, F) and Diego (P) have consistent difference scores for label signs and variable difference scores for event signs. Tomás (P) and Juana (F, P) have variable difference scores for both label and event signs, much like Antonio (I).

Lastly, I consider the difference scores for the three family homesigners, shown in figure 48, below. Sara (F), Ramon (F, H) (F) and Rosa (F) receive homesign input from a deaf adult relative.

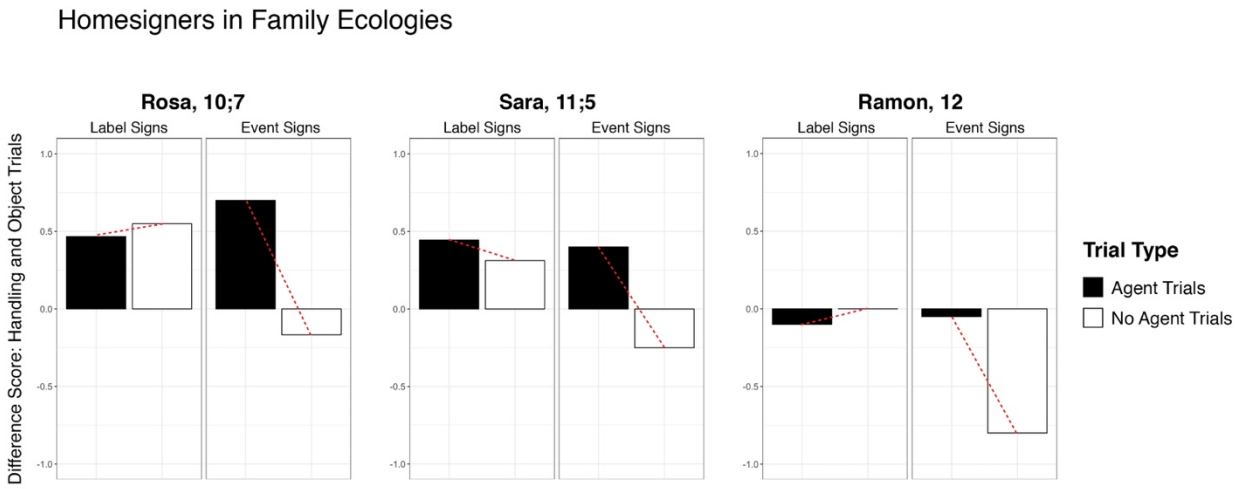

Figure 48. Charts showing the difference between the number of handling and object responses for label signs (left chart) and event signs (right chart) in responses to vignettes with a human actor (agent - black bars) and without a human actor (no agent - white bars) for family homesigners

In the signs produced by Rosa (F), Sara (F) and Ramon (F), there is not significant variation in the difference scores for labels in responses to agent vignettes and no-agent vignettes. Unlike the label signs that Rosa (F), Sara (F) and Ramon (F) produce in agent and no agent trials, there is variation in the event signs that they produce across these two trial types. This pattern of results suggests that the representation type for *labels* is stable across responses to agent and no-agent vignettes, while it is variable for *event descriptions* in responses to agent and no-agent vignettes.

When we consider the difference score between handling and object responses in descriptions of agent and no-agent vignettes, we find that all of the child homesigners with homesign input from a deaf adult appear to mark classes of signs with the distribution of variation in handshape representation type. For the class of signs considered labels, Sara (F), Rosa (F) and Ramon (F) do not use a different handshape representation type in label signs for

descriptions of agent versus no agent vignettes. For the class of signs considered events, signs describing what happened in vignettes, Sara (F), Rosa (F) and Ramon (F) do vary the handshape representation type of the sign. Diego (P) and Jose (P), homesigners in the peer ecology of the EOEE school, and Alejandro (I) and Jacinto (I), who are individual homesigners but who have attended the EOEE school for a limited time, show a pattern of variation similar to Sara (F), Rosa (F) and Ramon (F).

It is possible that the child homesigners who do not appear to use stability and variation to mark word classes (Antonio (I), Tomás (P) and Juana (F,P)) are using a different strategy to mark word classes like nominals and predicates, or that the seeds of morphology in their homesign systems function in a systematic way that is not captured by this analysis of variation. Based on this analysis, we can conclude that Sara (F), Rosa (F), Ramon (F), Diego (P), Jose (P,F), Alejandro (I) and Jacinto (I), show a pattern similar to the variation and stability of handshape representation in adult signers of standard sign languages, as well as adult homesigners.

In this study of emergent word classes, homesigners who have access to homesign input from a deaf adult homesigner, homesigners in family ecologies, exhibit more variation in handshape type for sign event descriptions than for sign labels in descriptions of agent and no agent vignettes. With the exception of Diego (P), the oldest homesigner (15;8) in a peer communicative ecology, all other homesigners show similar rates of variation in sign event descriptions and sign labels.

6.5 Discussion

This chapter asks about the emergence of two features of linguistic structure in the homesign systems used by ten homesigners from three different communicative ecologies.

Study 1 asked whether there was a systematic mapping of handshape type onto specific features of events; whether a homesigner reliably produced a sign with a particular handshape in descriptions of events with a particular characteristic. Many homesigners, across diverse communicative ecologies, mapped iconic handshape types onto the agentive status of events, similar to the patterns found in standard sign languages, young sign languages and adult homesigners.

In the second study, I consider the emergence of classes of signs – similar to nominals and predicates – based on the distribution of variation of handshape type. Three homesigners who interact with a deaf adult homesigner (Sara (F), Rosa (F), Ramon (F)) show evidence of a lexical disctinction between lexical classes of nouns and verbs. The oldest homesigner (Diego (P)) who is in a peer communicative ecology, also shows a trend for this distinction of nominals and predicates based on handshape type variation. The remaining six homesigners (Jose (P, F), Juana (F, P), Tomás, Antonio (I), Jacinto (I), Alejandro (I)), all individuals or community homesigners, do not appear to distinguish the classes of signs identified as labels (nominals) and events (predicates) using variation.

There are several alternatives that I will consider in future analyses of this data that might explain this pattern of results. First, it is possible that the homesigners who have variation in both events and labels are marking the agentive status of the event on both the event and the label. An additional concern with this analysis is the assignment of signs as either labels (nominals) or events (predicates) based primarily on place of articulation. In future analyses I hope to explore

corroborating evidence that signs that were identified as labels for the items in the vignettes appear in other contexts and refer to a similar item (e.g., does the sign produced for pen in this task appear in other contexts when the signer is discussing a pen).

Despite these concerns, the current evidence suggests that for child homesigners, access to homesign input from an adult homesigner may make it more likely that the homesign system distinguishes classes of signs like labels and events based on variation of handshape type. This would be an example of a linguistic structure that may have begun as "meaningless variation," or variation for an independent reason, but which was taken up as a contrastive, functional feature by the adult homesigner (as in the first two stages of the Senghas model of conventionalization, 2003b). The adult homesigner then models this pattern to their relative child homesigner (in this case, daughter, son or granddaughter). With the benefit of this model, the child homesigners with deaf adult relatives show this pattern earlier in development than other homesigners who do not see this modeled in their input from peers. This pattern may emerge much later in development (as in the case of Diego (P)), but we have very limited evidence to make this claim, and would need more longitudinal data from the peer and community homesigners in this dataset to assess whether this is a pattern that emerges over a longer developmental trajectory, even in the absence of an adult homesigner model. Additionally, it would support the account of transmission if the adult homesigners who are related to the child homesigners using the family homesign systems (Sara (F) and Ramon's mother, Rosa's grandfather) also show this pattern.

7. The Interaction of Social Context and Structure in Homesign: Iconic Affordances, Lexical Convergence and Lexical Richness

7.1 Introduction

> We come now to a consideration which takes precedence over all others. At any time a language belongs to all its users. It is a facility unrestrictedly available throughout a whole community… A language… is something in which everyone participates all the time, and that is why it is constantly open to the influence of all… It is part and parcel of the life of the whole community, and the whole community's natural inertia exercises a *conservative influence* upon it" (Saussure 74)

In his discussion of variability and invariability in human language, Saussure asserts that the historical, inherited characteristic of language is critical to its very definition, "In fact, no society has ever known its language to be anything other than something inherited from previous generations, which it has no choice but to accept…" (Saussure 72). The dual nature of this inheritance both enables and perpetuates arbitrary sign forms, making languages resistant to change by any individual speaker. In typical language acquisition, children must learn these inherited arbitrary forms and they learn them in the process of becoming competent social actors. Cook-Gumperz (1986) suggests that a child's desire to enter into the social community drives this mastery,

> The metaphoric image of the child 'caught in a web of words' gives us some sense of the moral imperative that Dürkheim suggests underlies all socialization. That is, that children have no choice but to be social beings; and thus, to inherit the language of their community. From their entry into the world at birth, they are a part of an interpersonal network of communication and social understandings (39)

The child homesigner, however, often does not have access to their linguistic inheritance, particularly the set of "form-meaning" mappings that constitute the lexicon of the spoken language in their environment. In this chapter, I explore how three dimensions of a signer's physical, cultural and social ecology influence the emergence of a sign lexicon and the convergence of that lexicon with the lexicons of other signers.

Figure 49. Properties of the referent, the signer, and the sign form that will influence rates of convergence, frequency of use and sign form.

This analysis is based on data from the lexical elicitation task, each task is treated as a mini-corpus of signs. Each corpus has properties such as the number of unique sign forms, the most frequent sign form and the similarity of sign forms that two signers use when they describe the same item. Each individual sign token has properties related to the referent that the signer describes from the stimulus photo, the ecology of that signer, and the form of the sign itself. These relationships are illustrated in figure 49 above.

The first dimension that will influence a sign form includes the properties of the referent itself. The stimulus photos that serve as the denotational ground for all of the signs in this task vary in their representational affordances, a term that describes how "imageable" an object, and how likely different signers are to use the same form to describe the referent. The imageability or representational affordances of an object are linked to properties like its size, semantic class and animacy. Additionally, there will be properties of the signer that interact with characteristics of the referent, particularly how familiar the signer is with the referent, and how they typically interact with it. For example, female signers may have more experience peeling and chopping potatoes, and thus may use an enactment or pantomimic sign representing that activity, while male signers may have more experience planting and harvesting or eating potatoes, and may be more likely to use iconic enactment signs that represent those activities.

The properties that any triple – consisting of the referent-signer-sign form- has include characteristics of the signer. The first signer characteristic is the communicative ecology in which the signer is embedded, the structure of this network or ecology reflects how many other deaf people the signer interacts with, and how frequently they interact, as well the typical contexts of interaction (see chapter 1 for an overview of communicative ecologies). The second signer characteristic is whether they are hearing or deaf. The hearing status of the signer is profoundly important, because it determines whether the signer uses a homesign system as their primary or secondary communication system. While there are very fluent hearing signers in families with multiple deaf relatives, and who attend the EOEE school, they can always switch to speaking Ixil or Spanish (if they speak Spanish) when they need or want to talk to another hearing person. Deaf signers do not have this option and they do not command an additional linguistic system other than homesign. Their social history is shaped by their use of a

communicative system which is very unevenly distributed in their social network, they are the only primary user of the system, unless we consider related homesigners and homesigners in contact to be using the same system – which is not guaranteed by regular contact alone. Additional relevant signer characteristics include the signer's age, which will affect how much time they spend in the home and whether they are likely to attend school, and lastly, the gender of the signer, which will affect which activities they engage in daily (see chapter 3 for a detailed description of the kinds of activities that male and female child homesigners are part of in their daily routines).

The final component of each sign form are the articulatory properties of the sign itself – that is, ease of articulation and ease of comprehension. Additionally, the use of a conventional gestural emblem might affect the form of a sign, and the frequency of a form, both within a community of signers and within an individual signer's lexicon of signs, may be associated with the likelihood that a signer produces a particular form.

Study 1 is an analysis of the representational affordances of referents from the stimulus set. I analyze each of the items in the stimulus set based on the most common sign form from all participants and find that some classes of referents from the stimuli set are more likely to have a common sign that is produced by all, or the majority, of signers who complete the task. This result is taken as one indicator of the representational affordances of different semantic classes or types of objects. In other work on this data, I have shown that the semantic class of the referent also affects the selection of iconic strategies in the signs used to describe that object, adding to a growing body of work on "patterned iconicity" in many standard sign languages (Hwang et al., 2017; Meir et al., 2013; Padden et al., 2015).

Study 2 considers the convergence of homesigners' lexicons, based on the similarity of sign forms. The analysis is based on a *jaccard index* calculation, a similarity measure for comparing sets. This index is the ratio of the intersection of two sets relative to the union of the two sets. Convergence is interpreted here as the rate at which two signers use the same sign form to describe the same referent, this is illustrated in figure 58 below.

Finally, Study 3, examines the relationship between properties of sign form inventories and particular communicative ecologies. Each signer's lexicon is described in terms of its most frequent sign – signs used for multiple stimulus items – and its *hapax legomenon* – the set of signs that appear only once in the set. Signs in the set of hapax legomenon are considered maximally informative, because the form is associated with only one referent. This strategy, however, may not be efficient for communication and would ultimately seem to tax the cognitive resources of its users. Additionally, based on properties of natural languages, we might anticipate that signs would eventually establish categories of items, based on perceived similarities, and that these might be reflected in the shard properties of the forms of signs. Signs used for multiple referents, and signs used for one unique referent, are likely to function differently in the lexicon and signers from different ecologies may be more or less likely to use the same sign repeatedly, or a large inventory of signs specific to one referent.

The chapter begins with an overview of some of the research that has simulated lexical emergence and conventionalization using behavioral experiments in the lab and computational models, followed by the results from Study 1, on the representational affordances of the items in the stimulus set, Study 2, on the convergence of lexicons between homesigners and Study 3, on the distribution of sign forms in the lexicons of participants from diverse ecologies.

7.2 Studying the Lexicon

7.2.1 Experimental Semiotics: Laboratory Studies of Language Emergence

Studies in experimental semiotics include laboratory studies that ask hearing people to devise strategies for communications under particular constraints. This work has shown that adults who are pressed to spontaneously invent strategies for communication with a partner in lab generate systems that are remarkably language-like. Many of the systems that partners develop are conventional (Galantucci, 2005), compositional (Galantucci & Garrod, 2011) and over multiple generations, in "iterated learning" paradigms, the communication strategies become increasingly arbitrary with successive generations (Theisen, Oberlander, & Kirby, 2010). Arbitrariness was observed to enter systems fastest when partners had an opportunity to give each other feedback on their strategies (Pickering & Garrod, 2004).

Some experimental semiotics studies have manipulated the relationship between partners to assess the impact of unequal status between partners collaborating on a novel communication system. In one study (Selten & Warglien, 2007), one participant was disproportionately responsible creating new forms. They found that these systems conventionalized faster than systems built by partners who played an equal role in generating novel forms. This makes a relevant prediction for the current study – specifically, systems in which one partner has more experience using the homesign system, as in the case of family homesign, might be expected to conventionalize faster than peer homesign systems where communication partners are of equivalent age and status.

Although behavioral experiments offer some insight into the behaviors of speakers creating a novel communication system, there are significant issues with the ecologically validity of this work. Participants in laboratory experiments always have a native language in place when

they engage in the task of creating a new system, thus it is difficult to predict when and how this existing language model interferes or interact with the new language under construction. Additionally, the interactions between participants – sometimes lacking visual contact, and only exchanging linguistic information relayed remotely through computer screens based on a partner's response – makes it difficult to predict the validity of these findings in more natural communicative settings.

7.2.2 Computational Models of Conventionalization

Computational models offer a distinct advantage over behavioral laboratory experiments in terms of the number of interactions that can be simulated, often including a simulation of millions of interactions between hypothetical "agents". In a (Gong, et al., 2008, 2012) asked whether different structures of community networks would affect the rate of conventionalization of labels for a specific class of items (in this study, they tested the domain of color terms). Their model compared six types of networks with varying degrees of connectivity between agents, e.g., in a ring network, each node is connected to exactly two other nodes while in a fully-connected network, every node is connected to every other node. The networks were also distinguished by relative distance between nodes, e.g., in a small-world network, nodes are primarily connected locally, but have a few long-distance connections.

Gong et al found that star networks, which had one central node (or agent), that was closely connected to other nodes, but in which those nodes were not connected to each other, conventionalized the fastest, followed by networks in which all nodes were connected with all other nodes (fully-connected). The results from Gong et al indicate that the amount of

interaction, relative position of an agent in a network, and the connections between other non-central agents all have the capacity to affect rates of conventionalization in an emergent communication system. These models, however, were not based on any experimental or naturalistic empirical data, raising concerns about social and ecological validity.

7.2.3 A Naturalistic and Computational Study of Lexical Conventionalization

The separation of experimental, naturalistic and computational data was first addressed in a 2014 study by Richie, Yang and Coppola (see also Coppola forthcoming, Hall, Richie and Coppola, forthcoming). Richie et al used data longitudinal data from adult homesigners in Nicaragua, and compared the rates of conventionalization between adult homesigners and their hearing communication partners to rates of conventionalization of adult signers using Nicaraguan Sign Language. They found that NSL signers rapidly (in less than 25 years) converge on lexical items: they use the same sign for the same item in a photo elicitation task of nine items (items included: cat, dog, cow, rain, sun, ice, egg, fish and orange). In comparison, homesigners and their communication partners had not converged on similar signs for the same set of items over the same period of time, despite being in daily contact. Richie et al developed a reinforcement learning model based on the social dynamics of homesigners versus NSL signers to assess the relationship between social interaction and rate of conventionalization in the two groups over time. In the social network modeled after homesigner networks, one agent (the homesigner) communicated with all the other agents who do not use signs to communicate with each other. In the language matrix, all agents use signs to communicate with each other. The models then computed the number of iterations required to achieved convergence. The language

matrix converged fully with significantly fewer interactions (260,000) than the matrix based on a homesign social network, which failed to converge fully even after 698,000 interactions. This result underscores the significance of a "mutually engaged community" (Richie et al 2014) for conventionalization.

7.2.4 Lexical Conventionalization in Homesign and Young Sign Languages

With regard to lexical conventionalization – there is evidence that aspects of shared sign systems, particularly urban or institutional sign languages, conventionalize rapidly (see discussion of Richie et al in section 7.2.3 above). The village sign system, ABSL, documented by Sandler et al (date) is observed to have greater lexical variation than a same-aged urban sign language, Israeli Sign Language (ISL) (Israel, 2009; Israel & Sandler, 2009). In a study of sublexical variation, Israel (2009) suggests that greater variation is tolerated in ABSL because it is used by a relatively small, insular community with a high degree of shared knowledge, echoing a finding by Trudgill (1995) for small communities of speakers. While Israel does document substantial variation in ABSL, researchers indicate that this does not significantly affect mutual comprehensibility between signers. This is not the case for adult homesigners and their communication partners, who experience significant communication breakdowns in an experimental comprehension task (Carrigan & Coppola, 2017).

The evidence from adult homesigners in Nicaragua, NSL and ABSL indicates that conventionalization of the lexicon may require a threshold of users who are deaf and certain degrees of connectivity between these users. Results from a lexical survey of a shared sign system in use on Amami island, however, find a more direct association between

conventionalization degree of social interaction. Amami island is located in a chain of islands between Taiwan and Japan and is relatively isolated, with a significant population of individuals who are deaf. Osugi et al (1999) used a lexical elicitation task that consisted of 25 basic word list items (stone, cow, two, fire, rain, snake, three, many, cold, hot, flower, cat, boy, girl, seven, eight, moon, star, sun, tree, dog, fish, egg, orange, potato). They found an association between conventionalization and rates of interaction between 21 deaf (13 participants) and hearing individuals. Thus, signers who interacted more frequently, specifically a group of signers from a single extended family, were more likely to use the same sign for the same elicitation item. While this result contradicts the findings from ABSL, Osugi et al propose no mechanism that might explain the variable rates of conventionalization that they observe. In this chapter, I present results from a similar task to Osugi et al and consider a possible mechanism for different rates of convergence and characteristics of emerging lexicons: the frequency and quality of social interactions with other hearing and deaf communication partners.

7.3 Methods

7.3.1 Elicitation Methods

Both studies are based on data collected as part of a lexical elicitation task (see chapter 3 for an overview of the materials and elicitation procedures). This is the same task that was analyzed in the preceding chapter and consists of 63 photos of familiar people, places, tools, foods, animals and materials, taken in Nebaj during my first visit to the field, see figure 50 below for examples. For a detailed description of elicitation methods and materials, see chapter 3.

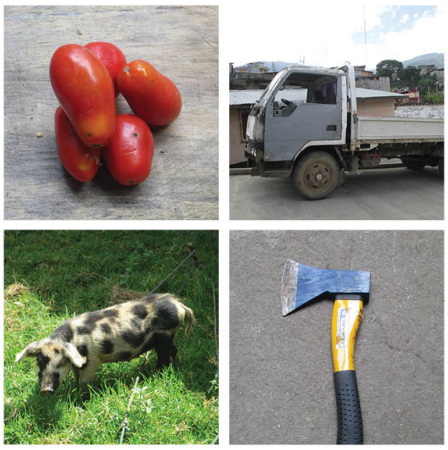

Figure 50. Example of photos from lexical elicitation task, including animals, tools, foods, vehicles. All photos available in Appendix A.

7.3.2 Participants

The data for study 1 and study 2 were collected between 2013 and 2017. Participant characteristics are summarized in table 14 below.

Table 14. Lexical Elicitation Task: Participant Characteristics

Participant	*deaf/hearing*	*ages*	*Lex Task Completed (N)*	*Education (school, years*)*
Antonio	deaf	7-8	4	Regular (1)
Rosa	deaf	7-11	5	EOEE (1)
Sara	deaf	8-12	8	Regular (6)
Jacinto	deaf	9-10	4	Regular (1)
Alejandro	deaf	10-11	3	Regular (4)
Jose	deaf	10-11	2	EOEE (4)
Tomás	deaf	10-13	4	EOEE (8)
Juana	deaf	14-15	2	EOEE (6)
Diego	deaf	13-17	5	EOEE (10)
Ramon	hearing	12-14	2	Regular (9)
Andres	hearing	8	1	Regular (3)
Ana	hearing	9	1	Regular (4)
Lucia	deaf	adult	4	NA
Pedro	deaf	adult	1	NA
Carlos	deaf	adult	1	NA
Luisa	hearing	adult	2	NA
Abel	hearing	adult	1	NA
Maria	hearing	adult	1	NA
Nila	hearing	adult	1	NA

* *years of school attended as of 2017*

The first ten participants listed in table 14 above are the focal child participants from chapters 5 and 6. This sample also includes 2 hearing children who are in frequent contact with at least one other child homesigner. Ana is a hearing child who is neighbors with Sara (F), one of the focal homesigners. Andres is Jose (P, F) and Juana (F, P)'s hearing younger brother. The three homesign adults in the sample include Lucia, Sara (F) and Ramon (F, H) (F)'s mother and Jose (P, F) and Juana (F, P)'s aunt; Pedro, Rosa's grandfather and Luisa's father; and Carlos, an adult homesigner without deaf relatives, but who works with other deaf men in the local market. Lastly, the sample includes four hearing adults who are relatives of the focal child homesigners. Luisa is Rosa's mother, she is hearing, but her father (Pedro) is deaf, as is another son, not included in this sample. Abel is Sara (F)'s father and Lucia's husband. Maria is Antonio (I)'s mother, she is hearing, as are all of her other children and relatives. Nila is Jose (P, F), Juana (F,

P) and Andres' mother. The relations between participants are summarized in table 15 and figure 51 below. These relationships are discussed in detail in chapters 2 and 3.

Table 15. Participants for Lexical Elicitation Task and Relatives

Participant	*deaf/ hearing*	*deaf relatives in the sample*	*hearing relatives in the sample*	*deaf peers in the sample*
Sara	deaf	Lucia (mother) Jose (cousin), Juana	Ramon, Abel	None
Diego	deaf	Tomás (cousin)	None	Tomás, Jose, Juana
Rosa	deaf	Pedro (grandfather)	Luisa (mother)	None*
Antonio	deaf	None	Maria	None
Jacinto	deaf	None		None
Lucia	deaf	Sara (daughter)	Ramon (son), Abel (husband)	None
Tomás	deaf	Diego (cousin)	None	Jose, Juana, Diego
Alejandro	deaf	None	None	None
Jose	deaf	Juana (sister), Sara (cousin), Lucia (aunt)	Nila (mother), Andres (brother)	Diego, Tomás
Juana	deaf	Jose (brother), Sara (cousin), Lucia (aunt)	Nila (mother), Andres (brother)	Diego, Tomás
Luisa	hearing	Rosa (daughter), Pedro (father)	None	None
Ramon	hearing	Sara (sister), Lucia (mother)	Abel (father)	None
Abel	hearing	Sara (daughter), Lucia (wife)	Ramon (son)	None
Ana	hearing	Sara (friend)	None	None
Andres	hearing	Jose (brother), Juana (sister), Sara (cousin), Lucia (mother)	Nila (mother)	None
Carlos	deaf	None	None	None
Maria	hearing	Antonio (son)	None	None
Nila	hearing	Juana (daughter), Jose (son)	Andres (son)	None
Pedro	deaf	Rosa (granddaughter)	Luisa (daughter)	None

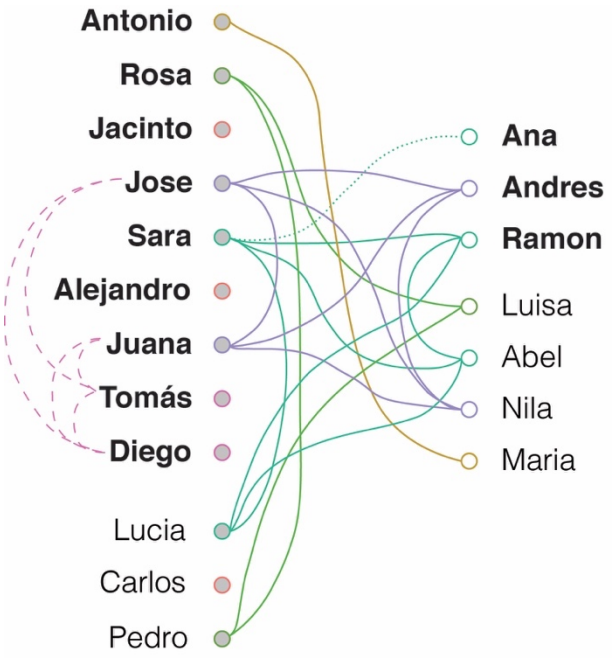

Figure 51. Relationships between deaf (left column) and hearing (right column) participants who are children (names in bold font) and adults (names in regular font). Solid lines connect participants who are related. Dashed lines indicate participants who are peers and interact at school. The number of lines from a person is an indicator of the number of regular homesign contacts they have.

Participants vary in the degree to which they have social interactions with other homesigners of the same age – child peers – as well as interactions with a deaf adult homesigner relative. Some homesigner participants see each other daily, for example, Sara (F) and her mother, Lucia (F), or Diego (P) and Jose (P) who attend school together, while others see each other intermittently, once or twice per month, like Juana (P, F) and Sara (F) who are cousins, but live quite far apart from each other. Lastly, there are homesigners who rarely, if ever, interact with another homesigner. Antonio (I) does not attend school with other deaf students and he is the only person, child or adult, in his extended family who is deaf. The quantity and the quality of his daily social interactions are quite different from Jose (P, F), Juana (P, F), Diego (P) and

Tomás (P), who attend school together, or Sara (F), Ramon (F), Lucia (F) and Abel (F), who live together in a small household with two deaf and two hearing family members.

In addition to different communicative ecologies for deaf homesigners, there is variation in the quantity and quality of contact between hearing relatives and deaf homesigners in this sample. Antonio (I)'s mother Maria, for example, has experience communicating with Antonio, but he is her only child who is deaf. Juana (P, F) and Jose (P, F)'s mother, Nila, however, has two children who are deaf, as well as a sister-in-law (Lucia (F)) and niece (Sara (F)) who are deaf. She has more opportunity and more experience interacting with another adult who is deaf and with two of her three children who are deaf. The two studies that follow explore whether frequent or intermittent interactions with another deaf homesigner are associated with (1) higher levels of similarity in the sign forms used to describe the same photo stimuli and (2) particular characteristics of a lexicon.

7.4 Results

7.4.1 Overview of Results and Organization of Analyses

11,456 signs were annotated across all sessions. 4,188 deictic signs (37% of total), 786 marker signs (7% of total) and 270 ambiguous signs (2% of total) were excluded. Of the categories of signs that were included (Emblem signs, Iconic Characterizing signs, Iconic Size and Shape signs, GSL signs), 95% were included. For both studies, a total of 5,892 signs (51% of total) are included in the analysis. The distribution of signs produced by each participant is presented in table 16.

Table 16. Number of Sessions, Sign Rate

Participant	*Number of Sessions*	*Mean Stims*	*Mean Signs per Stim*	*Total Signs*
Abel	1	35	1.80	63
Alejandro	3	59	1.40	248
Ana	1	30	1.53	46
Andres	1	58	1.84	107
Antonio	4	55	1.44	324
Carlos	1	63	2.49	157
Diego	5	62	1.50	470
Jacinto	4	56	2.33	523
Jose	2	61	1.77	217
Juana	2	59	1.26	149
Lucia	4	55	2.17	474
Luisa	2	56	1.79	201
Maria	1	58	1.40	81
Nila	1	58	1.47	85
Pedro	1	58	3.22	187
Ramon	2	49	2.12	230
Rosa	5	54	4.27	1254
Sara	8	53	1.78	734
Tomás	4	57	1.50	342

The mean number of signs per stim, excluding deictic signs, marker signs and ambiguous signs, ranges from 1.4 (Maria, Antonio's mother, who is hearing) to 4.27 signs per stimuli item (Rosa, a deaf homesigner with deaf homesigner grandfather Diego). There is also a significant range in the number of total signs from each participant, Ana, a hearing friend of deaf child homesigner Sara (F), produced only 46 signs in the one session that she completed the task, while Rosa (F) produced 1,254 signs across 5 sessions of completing the task. Illustrations of responses for three stimulus photos, *tomatoes*, *mug* and *cat*, are provided on the following pages.

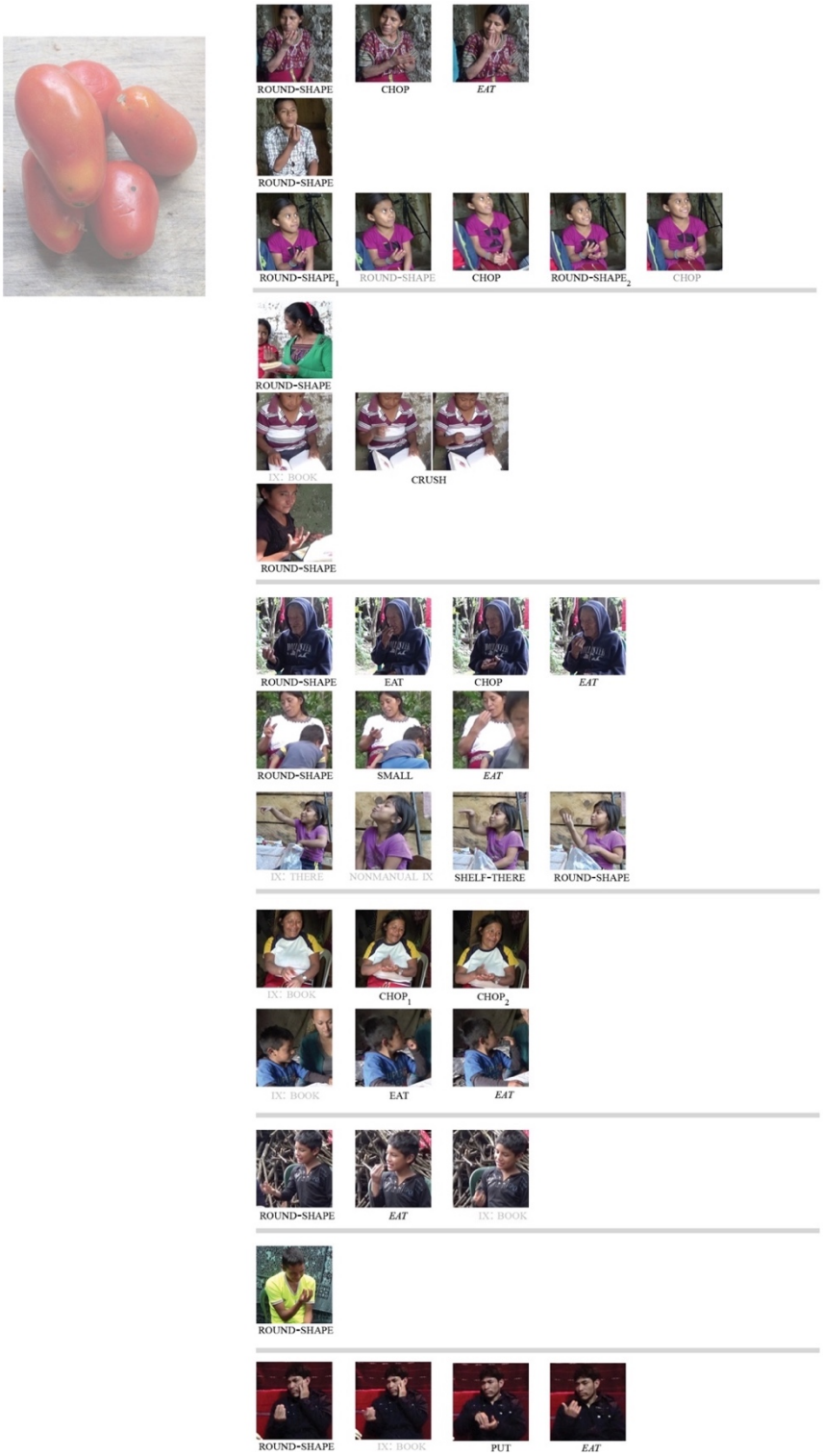

Figure 52. Example of responses to the stimulus photo of tomatoes.

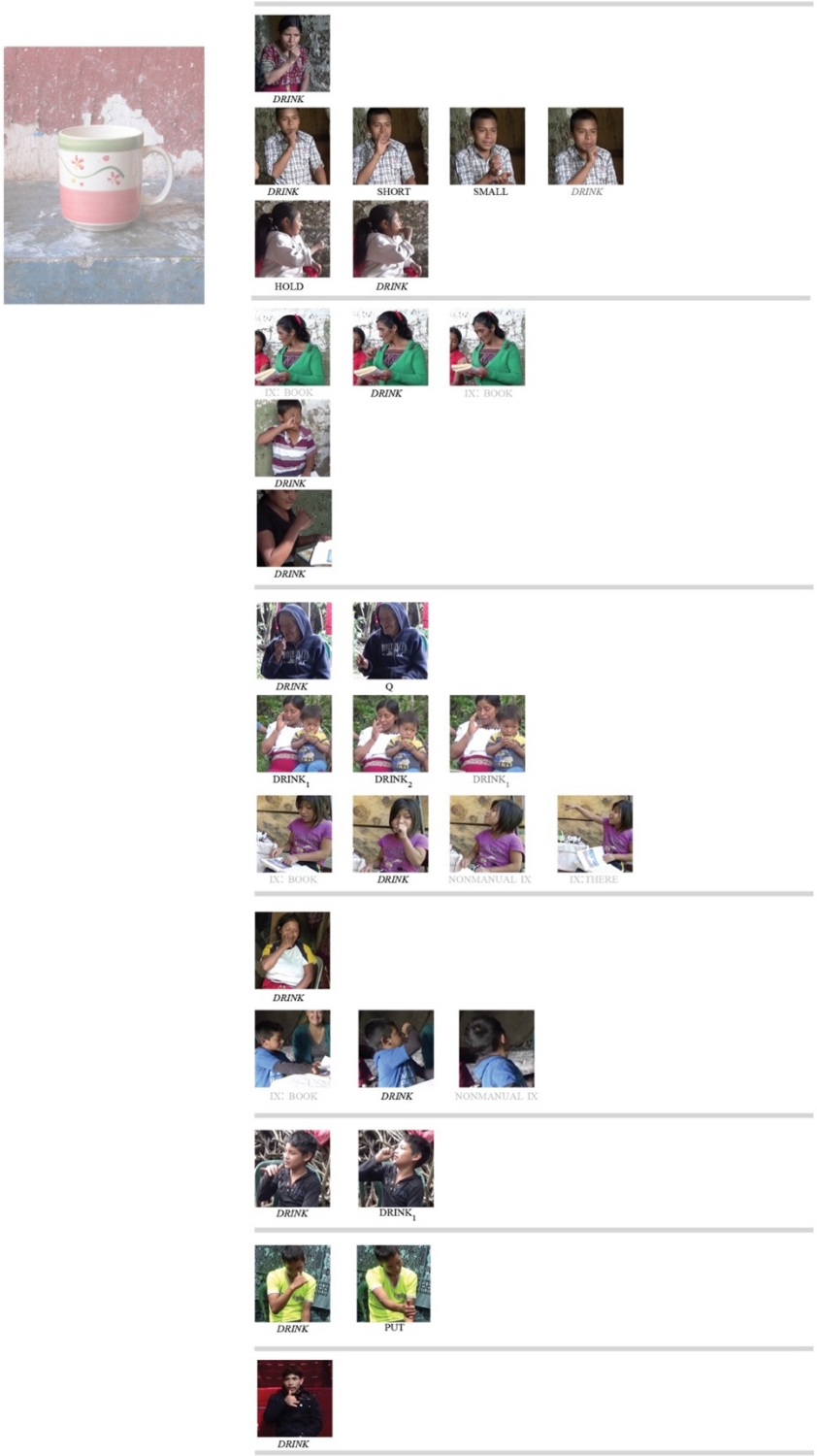

Figure 53. Example of responses to the stimulus photo of a mug.

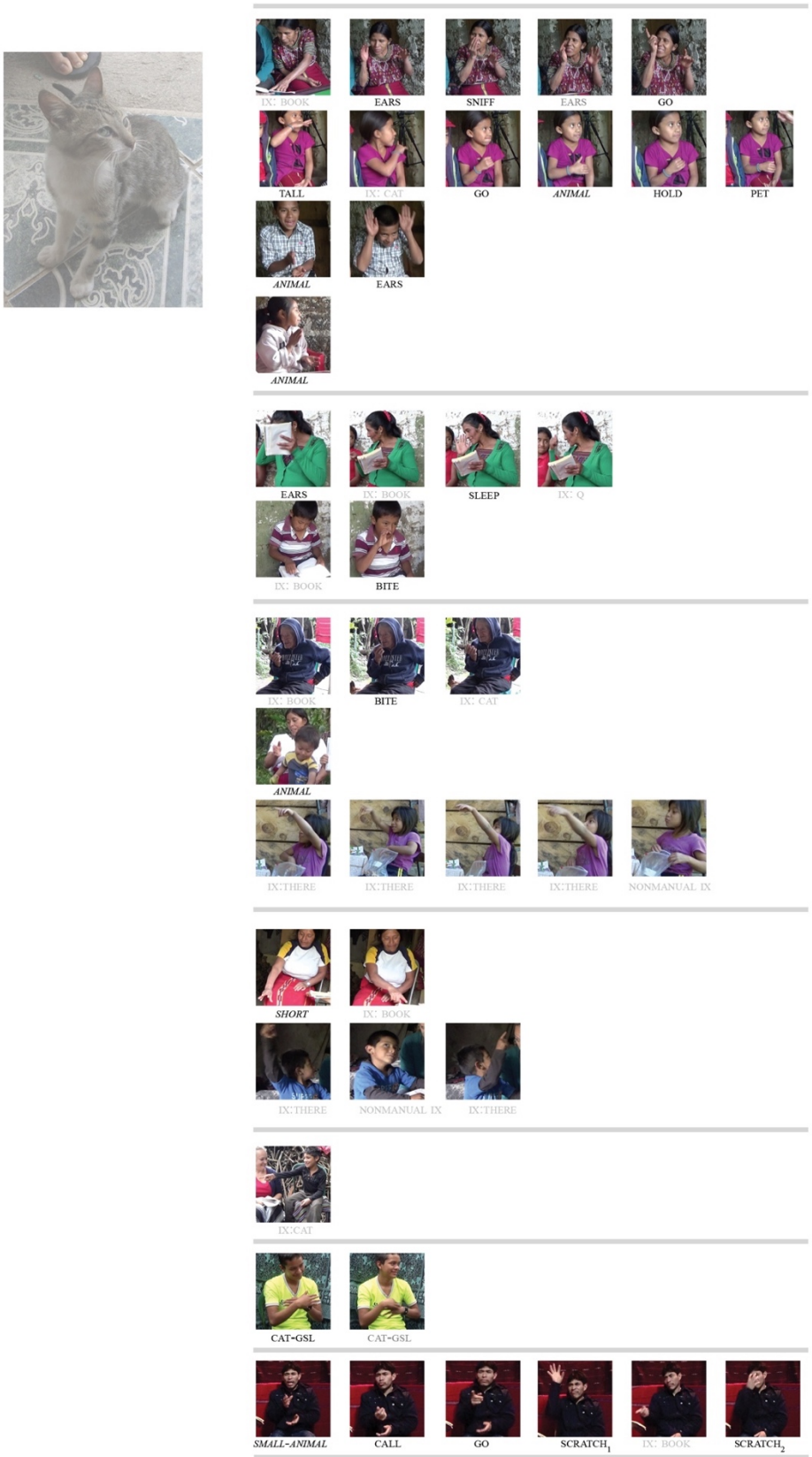

Figure 54. Examples of responses to photo of a cat.

Participants produced between one and six signs per stimulus photo in these examples. Participants in contact with each other are clustered. Groups of signers in contact are separated by grey bars. Signs forms that were not included in this analysis (because they were repeated or because they were deictic signs) are glossed in grey text. Sign forms that resemble gestural emblems used by hearing speakers of Ixil are glossed in italics.

7.4.1.1 Tomatoes: Similar Sign Forms and Iconic Signs

In descriptions of the photo of tomatoes (figure 52), all but three of the participants pictured here described the shape of a tomato. For the three participants who produced only one sign in their description, the sign that they used was a size and shape sign, glossed as ROUND-SHAPE. This form was always the first sign produced, if a participant produced it, and was repeated by one participant.

In recent work on patterned iconicity (Hwang et al., 2017; Padden et al., 2015), as well as in studies of the lexicons of young sign languages (Israel et al., 2009; Meir et al., 2005; Tkachman & Sandler, 2013), researcher have noted that size and shape signs (SASS) are common forms that appear across sign languages in lexical signs for food items, especially for fruits and vegetables. This trend appears to also apply for adult and child homesigners, regardless of communicative ecology. One of the three participants who did not produce the ROUND-SHAPE form for tomato was one of two hearing mothers in this example. She produces only an iconic sign for the action of cutting a tomato, glossed as CHOP. This form was produced by homesigners also, but never in isolation, without first indicating the size and shape of the tomatoes.

7.4.1.2 Mug: Similar Sign Forms and Emblems

All participants produced the gestural emblem glossed as DRINK in descriptions of a photo of a mug (figure 53). For eight of the participants shown here, DRINK was the only sign that they produced. This gestural emblem can be elicited and labeled by hearing Ixhil speakers who do not interact with deaf people (see next section for discussion of signs that share their form with gestural emblems).

Participants who did produce an additional sign in their descriptions of the mug frequently produced an alternative sign form for DRINK, but with a different handshape (glossed as DRINK_1). Additionally, two participants marked the emblem sign DRINK with an additional sign, PUT or PLACE. Haviland (2011) notes a similar pattern in the Z homesign system used in Chiapas by a family with multiple deaf siblings. Haviland suggests that this additional marker strategy to mark a sign as a label for an object or an action. In addition to a shared sign form across all participants, those in contact and those not in contact, the photo of a mug elicited relatively shorter descriptions than the other two examples. The importation of a gestural emblem from the surrounding gestural inventory seems to be a ready strategy for both hearing and deaf participants for some items (see Appendix X for examples and description of gestural emblems that appeared in the data).

7.4.1.4 Cat: Sign Form Variability

The descriptions with the most variability are the responses to the stimuli photo of a cat (figure 54). 5 participants used a common gestural emblem, glossed as ANIMAL. Additional iconic strategies for signs used to describe this photo included enacting the actions of a cat (e.g., SCRATCH, BITE), enacting an action performed by a human on a cat (e.g., PET), or iconic

representations of a body part (e.g., EARS). This pattern of variation and stability is characteristic of the full set of stimuli items, discussed in the next section, and in detail in Horton (forthcoming).

7.4.2 Study 1: Iconic Affordances of Referents

The term iconic affordance is used here to describe the range of sign forms that are produced by all participants, including participants not in contact with each other and participants who are hearing and do not use a homesign system as their primary means of communication. Items that have a high iconic affordance can be represented by a larger variety of iconic strategies and sign forms. For example, the cat photo from figure 54, which was represented using a common gestural emblem, an iconic form enacting an action that might be typical of a cat and an iconic form enacting an action that would typically be performed by a human when interacting with a cat. A referent with a low iconic affordance would be characterized by fewer salient strategies for iconically representing it in a sign form. Alternatively, there could simply be one sign form that is readily available, as in the example of the form drink, adopted from the gestural inventory of Ixhil speakers for the item mug.

In figure 55, I present the most common sign form for each stimuli item. The most common sign form for each stimuli item is listed to the right of the bar, e.g., the first stimuli item, at the top of the list in figure 55, is *paintbrush*, and the most common sign form for *paintbrush* was PAINT (see figure 22 for examples of the sign PAINT). The bars indicate the proportion of participants who produced the most common sign form. For *paintbrush*, for example, all participants produced the form PAINT at least once in every session in which they

described the photo of a paintbrush. Similarly, all participants produced the sign DRINK at least once in their description of photos. In contrast, the most common sign form produced in descriptions of the photo of a turkey was PECK, and this was produced by less than 25% of participants who described the turkey photo across all sessions.

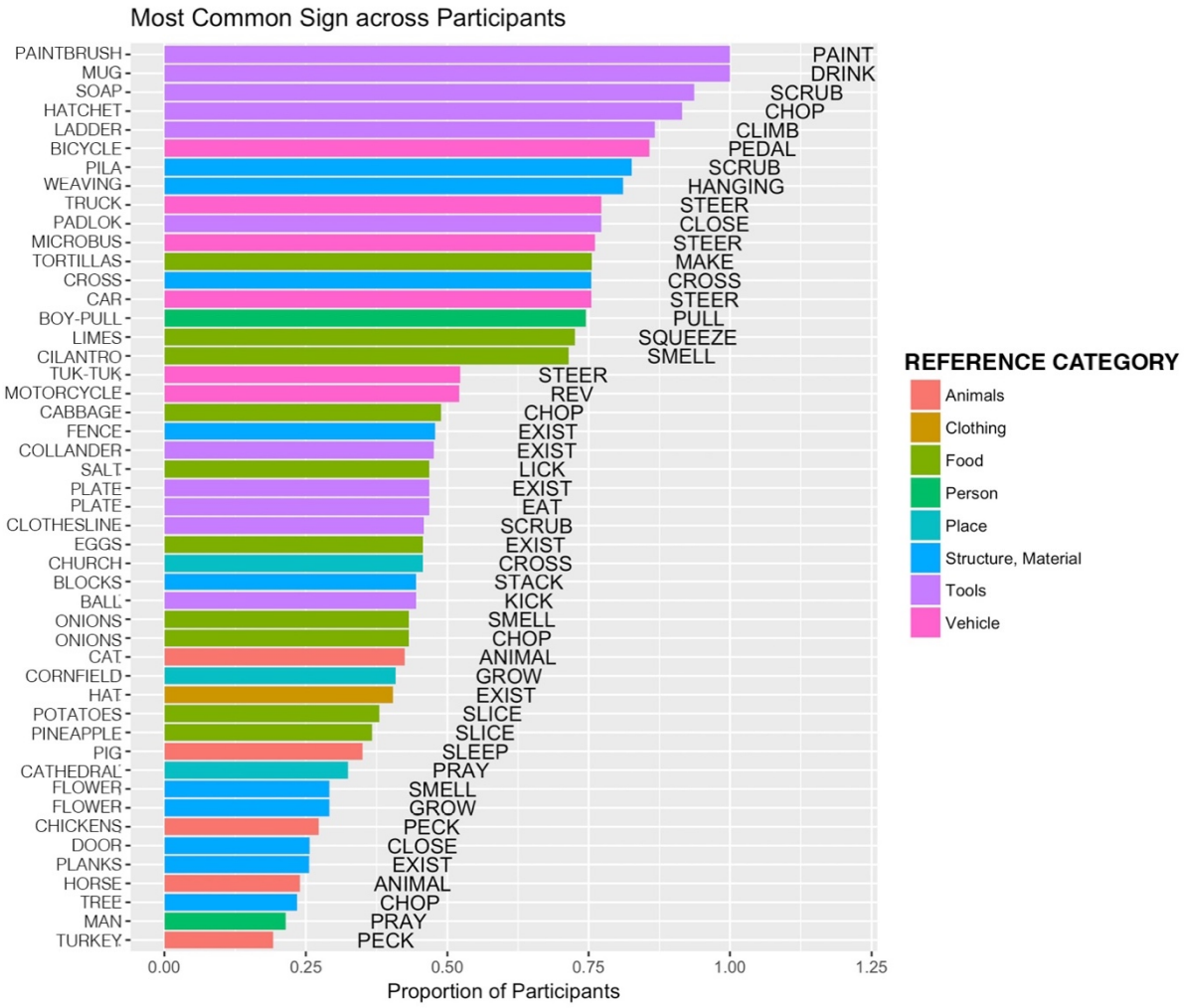

Figure 55. Showing the proportion of participants who produced the most common sign form (listed to the right) for each stimuli item (listed on the y axis). Colors indicate the referent type of the stimuli item. Tools, indicated by the purple bars, were most likely to have a higher proportion of participants produce the most common sign form in their description. For referents that were Animals (red), People (green) and Structures/Materials (blue), fewer participants produced the most common sign from, indicating greater variability in the relationship between sign form and referent.

The proportion of participants who produced the most frequent sign are coded according to the type of referent. Referent categories included: animals (e.g., turkey, cat; red bars), clothing (e.g., huipil shirt; brown bars), foods (e.g., tortillas, chilies; green bars), people (e.g., man, woman; dark teal bars), places (e.g., cornfield, church; light teal bars), structures or materials (e.g., pile of rocks, fence; blue bars), tools (e.g., hatchet, mug; purple bars) and vehicles (e.g., truck, tuk-tuk; pink bars).

The relationship between referent type and sign form, particularly the choice of iconic strategy, sometimes referred to as patterned iconicity, has been studied in detail for other sign languages (Hwang et al., 2017; Meir et al., 2013; Padden et al., 2015, Safar forthcoming), as well as within this same participant group (Horton, forthcoming).

For this study, the critical observation about the relationship between referents and sign forms concerns the type, or semantic class, of the referent and the rate of sign form convergence. There is likely to be a measurable degree of convergence across all participants, even those not in contact, where sign forms have restricted iconic affordances, particularly when there is a salient iconic form in use across the community of speakers and signers. Alternatively, where referents have higher, more diverse, iconic affordances, there may be lower convergence across signers. For these referents, even a form that is iconic is selected from a large inventory of possible iconic forms.

In figure 55, tools (purple bars) and vehicles (pink bars) are clustered near the top of the distribution. For many tools, for example, all signers in the sample produced the most common form at least once in their description. These are referents that have high sign form convergence, regardless of the amount of contact or interaction between signers. The category of food items

(green bars) clusters in the middle of the chart, some referents (*tortillas, limes*) have a common sign produced by the majority of participants. For other food referents (*potatoes, pineapple*), however, fewer than half of the participants produce the most common sign form. The referents from the categories "animals" (blue bars) and "people" (teal bars) have a *most common sign form* produced by the smallest proportion of participants. For these referents, there is more variability in the signs that participants produced, they lack one salient iconic form. Interestingly, this distribution roughly aligns with the animacy of the referent. Tools, and handheld objects have readily available, salient forms, while animals and people have greater diversity in the iconic ways that they are represented with manual signs and gestures.

Green (2014) characterizes these readily available forms as *immanent*, "Local signs, I will argue, are immanent in the social- material world: in the topography of built space, in corporeal routines, in everyday objects and agricultural production, in kinship relations…" (88). In her discussion of the immanence of certain signs, she invokes Hanks' notion of communicative practice, "routine patterns of experience and interaction through which actors [encounter and] recognize objects, individuals, and events not as mere things but as instances of familiar categories" (Hanks, 1990, p. 70). In this analysis, I show that communicative practice likely interacts with the representational affordances of the referent itself.

In figure 56, I summarize the convergence of sign forms across all signers, using the mean jaccard similarity score (introduced in section 7.1). The highest mean jaccard indices (highest convergence across all participants) are for vehicles (purple in figure 56), and while the convergence for tools (blue in figure 56) is nearly as high, there is much more variability in the rates of convergence for tools than for vehicles.

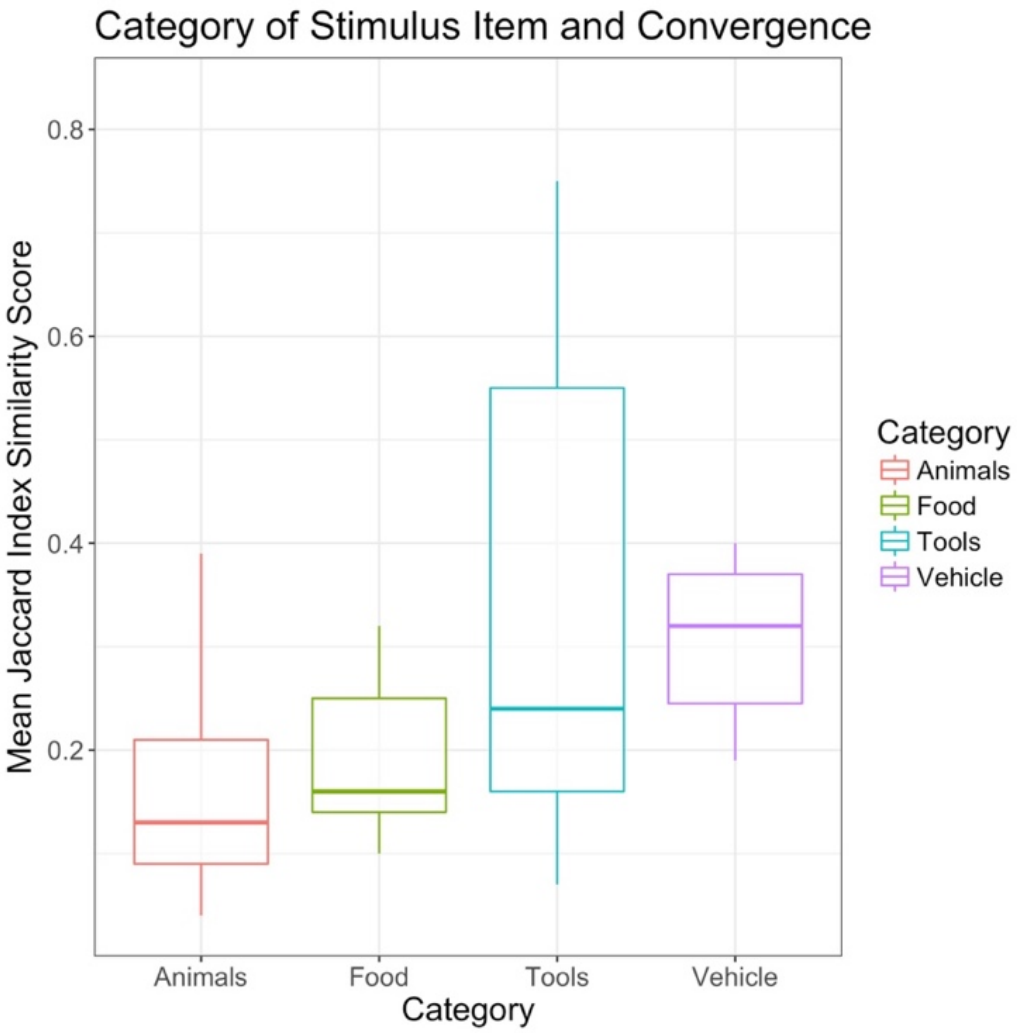

Figure 56. The mean jaccard similarity score of all pairwise comparisons for the referents in the vehicle (purple), tools (blue), food (green) and animals (red) categories.

In future analyses, I hope to account for both the representational affordances and the iconic affordances of particular referents when assessing sign form convergence. Specifically, these variables are an essential dimension to consider when accounting for the degree to which convergence is based on contact between signers, versus a natural correspondence between sign form and referent, or the availability of a common gestural emblem. In order to adequately address the degree to which interaction and contact with another signer leads you to converge on the same sign forms, these factors must be accounted for.

7.4.3 Study 2: Lexical Convergence and Social Interaction

In this section I present the results of study 2, an analysis of convergence across signers. To calculate convergence, I use the same jaccard similarity index calculation as the one used for Study 1, but in this analysis, I compare the set of signs produced by pairs of participants, rather than the set of signs produced by all participants for one stimulus item. As described in the introduction to this chapter, convergence is understood to be the degree to which two signers produce the same sign forms to describe the same referents from the lexical elicitation stimuli set.

7.4.3.1 Study 2 Methods - Calculating Jaccard Similarity Index

As described in section 7.1, for this analysis, I quantify convergence based on pairwise comparisons of signers. I compare the set of signs produced for every stimulus item that both signers described. I use a jaccard similarity coefficient, illustrated in figure 58 below. The jaccard index is a ratio of the number of unique sign forms that both signers produced divided by the total number of unique signs that both signers produced in total (including the signs that both signers produced and the signs that only one of two signers produced). The calculation is thus a ratio of the sign forms that were the same (the intersection of the sets of sign forms produced by each signer), relative to all of the sign forms that were produced by each signer (the union of the sets of sign forms produced by each signer). The example in figure 57 illustrates an example of two jaccard similarity scores, calculated from the set of sign forms produced by three participants.

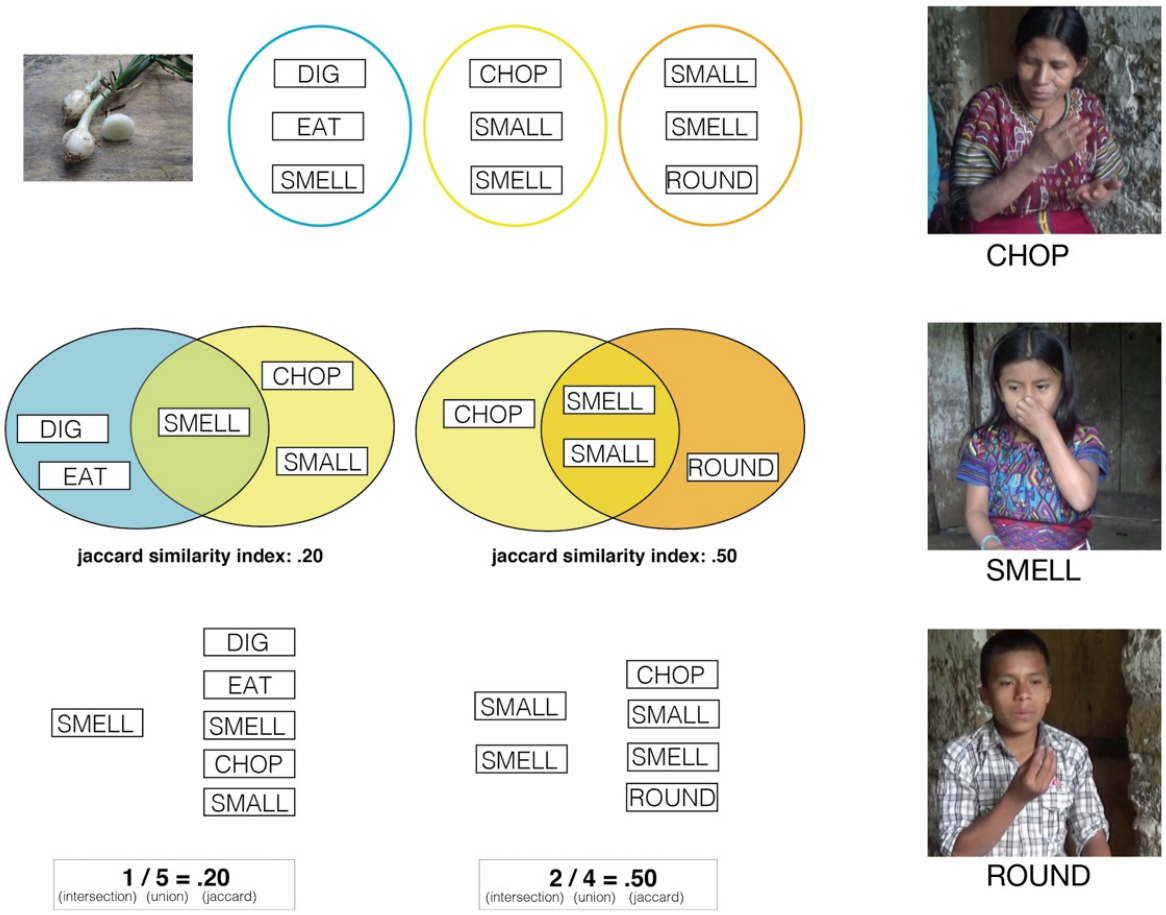

Figure 57. sample of jaccard similarity calculations for two pairwise comparisons of the set of sign forms produced for *onion* by three participants.

The set of sign forms produced by the first participant includes DIG, EAT and SMELL. The set of sign forms produced by the second participant includes CHOP, SMALL and SMELL, thus the jaccard similarity score for these two participants, for this stimuli item, is 1/5 (.20). The set of signs produced by the third participant, SMALL, SMELL and ROUND, overlaps more with the set of signs produced by the first participant, yielding a jaccard score of 2/4 (.50) for these two participants for *onion*.

7.4.3.2 Study 2 Results – Interaction and Convergence

Jaccard scores were calculated for all pairs of participants, including longitudinal comparisons of participants who completed the task longitudinally between 2013 and 2017. The longitudinal comparisons were excluded from this analysis, which is intended to be a cross-sectional analysis that considers the effect of communicative ecology on convergence. A total of 58,783 individual jaccard scores for a pair of participants for a given stimuli item were calculated across 1,436 cross-sectional pairs. The mean of the jaccard scores for all stimuli items that both participants described was calculated to generate an average jaccard similarity score for that pair of participants. To reduce the effect of smaller sets of comparisons, any pair that provided a description for fewer than 20 overlapping stimuli items (out of 63 possible stimuli item comparisons) was excluded from further analysis. This left 1,238 pairwise comparisons (56,816 individual stimuli calculations) in the final analysis.

The jaccard similarity scores for pairs of participants ranged from a minimum of .058 (a score for two child homesigners who do not interact with each other, one is male and one is femaly, they described 20 of the same stimuli items) to a maximum of .511 (a score for two child homesigners who are cousins, and interact with each other intermittently, both are female, they described 30 of the same stimuli items).

I begin by presenting the distribution of jaccard similarity scores for pairs of participants who have direct interactions compared to those who never interact with each other (to my knowledge). These are presented in figure 58 below, participant pairs who do not have contact are indicated in gold, on the left, and participants-pairs who do have direct contact are indicated in purple, on the right. The No Contact group consisted of 994 pairs of participants who do not interact with each other directly. The mean jaccard similarity score for this group was 0.24 (SD

.07). The Direct Contact group consisted of 243 pairs of participants who do interact with each other directly. The mean jaccard similarity score for this group was 0.31 (SD .07).

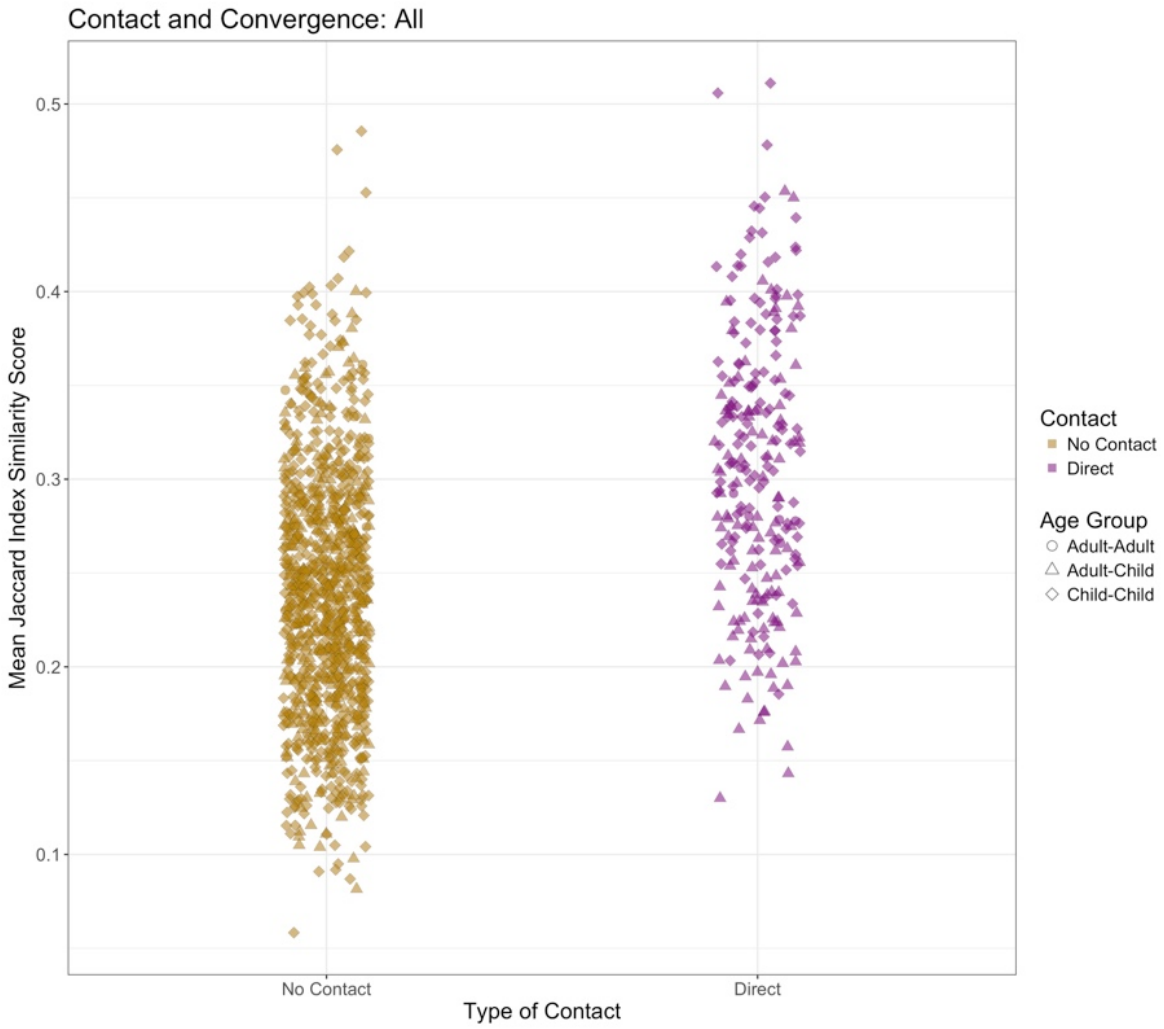

Figure 58. Comparison of the Pairwise Jaccard similarity scores for participants who do not interact (gold, left group) and participants who do interact with each other (purple, right group).

Based on this analysis, interaction between two homesigners does lead to higher levels of convergence as measured by similarity of sign forms. Interestingly, however, there is still substantial convergence of sign forms for pairs of participants who never interact. I attribute this

partially to some of the characteristics mentioned in section 7.4.2 above, including salient iconic affordances of referents and the availability of a rich set of conventional gestural emblems in use in the spoken language context (see table 17 for a summary of some common emblems).

7.4.3.3 Participant groups and rates of convergence

In the previous section, we saw that direct contact between homesigners is associated with higher levels of convergence. In this section, I analyze different types of groups who have different features of their communicative ecologies, specifically in terms of the age of the participants who are interacting, whether they are hearing or deaf, and the context of interaction (home or school). I divide the direct contact group from figure x into six sub-groups based on familial relations or school interaction. These relations are illustrated in figure 48 above, and listed in table 15. The seven groups in this analysis include three families (the Marcos, Cobo and Bernal families) with multiple deaf individuals, the peer group of child homesigners who attend school together, and more distantly related deaf homesigners who see each other intermittently (approximately once or twice per month). The remaining groups include participants who never interact with each other and a homesigner who is the only member of his family who is deaf and his mother, who is hearing (identified as Individual).

Table 17. Participant groups and mean jaccard similarity scores

Participant Group	*Comparisons*	*Mean Jaccard Score (SD)*
No Contact	994	0.24 (.06)
Individual	4	0.21 (.06)
Marcos Family	17	0.23 (.05)
Bernal Family	78	0.30 (.06)
Occasional Contact	75	0.32 (.07)
Cobo Family	13	0.34 (.06)
Peers	56	0.32 (.07)

In table 17 and figure 59, it is apparent that Individual child homesigners and their mothers (plotted in gold), who have a lower similarity score (.21, SD= .06) than homesigners who are never in contact with each other (the "No Contact" group, plotted in red, mean similarity score .24, SD=.06). The Marcos family (plotted in green), consisting of Pedro, a deaf man who is 82 years old, his hearing daughter, and his deaf granddaughter, also have a lower mean similarity score (.23, SD= .05) than homesigners who have never interacted with each other. The results from the Individual and Marcos family suggest that daily interaction alone does not guarantee convergence of sign forms, even for very familiar items.

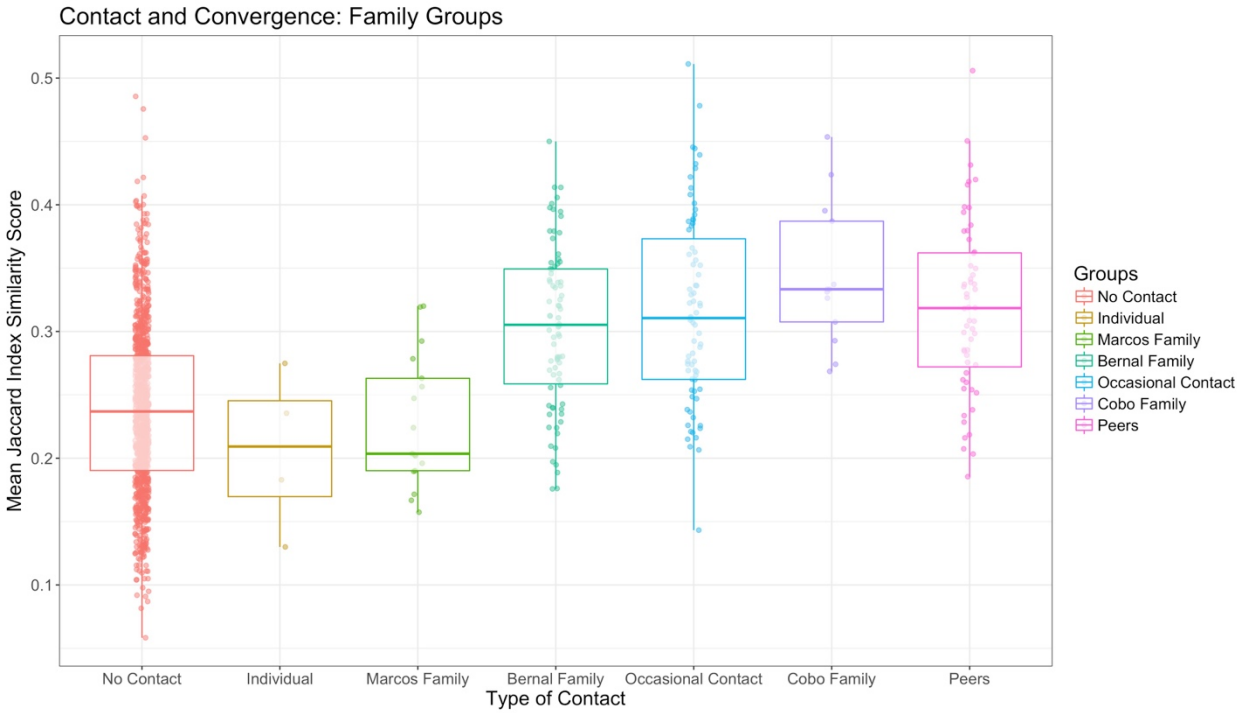

Figure 59. Distribution of pairwise jaccard similarity scores for participant groups, including: participant pairs with no contact (red), participant pairs of individual homesigners and family members (gold), participant pairs from the Marcos family (lime green), participant pairs from the Bernal family (teal), participant pairs with intermittent contact (blue), participant pairs from the Cobo family (purple), peers (pink).

The three groups with the lowest rates of similarity (homesigners with no contact, Individual homesigners and the Marcos family) differ from four remaining groups of homesigners. The highest similarity scores occur in jaccard index scores for the Cobo family (plotted in purple). Specific characteristics of this ecology may contribute to the higher rate of convergence in this group, including the relatively small size of this nuclear family (4 member family, two deaf children Juana and Jose, one deaf adult, their mother, Nila, and one hearing child, their younger brother Andres). In this family, half of the family members are deaf. Though Juana and Jose's father is deceased, he grew up with at least one sister who is deaf (their aunt, Luisa, who is Sara's mother), and thus he may have already been familiar with use of a homesign system when his children were born deaf. Additionally, Juana and Jose have attended school with other deaf students for many years. It appears that they have benefited from two communicative ecologies: home and school, as well as close contact with a small nuclear family.

I also note the high rates of similarity in the "occasional contact" group (indicated in blue in figure x) and the peers group (indicated in pink). This suggests that sign form convergence may be partially driven by interaction between same-aged peers, above and beyond the frequency of interaction. The occasional contact group includes Sara, Jose and Juana, all deaf child homesigners, Ramon (F, H) (F) and Andres, hearing siblings of Sara, Jose and Juana. Based on the reports of Nila, Jose, Juana and Andres' mother, the two families (Cobo and Bernal) see each other semi-regularly, approximately once per month. This contact seems to be sufficient to generate similar levels of convergence to the peer group of deaf child homesigners who interact daily at school. This convergence could also be associated with the duration of interaction, regardless of frequency. Since Sara, Jose, Juana, Ramon and Andres have presumably interacted since their birth, as their families are related, they have seen each other

infrequently, but over many years. Jose and Juana have also attended school with deaf peers over many years.

7.4.4 Study 3: Lexical Richness and the Emergence of Categories

7.4.4.1 Study 3 Methods - Calculating Lexical Richness

Each signer produced a set of signs to describe the photos, and we can characterize the distribution of frequency of these sign forms, relative to the number of stimuli photos that they were used to describe. Figure 60 offers a hypothetical distribution to illustrate the two components of the lexical richness score. The homesigner produced produced 8 unique sign types (signs with the same form gloss) and 13 sign tokens. Four of the signs (ANIMAL, EAT_1, STEER, EAT_2) were produced for multiple photos. STEER, the most common sign, was produced for three photos (*motorcycle*, *truck* and *micro*). Four of the signs occur only once in the set, they were produced for only one photo, these include LONG, ROUND, SPICY and SNIFF, which were produced for *micro*, *tomato*, *chilies* and *onions*, respectively. The signs that appear only once in the set are the hapax legomenon, in this example, they are .31 of the full set of sign tokens. The most common sign is .23 of the full set.

The forms in the hapax legomenon are considered maximally informative, because they are only associated with one referent. The form STEER, on the other hand, could be used as a categorizing sign that indicates, first, the class of the referent (possibly a vehicle), with subsequent signs to refer to specific properties of the referent within that class. This is a pattern that has been described for several young and emerging sign languages (Israel & Sandler, 2009; Perniss, Thompson, & Vigliocco, 2010).

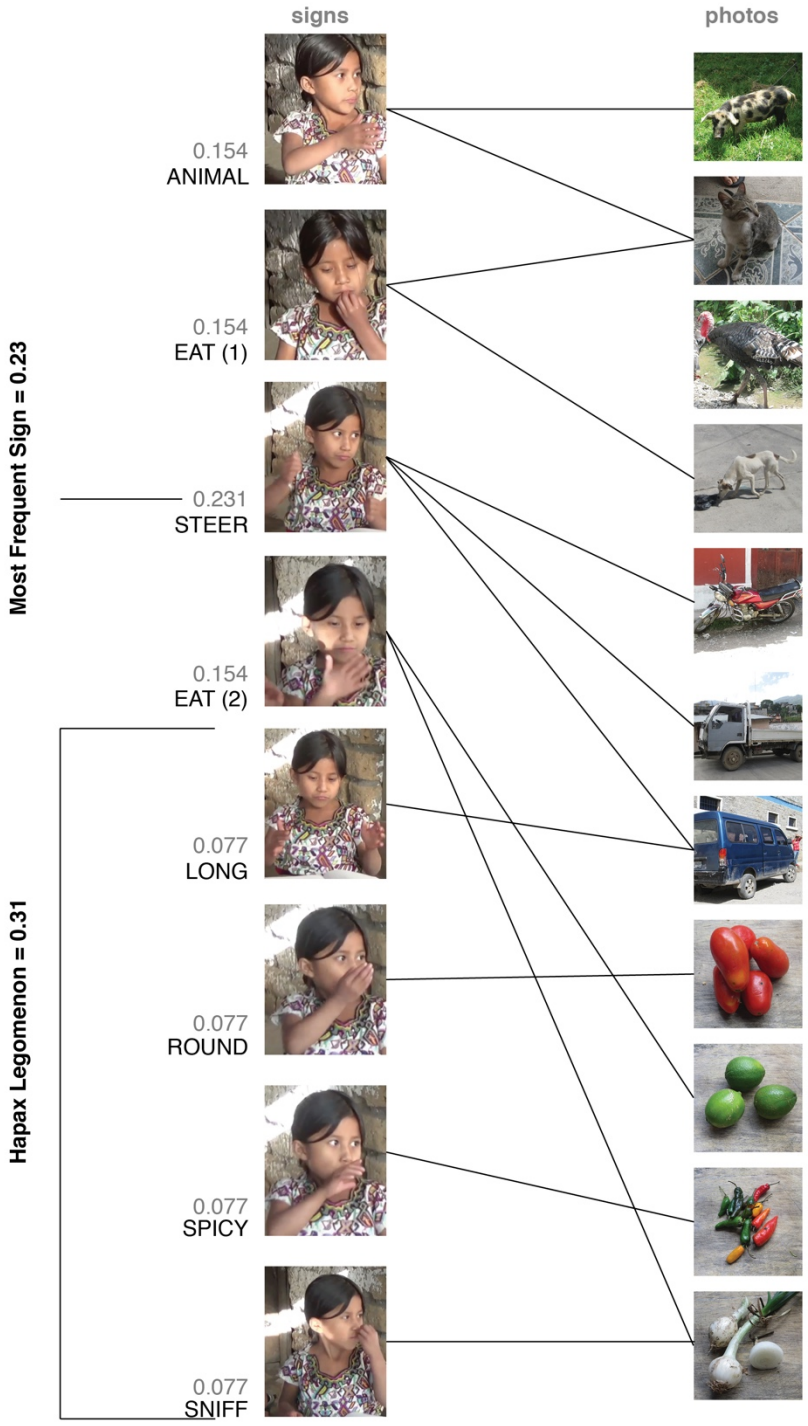

Figure 60. Sample illustration of lexical richness data. In a hypothetical dataset of 8 signs produced to describe 11 photos, 1 sign is used for three photos, 3 signs are used for two photos and four signs are used for only one photo. The four signs that appear only once in the set are the hapax legomenon and are .31 of the total set. The most common sign, STEER is .23 of the total set.

To characterize the distribution of sign forms within the lexicon at each session, the hapax legomenon and the most frequent sign, as a proportion of all signs was calculated for each participant. If the hapax legomenon is a significant proportion of a participant's signs in a given session, this indicates that they have a large inventory of signs that are associated with only referent. Thus their inventory of signs may be larger, but these signs are maximally informative, as they refer to only one referent. If the most frequent sign is a significant proportion of a participant's inventory of signs in a given session, this could indicate that they are using one form to categorize referents, and then further specifying those referents with an additional sign. This distribution could also indicate that the signer does not use maximally informative signs (here assumed to be signs with a relatively low ratio of sign to referent) and instead relies on other strategies to further specify their referent, for example deictic signs to indicate objects in the immediate context.

7.4.4.2 Study 3 Results

The data for study 2 are the same as study 1, 19 participants completed the lexical elicitation task in 51 sessions. The unit of analysis for this study was each session. Table 18 below summarizes the groups for this analysis, including individual homesigners, the Marcos, Bernal and Cobo families and the group of peers who attend school together. Recall that Jose and Juana, from the Cobo family, also attend school with Diego and Tomás, but for this analysis, they are included with their brother Andres and their mother, Nila.

Table 18. Participant Groups for Study 3

Group	*Number of Participants*	*Number of Sessions*	*Participant Names*
Marcos Family	3	8	Rosa, Pedro, Luisa
Individual	5	12	Antonio, Alejandro, Jacinto, Maria, Carlos
Bernal Family	5	16	Sara, Ramon, Ana, Lucia, Abel
Cobo Family	4	6	Jose, Juana, Andres, Nila
Peers	2	9	Diego, Tomás

As described above, each session was treated as a snapshot of the signer's lexicon, and two quantitative characteristics of each session were calculated: the proportion of the most common sign (out of all signs produced in that session) and the proportion of signs that were produced for only one stimuli item, the hapax legomenon (out of all signs produced in that session). The mean most-frequent-sign proportion (across participants/sessions) and the mean hapax legomenon (across participants/sessions) are presented in table 19 below.

Table 19. Summary of mean most frequent sign and hapax legomenon proportions across groups

Group	*Most Frequent Sign – mean proportion of all signs (sd)*	*Hapax Legomenon – mean proportion of all signs (sd)*
Marcos Family	0.11 (.05)	0.15 (.06)
Individual	0.09 (.02)	0.32 (.09)
Bernal Family	0.10 (.02)	0.28 (.06)
Cobo Family	0.08 (.02)	0.32 (.02)
Peers	0.06 (.01)	0.41 (.07)

Figure 67 illustrates the distribution of these two factors for all participants, each point represents one session. Sessions are color coded by group and the shape indicates whether the participant is an adult (triangle) or child (circle) The vertical axis shows the most frequent sign proportion, and the x axis the hapax legomenon proportion. Each group is discussed separately, and then all groups are presented together and analyzed with a cluster analysis. I find that the two groups

with the clearest shared characteristics (in terms of proportion of most common sign and hapax legomenon proportion) are the Cobo family and the peer group who attend school together. In the concluding section, I discuss possible reasons for these patterns.

Marcos Family

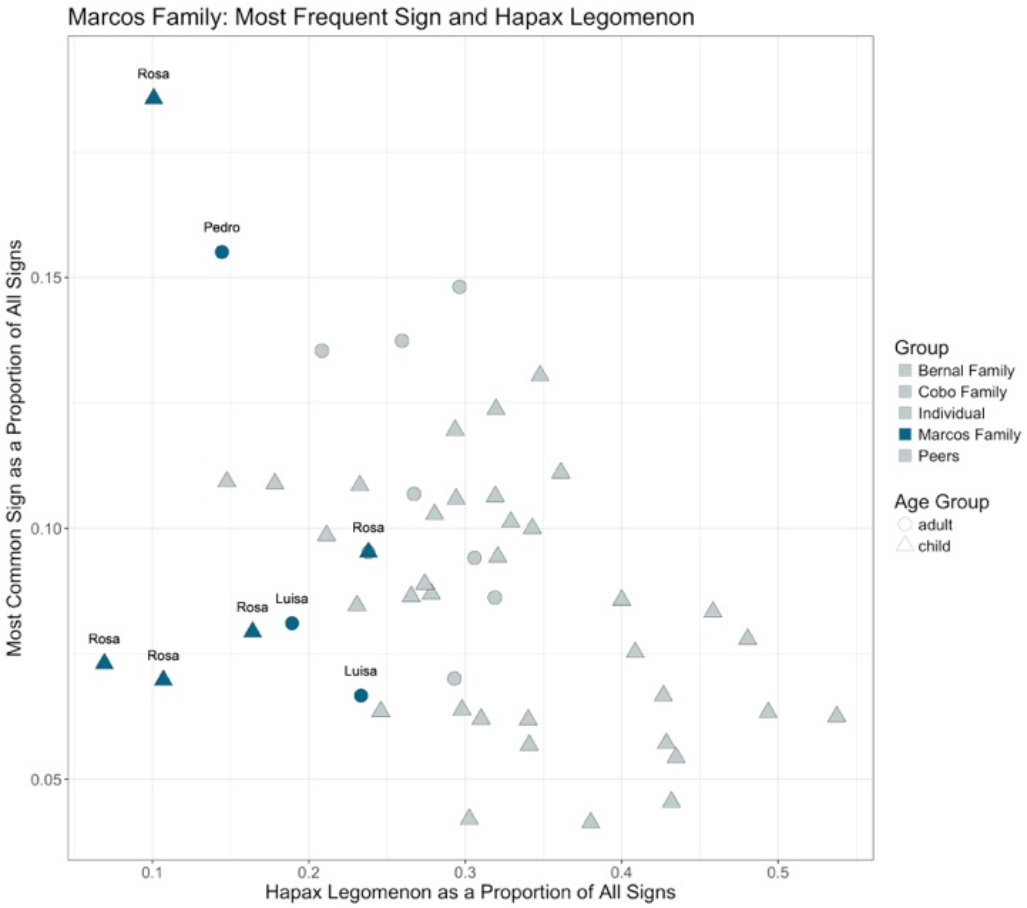

Figure 61. Plot of the hapax legomenon proportion (x axis) and most common sign proportion (y axis) for each session. The participants from the Marcos family are highlighted, in blue and cluster in the left third of the chart.

In figure 61, the sessions from participants in the Marcos family are highlighted. These individuals (Rosa, her mother Ana and her grandfather Pedro) have the lowest hapax legomenon proportion of all of the groups. With the exception of two sessions, one from Rosa (F) and one

from Pedro, the Marcos family members also have a low proportion of most frequent signs. This suggests that they produce several signs for multiple stimuli items, with few signs that occur only once and lacking a clear "most common form" that is used for many stimuli items.

Bernal Family

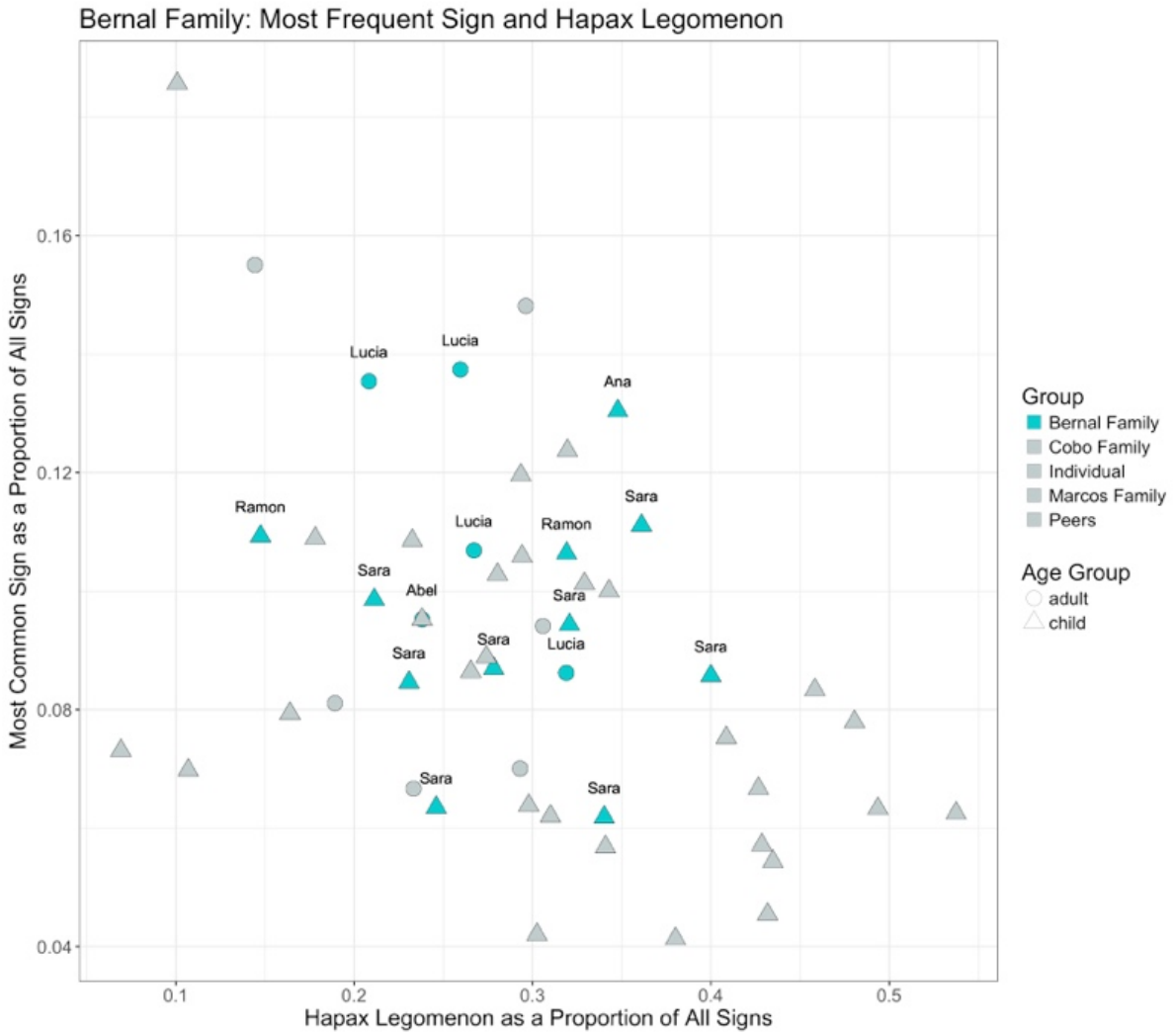

Figure 62. Plot of the hapax legomenon proportion (x axis) and most common sign proportion (y axis) for each session. The participants from the Bernal family are highlighted, in teal and cluster in the center of the chart.

The Bernal family (Sara, her friend Ana, her brother Ramon, mother Lucia and father Abel) each have a higher proportion of hapax legomenon than the Marcos family. Within the Bernal family, Sara typically has a lower most common sign form and higher hapax legomenon proportion. In this respect, she resembles her cousins, Juana and Jose, as well as Tomás and Diego, students who attend school together. Sara's mother, Lucia, who is also deaf, looks very different from Sara in terms of the properties of her lexicon. Lucia has, on average, a higher proportion of the most common sign form and a lower hapax legomenon proportion.

It is interesting that in a family where Lucia and Sara are the only two deaf members, the set of signs that they produce in the context of the same elicitation task have markedly different properties. Ramon, Sara's brother, who is hearing, and Abel, Sara's father, who is also hearing, fall between Lucia and Sara. They have a lower proportion of most common sign than Lucia, but also a slightly lower hapax legomenon proportion than Sara. Sara's friend Ana, resembles both Sara and Lucia, with a higher hapax legomenon proportion, but also a high most common sign proportion.

Individuals

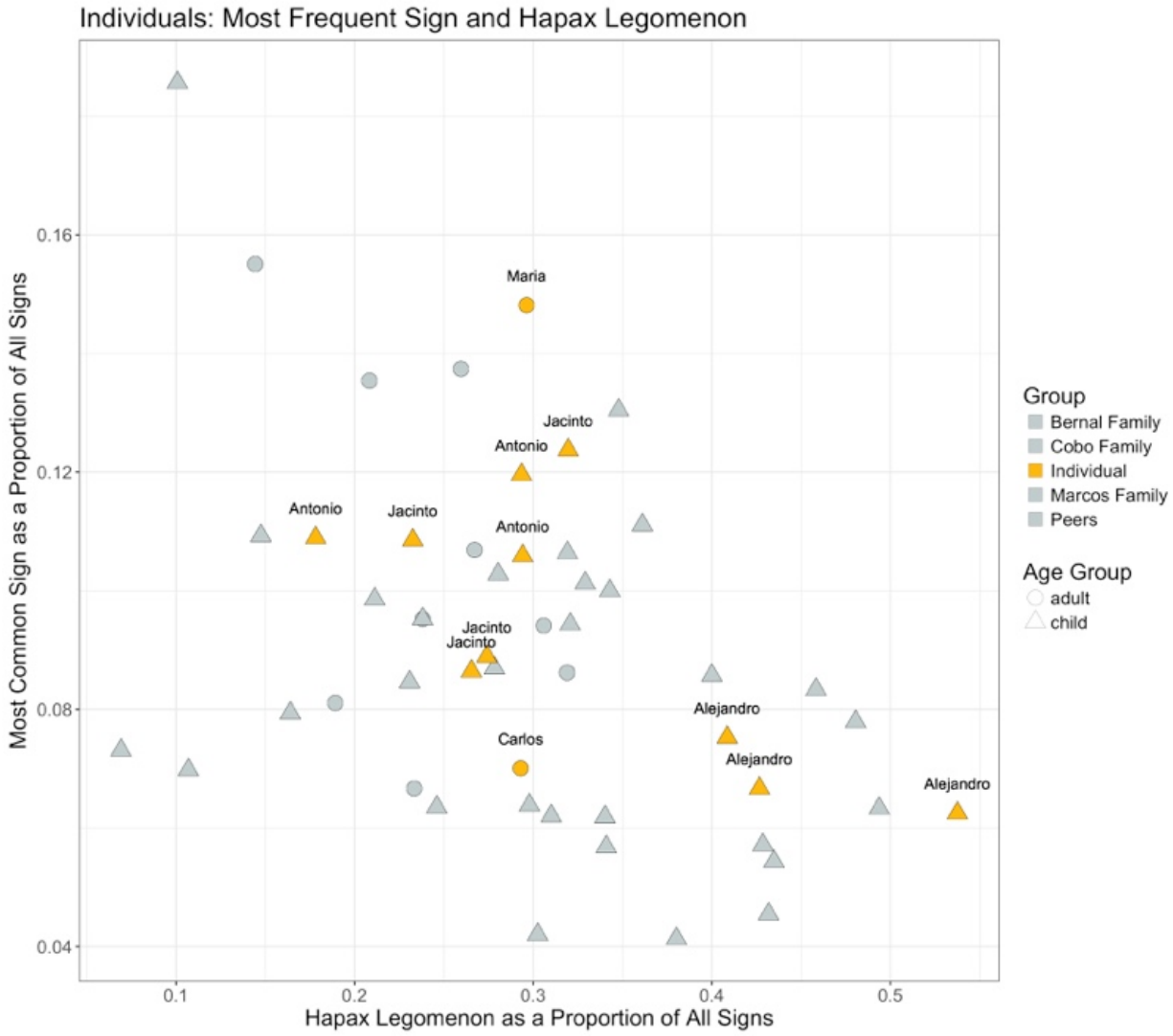

Figure 63. Plot of the hapax legomenon proportion (x axis) and most common sign proportion (y axis) for each session. The Individual participants are highlighted, in yellow, and cluster in the center of the chart, but are more widely distributed than the Bernal or Cobo family participants.

The participants in the individuals group include three child homesigners, Antonio, Jacinto and Alejandro, Antonio's mother, Maria, who is hearing, and Carlos, an adult homesigner. Antonio (I) and Jacinto (I) most closely resemble Sara's mother, Lucia, in the distribution of the most

common sign proportion (relatively high) and the hapax legomenon proportion (lower than Sara, Diego (P) and Tomás from the Peer group). Interestingly, Alejandro (I), who is included with the individual homesigners here, but who did attend school with Jose (P, F), Juana (F, P), Tomás (P) and Diego (P) briefly, looks more similar to Tomás (P) and Diego (P) in the distribution of the hapax legomenon proportion (quite high) and the most common sign proportion (lower).

Cobo Family

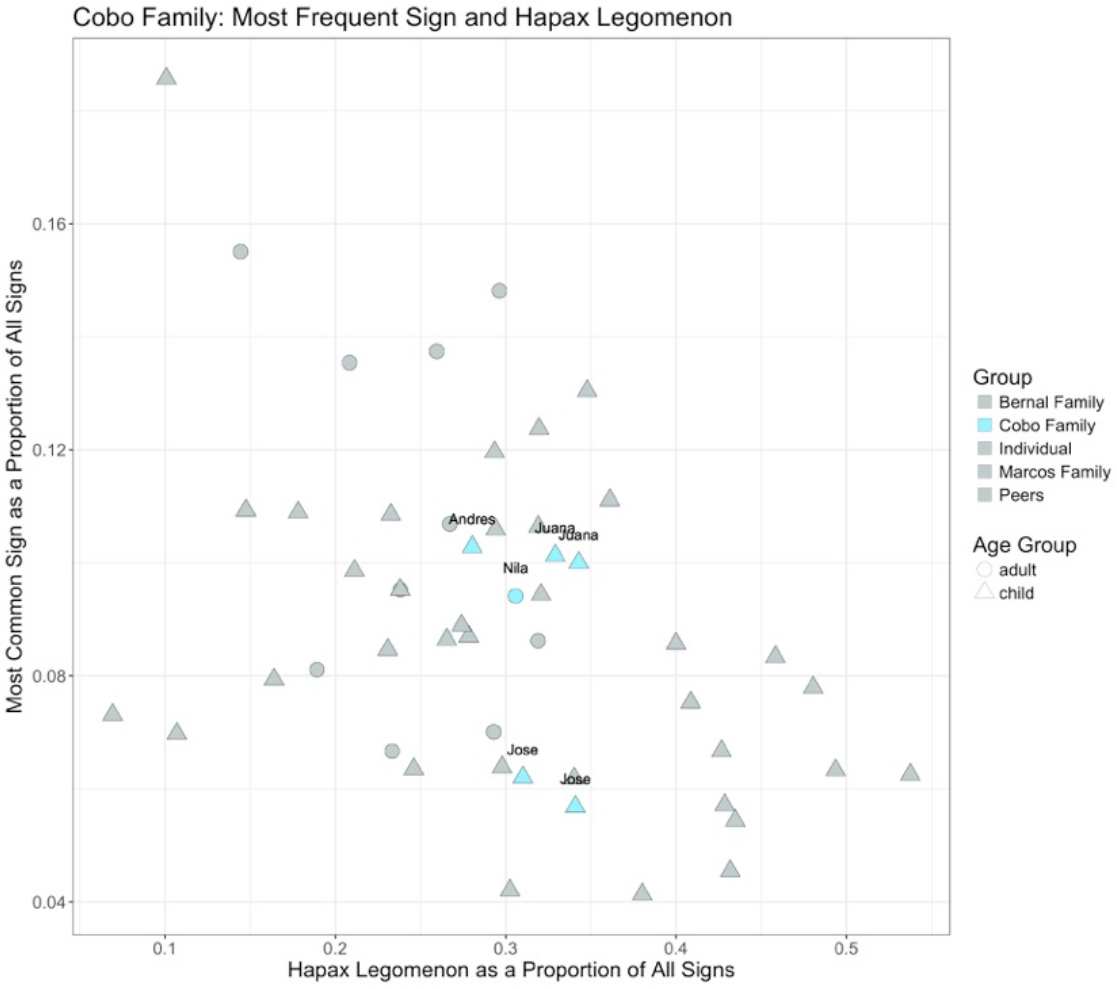

Figure 64. Plot of the hapax legomenon proportion (x axis) and most common sign proportion (y axis) for each session. Participants from the Cobo family are highlighted, in light teal, and cluster tightly in the lower center of the chart.

The members of the Cobo family, Jose and Juana, child homesigners, and their hearing brother Andres and hearing mother Nila, cluster tightly in the center of the chart. Nila, Juana and Andres, in particular, show a very similar distribution of hapax legomenon proportion (near the median of all participants) and the most common sign proportion (also near the median of all participants). Jose (P, F), who interacts with Tomás (P) and Diego (P) at school more regularly

than Juana (F, P), is somewhat distinct from the other members of his family, and more closely resembles Tomás (P) and Diego (P), his peers from school. Jose (F, P) has a very low proportion of a most common sign, and more signs in the hapax legomenon proportion for each session.

Peers

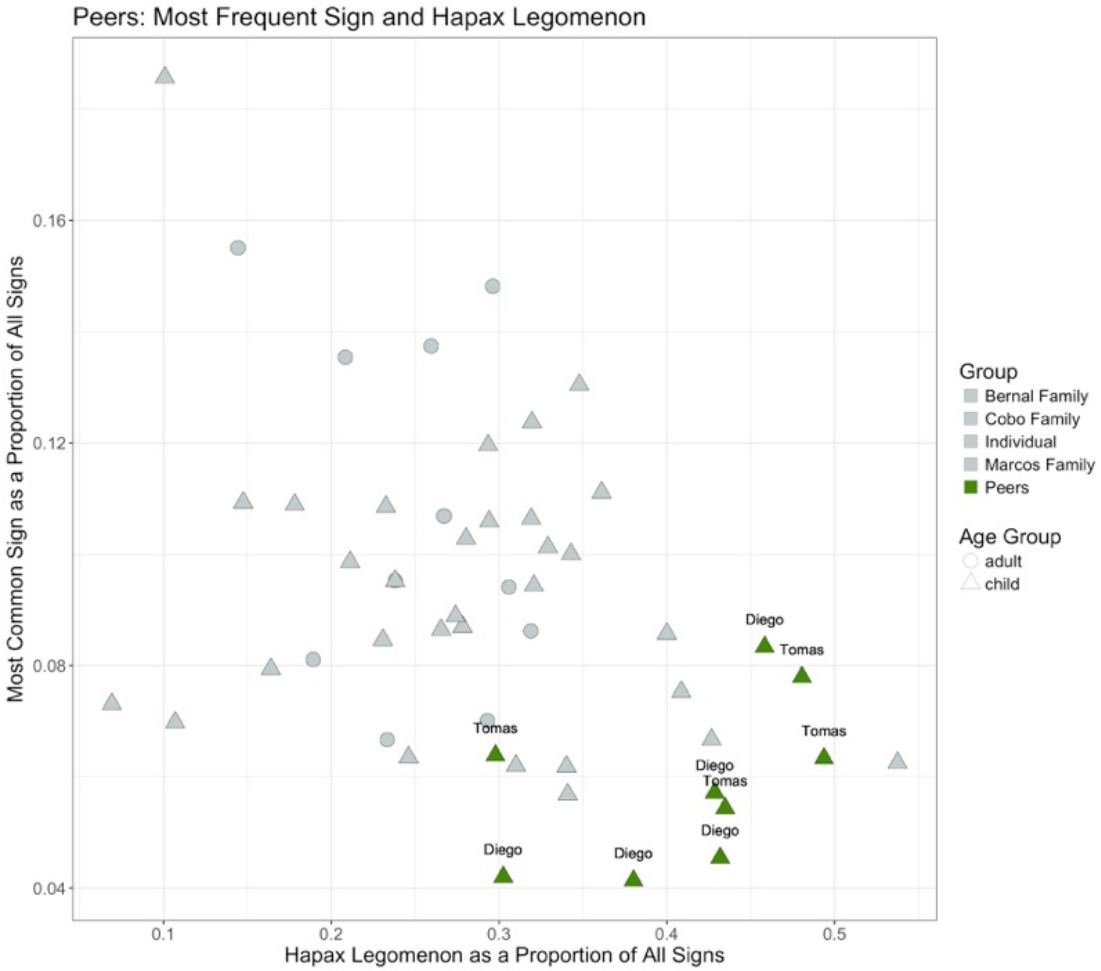

Figure 65. Plot of the hapax legomenon proportion (x axis) and most common sign proportion (y axis) for each session. Participants from the Peer group are highlighted, in green, and cluster tightly in the lower right third of the chart.

Diego (P) and Tomás, who attend school together, and are cousins, show a unique profile in terms of the hapax legomenon proportion and most common sign proportion. Both boys have a high hapax legomenon proportion and low most common sign proportion. As noted above, this is also a characteristic of the set of signs produced in sessions from Alejandro (I), an individual homesigner who did attend the school intermittently for one year, and Jose (P, F), who has attended the school regularly for at least five years.

All Groups, Clustering Analysis

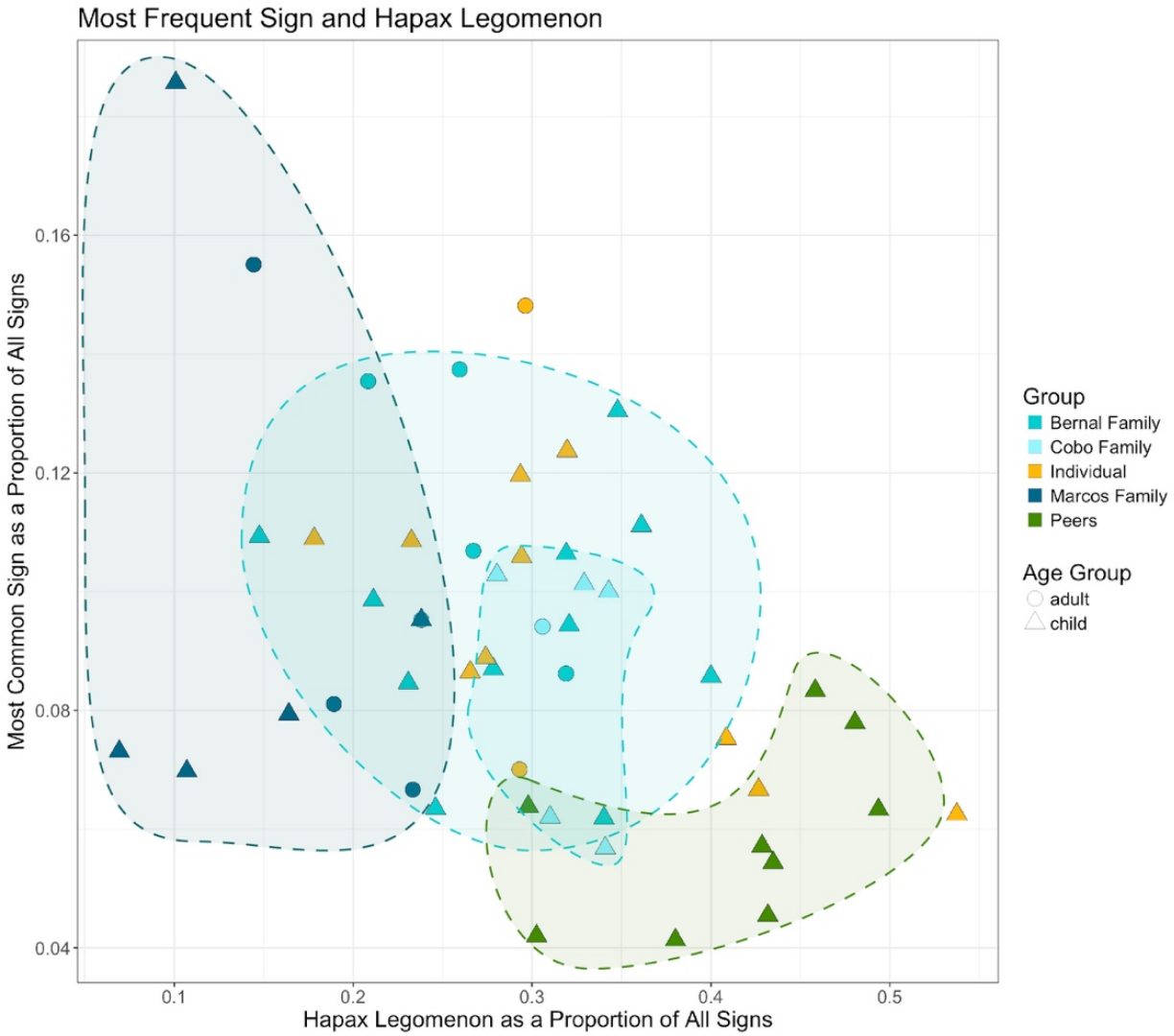

Figure 66. Clustering illustration showing five groups of signers. The Bernal family, in dark teal, clusters in the center of the distribution. The Cobo family, in light teal, also clusters in the center of the distribution, and is less dispersed than the Bernal family. The Marcos family, in dark blue, which clusters on the lower end of the distribution for the proportion of hapax signs and The EOEE peer group, in green, which clusters on the high end of the distribution for the proportion of hapax signs. The individual homesigners, shown in yellow, are widely dispersed.

When we consider all of the groups together, figure 66, above, we find that homesigner groups in contact tend to be clustered in terms of lexical richness. The Bernal and Cobo families have a moderate proportion of hapax signs, and a moderate proportion of signs comprised by the most

common sign form. The Cobo family, in particular, shows remarkable similarity in the profile of each signer's lexicon. The Marcos family, unlike the Bernal and Cobo families, has a lower proportion of hapax signs, but all of the participants in this family share this characteristic, despite being more variable in terms of the proportion of signs that consist of the most common or repeated form. The lexicons of signs from EOEE peer participants have the highest proportion of hapax signs, suggesting that interaction with a peer group, in an institutional setting outside the home, may facilitate the use of maximally informative hapax signs that refer to only one referent. The communicative ecology of the Bernal and Cobo families may support a balance of signs that are repeated across multiple referents, as well as hapax signs. Finally, the communicative ecology of the Marcos family does not seem to support the extensive use of hapax signs. It is possible that the high degree of shared context and common ground within the home supports the use of signs that are used for multiple items but are disambiguated, using that shared context. Lastly, I note that the individual homesigners are quite dispersed in terms of the dimensions of lexical richness explored here. Alejandro (I), however, who did attend the EOEE school intermittently for one year, clusters more with the peer EOEE signers. It is possible that even his minimal contact with the school affected properties of the set of signs that he produced on this elicitation task. It is also possible that some of these dimensions of lexical richness are driven by the amount of time that homesigners have spent in school, leading them to be more or less familiar with the demands of the task.

7.5 Discussion

This chapter offers an analysis of the sets of signs that homesigners and their hearing interlocutors produce in response to a lexical elicitation task. It includes several novel ways to think about the relationships between signer characteristics, referent characteristics and sign form characteristics. In particular, I find that some referents and some classes of referents have sign forms that are *immanent* (Green, 2014; Hanks, 1990) in daily routines and corporeal practices. These forms get recruited by all participants, or the majority of participants for these forms, and it seems less likely that convergence on these forms is driven by repeated interaction between two signers, or between a group of signers. In terms of convergence, I find immense diversity in the rate of sign form convergence between pairs of participants, but in general, participants in contact with each other are more likely to have a higher rate of convergence than participants who are not in contact. Participants from the Cobo family, which includes Jose and Juana, who are both deaf and both attend the EOEE school, as well as their younger brother and mother, have the highest rates of convergence with each other. They also share high rates of convergence with their relatives, the Bernal family, including Sara, Ramon, Lucia and Abel. This suggests that even intermittent contact (the two families see each other approximately once each month) may lead to higher levels of convergence, and even regular, daily contact may not lead to sign form convergence, as illustrated by the Marcos family. Rosa (F), her grandfather Pedro, and her mother Luisa are in almost daily contact, but they have the lowest levels of sign form convergence for signers who interact.

When we consider the results of studies 1 and 2 together, we find that it is not surprising that there is a substantial range of convergence, even for signers who are never in contact with each other. For many of the referents, it is possible that two signers will tend to produce the same

sign form, not because they are converging as a result of interaction, but because this form is commonly produced by many signers in the Nebaj community.

In the final study, I present a novel way to characterize the set of signs that signers produced, by examining properties of signs that occur only once in the set and signs that are repeated frequently in the set. When I consider these two dimensions for each signer's session, I find that each group of signers clusters relative to the proportion of hapax signs (signs produced only once) with some families evidencing a low proportion of hapax signs (Marcos family) and peer homesigners showing the highest proportion of hapax signs, as well as the most common sign, which occupies a significant proportion of the set for some family homesigners (the Marcos family) and a low proportion of the set for peer homesigners. Thus, properties of sets of signs are associated with the communicative ecology in which signers are participants.

Conclusion

> This suggests that engagement with the inner structural logic of a language and the particular discursive world it enables provides the leverage needed to transcend the immediate moment so as to re-envision reality, to rethink it, and ultimately to remake it… From this vantage point, linguistic relativity effects are not some unfortunate side effect of language development, but are rather its intended achievement as we recruit the inner face of our particular language structure to the shared task of reimagining the reality around us
>
> Lucy, 2010, pp. 282–283

Children learn the language in their environment with minimal visible effort and a lack of explicit instruction or guidance. This fact, in particular that children do not appear to require extraordinary interventions on the part of their parents, is surprising to adults from particular social and cultural environments, notably middle-class Western contexts. In other communities, the facts of language socialization and development may be less surprising or remarkable, but they nonetheless share the same outcome – most children become fluent speakers or signers of their native language and competent, if not accomplished, social actors.

The invisibility of the enormous scope of the task of language acquisition becomes visible when we are confronted with errors that children make, in the process of becoming proficient language users, and when we encounter a circumstance in which children do not have the same preconditions for language learning as their peers. This is the case for child homesigners. None of the child homesigners in this study are socially isolated, but they are insulated from language input. They cannot hear the languages spoken around them. All of the child homesigners in this study can see and access models for communicative interaction. They live in a community where children accompany parents almost everywhere and deaf and hearing children alike are perpetual observers of the social interactions taking place around them. The child homesigners I work with in Nebaj also live in a community where it is not uncommon for hearing and deaf people to interact, and where hearing people frequently make use of a large

inventory of conventional gestural emblems while speaking. Some of the child homesigner participants even have access to signed interactions and sign input, directed to them by an adult relative who is a deaf homesigner. This deaf adult has a lifetime of experience using their own homesign system, and negotiating interactions with hearing people in their family and community. A child homesigner who has a deaf adult relative enters a social world in which family members are already accustomed to signing with the deaf person who has been a member of the family for a lifetime. These children experience a socialization and language development process that is more similar to typical language development, with unhindered access to a type of linguistic input, but the input that they can access is not a language, it is a homesign system, and it lacks the protracted history of use of all spoken languages and many sign languages, as well as the diversity of speaker/signers and contexts of use of all spoken and many sign languages. Alternatively, some of the child homesigners in this study engage in regular social contact with other child homesigners who are their same-aged peers. They have these interactions at school, a less intimate context than home, and one occupied by a greater diversity of other interlocutors, routines and activities. All of the homesigners here have equivalent degrees of experience with their homesign systems, in terms of the time spent using the system. The interactions that occur at school likely take on a different character than the kinds of interactions that happen between a parent and child or even between siblings in the context of home, and there may be more variable social roles at play in the schoolyard than in the kitchen. Nonetheless, the homesigners at the school have significantly more interaction with other deaf homesigners, who use a homesign system as their primary means of communication, than homesigners who do not have a deaf relative, and homesigners who do not have social interactions with other homesigners. The

homesigner students can both participate and observe social interactions in which they have full access to the content and structure of medium of communication.

This project began with the prediction that these communicative practices and interactional patterns might have implications for the structural patterns of homesign systems developed by children embedded in these contexts. I start this conclusion with a summary of the findings from the second half of the thesis – these findings are based on a particular type of data, elicited by me, using standardized elicitation tools. I discuss the advantages and disadvantages of this methodological decision in chapter four, but here I note that one distinct opportunity afforded by this decision is my ability to compare signing from diverse participants under approximately similar conditions, within my own sample, and as a comparative sample with other established and young sign languages. Without this comparative aspect, it would be far more difficult to interpret the distributional patterns that characterize the homesign systems I document in this study.

In this section, I evaluate two predictions, laid out in detail in the introduction to the thesis:

(1) Different structural levels of organization (e.g., phonological, morphological) in child homesign systems will be related, particularly in terms of the order of emergence of structure
(2) The communicative ecology in which a homesigner is embedded will be associated with the structural/distributional properties of the homesign system they generate

Hypothesis 1: relationships between structural levels of organization in emergence

Based on the findings from the morphological[1] analysis and the phonological analysis, there is not a strong association between the handshape representation alternation, a morphological pattern in sign languages, and selected finger and joint configuration complexity, a morpho-phonological pattern found in sign languages. The majority of child homesigners (eight of ten) did produce a set of signs characterized by a similar distribution of more handling signs in descriptions of agentive events and more object signs in descriptions of non-agentive events, but very few child homesigners produced a set of signs characterized by the selected finger complexity pattern found for sign languages. The set of signs produced by homesigners from a peer ecology were slightly more likely to have the complexity distribution found in standard sign languages, but this pattern was inconsistent. In a recent overview of language emergence, focused on ABSL, Sandler makes several strong predictions about the order of emergence of different aspects of language (Sandler, 2017). Sandler predicts that lexical conventionalization must precede a phonological level of structure, characterized by duality of patterning (Hockett, 1960; Ladd, 2012), citing the documented absence of minimal pairs and strict formational rules in ABSL (Sandler, et al., 2011a). It is true that the phonological pattern (higher selected finger complexity) appears in fewer signers from this sample than the morphological distinction of agent (handling) and no-agent (object) handshape types; this supports the idea that phonology may not be the first component to emerge. However here we find the most widespread linguistic pattern to be the morphological pattern, rather than lexical conventionalization.

[1] I use the terms "morphological" and "phonological" as shorthand here, but I am agnostic, and lack adequate evidence, to demonstrate whether the units that were analyzed are discrete phonemes and/or morphemes

Sandler also cliams that lexical conventionalization only occurs in the context of prolonged, repeated interaction. The results from this study offer counter evidence to this claim. I find that contact between signers is neither a necessary nor a sufficient condition to guarantee lexical conventionalization or convergence between homesigners. Some referents have highly accessible, *immanent* forms, that are taken up by experienced and inexperienced hearing and deaf signers. The prevalence and distribution of these kinds of form-meaning pairs is likely particular to the place in which a sign system emerges, as well as the characteristics of the signers in a given sample. In Nebaj, for example, the sign for turkey has to do with breaking a turkey's neck or chopping its head off. In other communities, this is likely not the most salient characteristic or activity associated with turkeys. The larger claim here is that, based on the data I analyze here, lexical conventionalization is neither a straightforward nor a certain outcome for communities of signers.

Hypothesis 2: relationships between communicative ecology and distributional properties of homesign systems

Despite the absence of a clear relationship between the phonological and morphological components of the homesign systems under investigation here, I do find strong associations between communicative ecologies and properties of each homesigner's system. These include associations between ecology and the dispersion of handshapes, the distribution of handshape complexity, the rate of sign form convergence and the proportion of hapax and most frequent signs. The dispersion of handshapes in the set of signs produced by signers reflects the density of discernible units, handshapes, that are phonological in standard sign languages (Brentari, 1998; W. C. Stokoe, 1972, 1976). Individual homesigners and homesigners from peer ecologies have a higher density of unique handshapes than homesigners from family ecologies (Chapter 6, figures

32 and 33). This is driven primarily by the lower rate of signing from individual and peer homesigners. Family homesigners have a slightly larger inventory of unique handshapes, but their rate of signing is much higher on average than the homesigners from the other ecologies (rate of signing was measured as the total number of signs produced across two tasks).

In terms of selected finger complexity, there is a weak correlation between the size of a signer's inventory of signs and the proportion of higher complexity (SF) handshapes that they use. Homesigners from peer ecologies, however, tend to produce fewer high complexity handshapes, regardless of the size of their inventory (Chapter 6, figure 34). The tendency to use low complexity handshapes may be related to the types of social interactions that homesigners from peer ecologies typically have, particularly if there is a relationship between comprehensibility and selected finger complexity. A possibility that I will explore further in future analyses.

Communicative ecology is not associated with variable levels of sign form convergence (Chapter 7, figure 60). The Cobo family, which includes signers who are deaf siblings, have intermittent contact with their cousin, who is also deaf, and attend school regularly with deaf peers, has the highest levels of sign form convergence. The Marcos family, which includes Pedro, who is deaf, and his granddaughter Rosa (F), who is also deaf, has the lowest level of sign form convergence. This suggests that there is significant variation between particular ecologies, even within the same type of ecology.

Lastly, communicative ecologies are associated with certain properties that characterize the sets of signs produced in the lexical elicitation task, specifically the proportion of hapax signs, produced only once, and the most common sign form (see Chapter 7, figure 67). The sets of signs produced by homesigners from peer ecologies tend to have a high proportion of hapax

signs and a relatively infrequent most-common sign form. This suggests that there is a high tolerance for a one-to-one mapping between sign form and referent, and less pressure to use the same sign for multiple referents, to indicate a category, for example, in the peer ecology. The Bernal and Cobo families have a balance of hapax and most-common signs, and the Marcos family has a low proportion of hapax signs, indicating that the sets of signs they produce are characterized by fewer unique signs forms, repeated in descriptions of multiple referents. These signs may be less informative than the hapax signs that are more common in the sets produced by peer homesigners, but the intimacy of shared context may compensate for this lack of denotational specificity.

Homesign and the study of Language Development

> The acceptance of language both as syntax and as vocabulary is a realization that the world is already shaped by others who have lived in it before (Vygotsky 1962). The child's development of the principles of syntactic regularity is an immense cognitive task that the child undertakes in order to be a participating member of this common order… what is social about language socialization is the learning of language. The acceptance and, therefore, use by the child of the regulative principles and vocabulary that others use to express their comments and requests is an acceptance of a common shared view of the world. The perception and use of syntactic rules brings with it the understanding that the world of others that the child shares is governed by *normative* principles and that, in order to share the world known in common, the child must use these principles" (Cook-Gumperz 145).

In her description of the child, confronted with the normative principles of their native language, Cook-Gumperz (1975) highlights the experience that homesigners often lack. I am generally disinclined to characterize homesign as a lack of particular features of experience, or as solitary and isolated, but in this instance, this seems an appropriate claim to make. The homesigner does not encounter the suffocating, but enveloping, structure of an established, inherited (Saussure, 1986, p. 74) system, nor do they experience entry into a community of

speakers/signers who share their system. They are never forced to negotiate their personal system for communicating, and thinking, with the social system that exists in the context as language. This is the process that Vygotsky (1986, p. 94) considered critical to the development of certain ways of thinking; the internalization of the social becomes transformative for the child, who enters into a new understanding of the ways in which the world of their thoughts is a shared space, shared with the other speakers/signers of their language. While Vygotsky was interested in the significant, qualitative changes he associated with this internalization process, the absence of this process is critically associated with the homesigners sense of identity and social connection to others. Language is a tool for both self-expression and as a marker of identity, used for as an affiliative index and as a demarcation of individuality. For the homesigner who is never fully presented with the choice to affiliate or separate, their communicative exchanges are marked with continual negotiation and accommodation in terms of the shared common ground of conversation. Green notes that this is not universal, nor is it restricted to people who are deaf, but it remains that homesigners, especially homesigner children, likely have a very different sense of the "reciprocity" principle (Schutz 1974) – the notion that others are the same as oneself, and can be expected to understand in predictable, relatable ways.

In this dissertation, I have tried to describe the ways that characteristics of socialization typical to Nebaj may affect the child's early social experience. I emphasize that infants and young children are ever-present and participate in early social encounters, particularly since few parents in Nebaj are aware of their child's hearing status until they are age three or older. Additionally, I have observed a social expectation that homesigners, especially females, will be active contributors to the household, regardless of hearing status. Ideologies of learning that emphasize silent observation, as well as pedagogical strategies in the classroom that rely on

repetition and rote performance actually incorporate child homesigners, even if they may not promote complete comprehension. Thus, the child homesigner in Nebaj may be more socially integrated than child homesigners in other communities, but they also lack many of pathways for access to the social and academic world available to deaf children in other communities. I hope that this study contributes to our understanding of the immense diversity of child homesign systems, which are a testament to the human drive to connect, and to communicate. They are also a testament to the contribution of social context and ideologies about child language development and socialization in both typical and atypical language learning in childhood. I am unfailingly grateful to my participants for their willingness to connect, and to communicate, with me.

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Appendix A. Stimulus Items from Lexical Elicitation Task



pig
cat
turkey



dog
motorcycle
truck



bicycle
bus
tomatoes



limes
chilies
onions



hat
rocking chair
weaving



chair
paintbrush
pila



laundry
mug
man

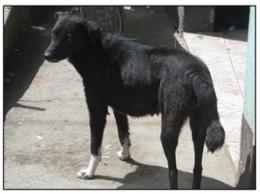


woman
flower
tree



grave
rocks
firewood





fence
firewood
dog



horse
pig
car



motorcycles
tuk-tuk
potatoes



pineapple
cabbage
cilantro



church
door
planks



blocks

plate

salt



chilies

tomato

huipil



soap

view

coffee beans



milpa

ladder

padlock



bowl

pot

eggs



chickens

tortillas

sheep



ball

axe

cathedral

Appendix B. Selected Finger Complexity Coding

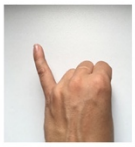
High Selected Finger Complexity
3 complexity points

M
Index, Middle, Ring

H
Index, Pinky

Medium Selected Finger Complexity
2 complexity points

U
Index, Middle, Ring



J
Pinky

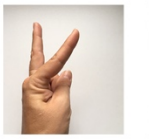
Low Selected Finger Complexity
1 complexity point

B
Index, Middle, Ring, Pinky

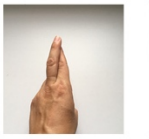
1
Index

Appendix C. Joint Configuration Complexity Coding

High Joint Configuration Complexity
3 complexity points



k
stacked



x
crossed

Medium Joint Configuration Complexity
2 complexity points

<
flat open

(
curved open (wide)

>
flat closed

o
curved closed

c
curved open (narrow)

[
bent

Low Joint Configuration Complexity
1 complexity point

/
fully extended

@
fully closed

Appendix D. Gestural Emblems from Nebaj

Some signs produced by participants resembled conventional gestures used by hearing Ixil speakers in Nebaj. The forms of conventional gestures were verified in at least two of three possible sources: an informal pilot study to collect emblems from hearing speakers of Ixil in the Nebaj community based on an emblem elicitation task described in (R. E. Johnson, 1991) (Horton, unpublished data), a dictionary of conventional gestures in Mexico and Latin America (Meo-Zilio & Mejía, 1980, 1983; Zilio, 1986), and a descriptive account of regional sign systems proposed by (Fox Tree, 2009). There were four conventional signs (ANIMAL, BIRD, EAT and DRINK) that were attested in at least two of three of these sources and that were also common in the productions from deaf homesigner participants in this study. They are illustrated in figure 1 and described in table 1 below.

Figure 1. Signs that have the same form as conventional gestures used by hearing people in Nebaj. These are the signs for ANIMAL, BIRD, DRINK and EAT. Top row: child homesigners producing conventional gestures from the hearing community during the lexical elicitation task. Bottom Row: Hearing speakers of Ixil producing conventional gestures during emblem elicitation task.

Table 1. Summary of Conventional Forms

Gloss	*Form*	*Attested Sources*
EAT	Loose B-Hand waved in front of signer's mouth	Survey of co-speech emblems of Ixil speakers in Nebaj (Horton, unpublished data); Meo-Zilio & Mejía (1980: p.79)
DRINK	Hand in fist with Thumb extended, raised and moved toward and away from signer's mouth	Survey of co-speech emblems of Ixil speakers in Nebaj (Horton, unpublished data); Meo-Zilio & Mejía (1980: p.52)
ANIMAL	B-hand, palm oriented to signer's midsagittal plane (several variants for placement and movement)	Survey of co-speech emblems of Ixil speakers in Nebaj (Horton, unpublished data); Fox Tree (2009, p. 335, 341); Meo-Zilio & Mejía (1983: p.54)
BIRD	Curved, spread B-hand, palm oriented down, held at mid-chest height. Second hand: curved, spread B-hand, palm oriented up, held below the dominant hand.	Survey of co-speech emblems of Ixil speakers in Nebaj (Horton, unpublished data); Fox Tree (2009, p. 356[1])

While the conventional gestures for EAT and DRINK were easily elicited from hearing speakers of Ixil, the gesture for ANIMAL was not produced spontaneously by some of the hearing participants when they completed the emblem elicitation task, based on Johnson, Ekman & Friesen (1975). Conventional gestures need not be iconic, but many forms do resemble some component of their referent. For example, the conventional gesture glossed as DRINK represents a cup, or a hand holding a cup, bringing a drink to the mouth (see figure 55). Conventional gesture forms may be less likely to encode particular distinctions between objects. For example, the same conventional

[1] Fox Tree describes a form that is similar to the form elicited for bird from multiple deaf signers and hearing Ixil speakers. The form that is illustrated in Fox Tree, however, represents the palm of the dominant hand facing outward, away from the signer's body. He reports that in Nahualá (Western Guatemala) this form is used to refer to infants, while in Chiapas it refers to corn/maize ears.

EAT gesture was produced by some participants as a description for elicitation photos of both chilies and potatoes, which are notably different in size and shape, how they are processed and consumed, but both are things that can be eaten.

Appendix E. Extended Results, Chapter 5, Study 3