5-11-2013

Degrees of Rootedness in Acquisition of Language: A Look at Universal Grammar in Homesigners and Late Learners of Libras

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The primary goal of this dissertation is to investigate the relationship between Universal Grammar and the properties that Universal Grammar constrains, by investigating how language is created/acquired. We examine the strength of ‘rootedness’ with respect to universal properties and parameters, i.e. the relationship between the degrees of external input provided to the child and the degrees of guidance provided to the child innately through UG. The framework proposed in this dissertation provides us with tools for predicting what will and will not appear in linguistic systems of homesigners, late learners of a first language, and native signers/speakers of a given language. New data presented from the spontaneous production and experimental studies of Brazilian homesigners, late learners and native signers of Libras (Brazilian signed language) supports the proposal with regards to the strength of rootedness of recursion, merge, hierarchical structural dependency, word order, and topic.

If a particular property of language is ‘strongly rooted’, this indicates a high degree of innately specified guidance specifically for language development. Also, there are some properties that are constrained by UG, but with possible options, which are considered ‘somewhat rooted’ in my framework. These are expected to evince variability in their acquisition with input from a mature, established language or in their creation with self-
generated input. In this dissertation, there are three experimental studies, plus an in-depth analysis of each homesigner’s spontaneous production to test the hypotheses described above. The studies described in this thesis test these hypotheses using elicited production, spontaneous production, and comprehension involving aspects of language, which fall into the categories of ‘strongly rooted’ and ‘somewhat rooted’ properties. The findings provide support for merge, recursion, and hierarchical structural dependency as ‘strongly rooted’ properties since all of the homesigners, late learners and native signers of Libras were able to present evidence of these in their linguistic systems. ‘Somewhat rooted’ properties, in the form of word order and topic, were also supported by the findings from the experiments with the participants. The proposed framework in this thesis sets the stage for future hypothesis-driven research on language development and language creation.
Degrees of Rootedness in Acquisition of Language: A Look at Universal Grammar in Homesigners and Late Learners of Libras

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A Dissertation
Submitted in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy
at the
University of Connecticut

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APPROVAL PAGE

Doctor of Philosophy Dissertation

Degrees of Rootedness in Acquisition of Language: A Look at Universal Grammar in Homesigners and Late Learners of Libras

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2013
Acknowledgements

This dissertation was a long time in the making and it would not have been completed, if not for all the support, encouragement, and assistance from my professors, fellow students, friends, and family.

All of my professors at University of Connecticut were there to teach us the solid basics of theory and scientific inquiry, how to grow as a linguist, and as a person. I am grateful to Howard Lasnik and Željko Bošković for the incredible job they did in teaching syntactic theory the first year and nurturing that spark thereafter. Andreas Calabrese, Jonathan Bobaljik, and Susanne Wurbrand were also instrumental in my growth as a linguistics student. William Snyder was amazing in his patience and steady encouragement, sharing generously his knowledge of theory and research in acquisition of language. As a colleague and one of my committee professors, Marie Coppola provided so much encouragement and support and shared her knowledge of homesign research while I was writing my dissertation. Also, I must thank Ronice Müller de Quadros from the Universidade Federal de Santa Catarina for being on my committee and helping me with my data collection in Brazil while I met with homesigners, late learners and native signers of Libras. She was always very encouraging and always had good points for me to consider in my dissertation.

Most of all, I must express my most profound appreciation for the fantastic teaching, mentorship, and guidance that Diane Lillo-Martin provided for me as my advisor and mentor. She was amazing in her ability to explain and discuss syntax, language acquisition, and ASL linguistics. I was so fortunate to have an advisor with whom I could communicate fluently in ASL and who was very sensitive to the issues of a Deaf graduate student in a top-notch graduate program. She constantly encouraged and pushed me to do my best and was always willing to
answer my questions and discuss different ideas. Any student who has her for an advisor is very lucky. Thank you, Diane, for believing in me and helping me arrive at this level.

Along with the professors at University of Connecticut, I also received a lot of support and friendship from my fellow students: Simona Herdan, Serkan Şener, and Duk-Ho An. We were a small class but we stuck it out and made it! I must also express appreciation for the help and encouragement from some of the other students: Debbie Chen-Pichler (You were the first to welcome me to UConn. Remember all the talks we had- wonderful support and encouragement!), Luisa Marti Martínez (I would not have made it through semantics without your help!), Jeff Bernath (Thank you for all the ‘tech’ help with the Mac!), Klaus Abels, Tsuyoshi Sawada, Bosook Kang, Sarah Felber, Jean Crawford, Inkie Chung, Miguel Rodríguez-Mondoñedo, Ana Bastos Gee, Cynthia Zocca DeRoma, Nilufer Gultekin Şener, and Elena Koulidobrova.

The journey for my Ph.D. all started in 1994 when I met Ronnie Wilbur and became her undergraduate/graduate student and was provided with a strong foundation in American Sign Language linguistics at Purdue University. Ronnie nurtured and supported my aspirations to complete my doctorate. My gratitude goes out to her for seeing something in me worth nurturing and helping me start out my life in linguistics. I also had the good fortune to have Diane Brentari and Elena Benedicto as my professors at Purdue University. Both Ronnie and Elena were very patient and supportive while waiting for me to realize that I really did like syntax after all!

I could not have done this without the generous support and encouragement from my own Deaf community. Two people who always knew exactly what I was going through and always rallied my spirits when I needed it with a good dose of food, humor, and ASL: Gaurav Mathur and Doreen Simons. Thank you so much for being there! You guys rock! These two weren’t the only ones who supported me: Christian Rathmann, Rivka Hozinsky, Laura Smith,
Karen Millsap, Frank Bechter, Rocco DeVito, Susi Wilbur, Christopher Krentz, Laurie Shaffer, Sherry Powell, Kimberly Hale, and many others. So many Deaf people came up to me telling me I had to finish the dissertation because it wasn’t just “my dissertation” but theirs too. I am so humbled and glad they believed in me that much and showed it in so many different ways.

I am also profoundly grateful to all of the homesigners, late learners of Libras, and native signers of Libras, i.e. the participants in my study, who patiently allowed me to test ideas and look for syntactic structure in their grammar for my dissertation, because they knew this was “important for other people to recognize and learn about”. One special person who helped me with guiding me through the maze of the favelas in Florianapolis, a very long bus drive to Rio de Janieros, and acting as a Deaf interpreter for Libras/ASL back and forth so I could find people to participate in my studies is Ana-Regina Campellos. I could not have done this without you at all- Many thanks to you!

Finally, I would like to say thank you to my family, especially my mother- Carol Wood. She nurtured my love of language and desire to understand “how language works” from an early age with constant support and enthusiasm. I seriously doubt I would be here if it were not for her love and patience all those years. She’s been my biggest fan and cheerleader ever since I started graduate school. My husband, John Kang, and my two children, Nick and Joni Hall were very patient (most of the time!) and they know how much work, blood, sweat, and tears went into this dissertation. Thank you for your love and encouragement! Also, I must thank the Divine Light within all of us for teaching me that it’s not just about the destination, but the journey, shaping me, as a person and scholar, from all the teachers and people I have met along the way.
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1.1 Goal

The goal of this dissertation is to investigate the relationship between degrees of external linguistic input provided to the child and the degrees of guidance provided to the child innately by Universal Grammar (UG) for acquisition of language. I also provide a conceptual framework in which I propose that there are ‘degrees of rootedness’ corresponding to particular properties of language. Moreover, how well the child will acquire that property of language with impoverished or late input is predicted based on the strength of its ‘rootedness’.

Several areas of research examine the acquisition/development issue with respect to impoverished or late input such as creolization, unbalanced bilingualism, late learners of a first language, and homesigners (deaf signers who develop a gestural system with no or minimal input). This dissertation focuses on data from late learners of a sign language as a first language and from homesigners because these two cases illustrate more extreme degrees of impoverishment with respect to environmental/linguistic input.

Research findings with these two groups have provided evidence of certain linguistic properties appearing in their linguistic system, but no research has yet connected acquisition of these properties to components of UG. It is well attested that the earlier a child learns his language, the more native-like the child is in their acquisition; also, the later the child receives linguistic exposure to the target language, the likelihood of the child obtaining native-like proficiency in that language decreases (Johnson and Newport 1989; Newport 1990; Mayberry
1993; Mayberry & Lock 2003; Berk 2003; Berk & Lillo-Martin 2004; Boudreault & Mayberry 2006). So, one question that comes to mind is what kind of guidance does UG provide for the acquisition/development of a particular property of language in these circumstances? Can we predict which properties will occur in the linguistic development of a late learner or homesigner and to what extent these properties are universal? The framework, based on ‘degrees of rootedness’ that I propose in this thesis provides a testable prediction of which properties of language will appear in homesigned systems and late learners. Also, this framework predicts which will not appear and which will show variable results in their acquisition/development.

In this introductory chapter, I review some research relating to impoverished input with regard to late learners of a first language (more specifically, signed language) and homesigners. The age of exposure and type of input received as crucial factors in the acquisition of a full-fledged language are discussed in Sections 1.2 and 1.3. Some background on Universal Grammar is given in Sections 1.4 and 1.5, which provides the foundation for Section 1.6 where the concept of ‘rootedness’ is introduced as a means for answering the questions raised above. We will also see how ‘degrees of rootedness’ can provide a mechanism for predicting acquisition of particular properties of language that has not yet been provided by previous research. Section 1.8 will discuss the participants and the general methodology in the four studies in which experimental data was collected to bear on these predictions, and the outline of the dissertation is presented in 1.9.

1.2 Previous research: Impoverished input

We first review some literature which examine the issue of impoverished input found for children with atypical acquisition of language, i.e. late learners of a first language, second language learners, and homesigners. One area of research involving atypical acquisition of
language looks at how Deaf children acquire language, since most Deaf children experience some degree of impoverished or delayed acquisition of a first language. Deaf children with hearing parents tend to have a little or some exposure to the spoken or written language before learning sign language, often before they enter a school or a program for Deaf children. (Mayberry 2003, 2010). However, that does not always mean they achieve native-like proficiency in the spoken/written language. They often do not achieve linguistic competence until they start learning sign language, which then becomes their primary language, i.e. they are late learners of a first language. These children experience a gap in their input that is quite different from children learning a second language or Deaf children of Deaf parents. Therefore, it is crucial to consider what level of mastery they can attain and which properties of language will be attained due to innate constraints.

Late learners of a first signed language are typically Deaf children who have impoverished input, i.e. incomplete access, to the spoken language and they typically do not have access to a signed language until they enter a school for the Deaf at the age of five or older (Berk 2003, 2004; Lillo-Martin and Berk 2003; Boudreault and Mayberry 2006, Newport 1990, Mayberry 1993, 1994). Although these late learners exhibit grammatical deficiencies in their grammar, they do learn much of the signed language, even well past the age of puberty.

Approximately ninety-five percent of deaf children are born with hearing parents who most often do not know ASL and expect their children to learn English orally (Mitchell and Karchmer 2004). Sometimes, the parents provide linguistic input with sign language, though it may not always be ASL, but some other form of signed communication system such as Pidgin Signed English, Signed Exact English, or Manually Coded English, which are not naturally

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1 It is widely assumed in the literature and in the Deaf community that ninety percent of Deaf people have hearing parents, but Mitchell and Karchmer (2004) revise the figure to ninety-five percent.
occurring languages, but were invented as pedagogical tools (Erting 1988; Bochner and Albertini 1998; Supalla 1991) and have properties that are apparently unlearnable by Deaf children (Supalla 1991; Schick and Moeller 1992). Many of these deaf children experience a serious lack of linguistic input until the age of five years old or older, when the parents realize that learning English orally is not proving effective and send them to a school for the Deaf, which is often where they first become exposed to ASL. Children of hearing parents frequently create their own gestural system in the absence of linguistic input, i.e. they use “home signs” (Tervoort 1961; Goldin-Meadow & Feldman 1977; Feldman, Goldin-Meadow & Gleitman 1978; Padden & Humphries 1988; Morford 1996). In some cases, homesigners are not exposed to a conventional sign system and continue using their gestural system as a primary means of communication as adults (Coppola 2002). We will discuss more about homesigners in section 1.3 as these individuals are one of the populations of the study presented later in this dissertation.

Another area of impoverished input that is of interest to our discussion is exemplified by a classic study involving a Deaf child with Deaf parents, i.e. the Singleton (1989) study with ‘Simon’ (also discussed in Singleton and Newport 2004). Typically Deaf children of Deaf parents do not experience the same degree of impoverished input, but are akin to hearing children with hearing parents in their acquisition of language (Newport and Meier 1985; Lillo-Martin 1999). However, Simon learned ASL from Deaf parents who were themselves late learners of ASL, and therefore provided an imperfect model. In this case, Simon was able to surpass his parents in his mastery of ASL, in areas that second language learners have difficulty with. Unlike most Deaf children with impoverished input, Simon had access to ASL from birth,
so even though his input was not perfect, he acquired the grammatical structure of ASL quite well².

Cases of late learners of a first language lead us to discussion of the hypothesis that there is a critical period for acquiring language. In such cases, there are questions about how much of the language late learners are able to acquire and why particular aspects of language are more readily learned than others. That is, is there a critical period of language acquisition that constrains the late learner’s ability to acquire (signed) language fluently or at near-native levels?

1.2.1 Critical period hypothesis

The premise of the critical period hypothesis by Lenneberg (1964, 1967) and Newport (1990, 1991), among others, is that to achieve a native level of fluency language must be acquired before the onset of some specific age, which may be puberty or much earlier. If the child has not acquired the language by then, their fluency will be markedly decreased, i.e. never at the native level. That is, the acquisition of language is correlated with the maturational constraints imposed by the “plasticity of the brain”.

There are different formulations of the critical period hypothesis but all assume that there is a critical period or sensitive period during which input for learning language is crucial in order to achieve native competency³. Outside of this critical period, success is less assured and more variable (Bialystok and Hakuta 1999). Two types of acquisitional evidence for the critical period hypothesis have been studied over the past twenty years. One set of studies focuses on those who

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² We will discuss Simon’s case further in more detail in section 3.0 since this is also relevant to our discussion regarding the ‘poverty of stimulus’. The point here is to illustrate studies that briefly highlight different types of impoverished input with Deaf children.
³ Some use ‘sensitive period’ which refers to a model of acquisition that assumes acquisition is still somewhat possible even after this period, with a gradual decline in success rather than a sharp distinction. However, there are also other associations with this terminology used regarding the influence of outside stimuli on the organism even after the age of puberty (Kelley 1992). See Eubanks and Gregg (1999) and Newport (1991) for a deeper discussion of the critical period hypothesis. For ease of exposition during this chapter, I will not make a distinction between a critical period and a sensitive period (as proposed by Eubank and Gregg 1999), but collapse the two under the critical period hypothesis.
experienced an extended delay in their exposure to their first language, i.e. Deaf children, who often do not enter school until the age of approximately five years old and then become exposed to ASL. Moreover, many Deaf people do not learn ASL until even later, perhaps well after puberty; and they often have achieved varying degrees of fluency with English before ASL exposure begins (Newport 1990, Newport and Supalla 1990; Mayberry 1993, 1994, among others). This is discussed further in the following section. Another set of studies (discussed in section 2.2.2) focuses on acquisition of a second language, either as young child or well after puberty; immigrants or foreign students who move to the US figure prominently in these (Johnson and Newport 1989; White and Genesee 1996; Birdsong and Molis 2001, among others). Both areas of study look at the strength of the critical period using situations of delayed input, but one is as a delayed first language and the other is as a second language.

1.2.2 Age of Exposure and input
1.2.2.1 Late learners of a first language

Research shows that Deaf children of Deaf parents who are fluent signers acquire ASL as a native language, in the same manner as hearing children do with their languages (Newport and Meier 1985; Lillo-Martin 1999). Their milestones are passed at approximately the same ages and they go through the same stages as hearing children. Those who learn ASL as a late first language have difficulty mastering many aspects of the language, although they are sufficiently fluent to fully communicate with others in the Deaf community. Research focusing on this group compared with those who achieve native-like mastery of their first language shows evidence for a critical period of acquisition even if the participants have used that language for a considerable period of time.
Newport (1990 and other works) tested three groups of Deaf adults (ages 40-50 years): those who acquired American Sign Language (ASL) as native signers⁴; early learners, who learned ASL beginning at the age of 4 to 6 years; and late learners, who acquired ASL after the age of twelve. The tests involved a series of tasks on the production and comprehension of complex morphology (verb agreement and verbs of motion), among others. Compared to the native signers, the early learners had a significant decrease in accuracy on the tasks, even though they all had been using ASL for a minimum of thirty years, and some well over forty years. Those who acquired ASL after the age of twelve presented even less accuracy on the same tasks. On these tasks there was a correlation of -.6 to -.7 between age of acquisition (AoA) and the test score. However, AoA was not a factor on all the tasks. On a test involving basic word order, all three groups had an accuracy of 95% or better. Newport argues that this provides strong evidence for a maturational account of the critical period hypothesis in which AoA is a factor for acquisition of certain aspects of language.

Boudreault and Mayberry (2006) also found that adults who were late learners of American Sign Language (ASL) showed a significant decrease in mastery of various sentence-types (simple, negative, agreement, *wh*-question, relative clause and classifier sentences), which correlated with the age of exposure to ASL. They tested three groups of Deaf adults (ages 18-79 years): those who acquired ASL as native signers (ages 18-41); early learners (ages 31-62), who learned ASL at the age of 5 to 7 years; and delayed late learners (ages 24-79), who acquired ASL between the ages of 8 and 13 years. Signed stimuli with grammatical and ungrammatical counterparts of a particular syntactic construction were presented to the participants. The early late learners and the delayed late learners of ASL made significantly more errors on

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⁴ That is, they have had exposure to ASL since birth from Deaf parents who use ASL as their primary or first language.
ungrammatical constructions than on grammatical constructions, except for negative sentences and classifier sentences. Negative sentences were comprehended most accurately and relative clauses were comprehended the least accurately. The more pronounced the delay of exposure, the less accurate the signers were. That is, syntactic knowledge of the target language is affected by the length of delay for the acquisition of that language as a first language. Unlike Newport (1990), Boudreault and Mayberry also found that basic word order was problematic for the late learners, especially without any non-linguistic cues to assist them, such as pictures accompanied by a signed syntactic construction illustrating the picture with the subject and object in either grammatical or ungrammatical positions. Hence, a significant effect of AoA was found for the early late learners and even more so for the delayed late learners in their acquisition of ASL syntax.

Other studies done by Berk (2003, 2004) and Lillo-Martin and Berk (2003) investigate acquisition of a particular syntactic construction, verb agreement in ASL, by two Deaf children, MEI and CAL, who were initially exposed to ASL as a first language at the age of approximately six years old. The two children were studied longitudinally and their use of ASL verb agreement was studied intensively. They made a significant amount of errors with verb agreement, compared with a two-year old ASL Deaf native signer, and even over time, these errors did not decrease. As in the Newport (1990) study, the children showed near-native fluency with the basic SVO word order for ASL and were approximately at the same stage as the two-year old Deaf native signer with respect to word order and other factors (Berk & Lillo-Martin 2012). However, unlike the native signer, their production of derived word orders, such as topicalization, was limited and prone to errors.
Late first language learners of ASL also show processing limitations much greater than that of native signers (Mayberry and Eichen 1991; Mayberry 1993, 1994; Emmorey et al. 1995; Morford 2003). For example, Emmorey et al. (1995) conducted both on-line and off-line tests with native, early, and late learners. In the off-line grammaticality judgment task, all three groups were equally able to detect grammatical errors in verb agreement and temporal aspect. However, only the native signers were sensitive to the verb agreement errors in on-line tasks. Mayberry and Eichen (1991) found that age of acquisition was significantly related to performance on a sentence recall task, concluding that lexical processing is affected by delayed exposure. Mayberry (1993, 1994) also showed that such effects are specifically associated with late first language exposure, as participants who learned ASL at the same age, but as a second language, performed better than the late first language learners.

1.2.2.2 Late learners of a second language

In a classic study done by Johnson and Newport (1989), a group of Chinese and Korean learners of English show an effect of AoA in which the age of arrival correlated with decreased performance on a grammaticality judgment task. The older the student was upon arrival, the worse their score was on the task. Furthermore, Johnson and Newport argue for a ‘maturational’ account of acquisition based on finding significant correlation between young age of acquisition and performance. They found a -.87 correlation for those who arrived before puberty and a -.16 correlation for those who arrived after puberty. In other words, if the student/learner acquires language (either as a first or second language) during an early stage of the maturational period, they perform significantly better than those who acquire language at a later stage.

However, critical period effects have been shown to be more sensitive for first language learners than for second language learners. In a seminal study of critical period effects, two
groups of ASL language learners were studied (Mayberry 1993). Both groups were Deaf, but one group consisted of adults who were born hearing and became Deaf between the ages of 9-13 years old, whereupon they started learning ASL as a second language. The other group consisted of adults who were born Deaf and learned ASL as a late first language between the ages of 9-13 years old. The participants were required to recall complex ASL structures. The ASL as a second language group did much better on the recall task (82%) than the late learners of ASL (43%). Moreover, AoA had a significant effect on the performances of the late learners of ASL. That is, the older the participant when acquiring ASL, the worse the performance on the task.

Mayberry and Lock (2003) followed up with a more detailed study involving 54 adults consisting of four groups: Normal Control (NC)- 14 hearing, native speakers of English, 13 hearing non-native speakers of English who acquired English early (Early Spoken Language), 14 Deaf native signers of ASL (Early Signed Language), and 13 Deaf non-native signers of ASL (No-Early Signed Language). All were given tasks relating to grammatical judgment and comprehension testing their knowledge of selected English structures. In the grammatical judgment tasks, the NC group had the highest accuracy with an error rate of 5%. Both the Early Sign and Early Spoken groups had an error rate of 14%. The No-Early group showed a significant decrease in accuracy with an error rate of 34%. In the comprehension tasks (consisting of matching sentences with pictures), there were no significant differences between the NC, Early Sign, and Early Spoken groups, with an accuracy rate above 94%. The No-Early group performed worse with an accuracy rate of 74% and showed a significant decline in accuracy with passive and relative clause structures. Mayberry and Lock concluded that “timely first-language acquisition is necessary, but not sufficient, for the successful outcome of second language learning”. That is, the effects of AoA of a first language versus that of a second
language show that early language exposure is needed in order to acquire a second language later and if there is no early language exposure, i.e. exposure to language is late, it is difficult to learn language, especially as a late first language, let alone as a second language.

However, several studies have tested the maturational hypothesis with second language learners and their results do not support this hypothesis (Bialystok and Hakuta 1999; Birdsong 1992; Flege et al. 1999, among others). In a replication of the Johnson and Newport (1989) study, Birdsong and Molis (2001) found a negative correlation with the acquisition of a second language and the age of acquisition, but primarily with those who learned the second language well after puberty, extending some support for Johnson and Newport’s maturational account. Their study involved 61 native speakers of Spanish, with 29 participants who learned English as a second language grouped according to three different AoA: 3-7 years old, 8-10 years old, and 11-16 years old (Early Arrivals), and with 32 participants who learned English after 17 years of age (Late Arrivals). The results for the Early Arrivals did not significantly correlate with decreased accuracy, but the results for the Late Arrivals showed a strong effect of AoA.

Birdsong and Molis state the following three putative arguments for the maturational hypothesis for the limits on how well L2 acquisition is attained: (1) there should be a negative correlation between the increase in AoA and the performance results and this should be apparent before puberty; (2) there should be few instances of any native-like competence during this period of acquisition, that is, if the L2 learners showed native-like competence, this would suggest innate constraints in effect; and (3) the results should apply regardless of when the second language was learned. As noted earlier, the first argument did not hold true for the Early Arrivals- there was no significant differences between the three different age groups in the Early Arrivals, but there was a significant AoA effect observed for the Late Arrivals. Moreover, they
show that the second argument may not be as robust as previously thought. They had one participant (in the Late Arrival group) who was native-like in competence, answering all of the items correctly as the native speakers did. Moreover, there were thirteen Late Arrival participants who had scores of 92% of accuracy on the test items. Birdsong and Molis state there appears to be “modest evidence” that near-native or native-like competence is possible for late learners.

As noted earlier, critical period effects appear to behave differently for those learning a late first language and those learning a second language. Even though, there are ‘maturational’ changes for second language learners, the critical period effects are much more severe for those learning a late first language. As noted earlier in this paper, Deaf children frequently learn ASL as a late first language rather than as a second language, as 95% of Deaf children have hearing parents (Mayberry 1993, 1994, among others). So, we would expect to see more severe AoA effects with this group. Even so, even the very late first-language learners are able to learn ASL (without any formal instruction) and achieve some degree of fluency (Newport and Supalla 1987 discussed in Johnson and Newport 1989). They can master some aspects of grammatical constructions and morphology but will not exhibit the same level of competence as a native-signer.

So, now we start to consider more fully the question regarding which grammatical constructions show AoA for only late first learners and which show effects for both late first learners and second language learners. If all grammatical constructions are innately constrained, we expect them to be acquired regardless of their AoA. We have seen that this is not the case in

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5 In fact, there is a vigorous debate among second language researchers as to whether there are actually critical period effects for second language learners. Since this is beyond the scope of this paper, see Birdsong and Molis (2001) for a more detailed discussion regarding evidence against critical period age effects for second language learners.
the studies above because certain grammatical phenomena such as word order seem to be acquired with relative ease and others such as verb agreement are not. Another possibility is that certain grammatical phenomena, being language-specific, are not innately constrained. It may be that the relevant critical period for these grammatical phenomena lies well before puberty (that is, AoA is relevant for their acquisition) and must be learned by the child with sufficient input at an early age. The relationship between AoA and innately constrained grammatical constructions relates to the premise of ‘rootedness’ of Universal Grammar, which I will discuss in section 4.0.6

Up to this point, we have discussed studies involving impoverished input for early late learners, delayed late learners, and second language learners, which all point towards a critical period for language acquisition and some type of constraint in acquiring certain grammatical phenomena. These groups all have access to either a spoken or signed language at some point in their acquisition. What happens when a Deaf child does not come into contact with a spoken/signed language? Do they create their own linguistic system and, if so, which elements of language, i.e. grammatical phenomena, are evident in their system?

1.3 Homesigners

One way to investigate extremely impoverished input, i.e. with no spoken or signed input, is to look at homesigners - Deaf people who are born into a hearing family and do not receive any or very little linguistic input and therefore develop their own linguistic system based on their own formulations of gestures or signs (Goldin-Meadow 2003; Coppola 2002; Kegl 1994; Kegl, Senghas, and Coppola 1999). Previous research on homesigners indicates that certain properties of language appear even without input (Goldin-Meadow 2003; Coppola 2002;

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6 Although my data will not cover second language learners, my proposal in section 4.0 regarding ‘rootedness’ could apply as well to this group of language learners with respect to predicting which grammatical constructions would be acquired earlier/later in their acquisition of the second language.
Coppola and Newport 2005). Different groups of young homesigners show similar properties in their systems, even across cultures as distinct as American and Chinese (e.g., Goldin-Meadow and Mylander 1998).

Goldin-Meadow (2003) studied ten young Deaf children of hearing parents, ranging in age from 1;4 to 4;1. One homesigner, ‘David’, created the most extensive gestural system, having the most number of utterances compared to the other children in the study. David produced in his gestural system evidence of certain properties of language, i.e. lexicon, word order, and recursion, among others. He produced 190 different gestures, but out of these, eighty-one were used only once. In the remaining 109 gestures, David rarely changed the form of the gesture. These gestures could be combined with other gestures to create a new gesture. Each gesture token is associated with a particular meaning. He also had noun-verb pairs, in which both share the same root handshape and lexical relationship, as in JAR, TWIST-OPEN, but are signed in a way to delineate the two. That is, the noun is signed once and the verb is repeated twice. This is also seen in ASL but in the other direction, i.e. the noun is produced with a repeating motion and the verb is produced with a single motion (Supalla and Newport, 1978).

Goldin-Meadow studied the word order pattern in David’s and the other homesigners’ gestural systems and found a systemic pattern for intransitive actors and patients, i.e. PATIENT-ACT and Intransitive ACTOR-ACT. The homesigners exhibited a preference for the action gesture (‘verb’) to be in the sentence-final position. Goldin-Meadow argues that recursion is found in their gestural system via what she calls ‘complex’ sentences in which there is more than one proposition in one sentence. All of the homesigners produced instances of complex sentences. For instance, David signs CLAP-David-TWIST-BLOW-Mother, meaning that he wants his mother to open the jar and blow a bubble for him to clap.
Moreover, there are deaf adults who were never exposed to a language, or experienced exposure at a very late age, in their 40s and 50s. Studies with Nicaraguan homesigners have produced evidence of ‘subject’ as a grammatical category, differentiated from ‘topic’ (Coppola and Newport 2005); a possible spatial grammar including spatial verbs and location (Senghas and Coppola 2001; Senghas 2003); and a lexicon that is created by the homesigner (Richie et al 2012).

Coppola and Newport (2005) studied three adult homesigners, ages 15, 19, and 24 at the time of the most recent analyses, with respect to the grammatical category SUBJECT, using elicited production tasks in which the participant signs a description of events depicted in a series of pictures. Each of the homesigners consistently used the same word order to indicate the subject of the utterance, regardless of its semantic role as Agent, Patient, or Experiencer. In another experiment, they were also able to differentiate between the subject and the topic in their productions.

Nicaraguan signers, who formed the first and second cohort at a center for special education in Managua the first Deaf school in Nicaragua, were studied by Senghas and Coppola (2001) and Senghas (2003) with respect to evidence of spatial grammar. The first cohort had no previous experience with any signed language and used homesigns with their communicative partners in their homes. However, once they began interaction with one another in the context of the center for special education, they formed an interlanguage. The second cohort, or wave of children, to enter the school was exposed to this interlanguage and changed it in the process of acquiring it. Spatial grammar involves depicting a relationship between one person and another. For instance, an event in which a man taps a woman could be depicted from the signer’s perspective, i.e. where the man and woman actually are located in the space in front of the signer.
(what they call ‘unrotated’) or it could be from the “man’s perspective” (‘rotated’). The first cohort used both possible spatial modulations and were inconsistent in their use of one over the other. The second cohort consistently used the rotated perspective in their spatial grammar.

Richie et al. (2012) looked at seven homesigners, ranging in age from 11 to 33 years old, and studied the lexicon that is ‘shared’ with their communication partners, i.e. their relatives or friends. The question addressed by this study was did both the homesigner and his/her communication partner consistently use the same form for the same object. The researchers showed the participants pictures of everyday objects such as ‘orange’, ‘cow’, ‘potato’ and asked them to produce a gesture for the object. The results showed variability in the responses from the homesigner and their communication partner. However, each homesigner was more consistent in their designation for the items than their own communication partner. The homesigners also produced more contrastive gestures than the communication partners. That is, the communication partner would use the same gesture for different items whereas the homesigner differentiated more often.

From the studies summarized above and others, we can see that these homesigners have possibly developed a linguistic system that is language-like, yet, lacks certain features found in established, mature languages (Morford 1996; Coppola 2002). The question now arises as to whether this linguistic system is self-generated or generated from gestural input by their communication partners, i.e. relatives, friends, or the community at large.

**1.3.1 Gestural “input” for homesigners**

Typical ‘input’ provided to homesigners is based primarily on indexical gestures and a few lexical gestures improvised by the signer and his/her family for common items such as food (in general), animals, and family members, often incorporating conventionalized gestures used in
the community at-large (Goldin-Meadow 2003, 2005; Morford and Kegl 2000). However, Carrigan and Coppola (2012) show that the mothers of the homesigners typically do not comprehend their own child’s linguistic system and that native signers of ASL perform better than the mothers at this task as well, which indicates that the mothers are not using their own gestures with the homesigners as a linguistic system, while the homesigners are using their gestures as part of their own linguistic system. Therefore, the homesigners are the source of the innovation of the linguistic system rather than the mothers or family members who are their communication partners. Even when they incorporate conventionalized gestures, homesigners typically adapt these gestures to their own convention and change the function of the gesture.\(^7\)

For instance, in Goldin-Meadow (2003, 2005), three young homesigners (who did not know each other) all incorporated the gesture for WAIT into their system but used it to signify the “immediate future” as in “I’m going to do this next”, rather than an instruction to stop. However, all of their mothers did not use the gesture in the same way their child did, but used the conventional meaning. Goldin-Meadow (2003, 2005) discusses input with respect to young homesigners (ages 1-3) and shows the same pattern discussed above. The parents do not use the same gestures in the same way as the children do. That is, the children’s linguistic system was not typically adopted and used by the parents in the same manner. The parents typically appropriated indexical gestures and used gestures that accompanied their speech but did not apply the same conventions to the gestures that their children did.

\(^7\) In my study, I also encountered homesigners using a conventionalized gesture that was widely used by the community at-large, which consisted of snapping the fingers and means “a period of time”. Interestingly enough, the homesigners would use the gesture to mean “over a long period of time” and they would move the hand forward in an arc, which is not used by the community at-large. Also, Libras signers have the same gesture, used as a sign, which moves backward over the shoulder to indicate “a long time ago”, which is again not used by the hearing community in this manner.
Since homesigners are Deaf and cannot hear the target language spoken around them, and the family members are not using an established sign language with them, but instead are using indexical gestures and a few agreed-upon signs with the homesigners, this indicates a double degree of impoverished input in which the homesigner has no access to syntactic phenomena in either the spoken or signed language. Homesigners clearly experience greatly impoverished input, and yet, as I will show, they still produce evidence of grammatical phenomena such as recursion and ‘merge’ (i.e. operations assumed to be in UG) in their linguistic system. This result provides a strong argument for some form of knowledge despite ‘poverty of the stimulus’. That is, we find evidence of syntactic phenomena in their linguistic systems that is based on the use of their own gestures and these syntactic phenomena are evidence of what I call “strongly rooted” properties of language (to be discussed further in section 4.0).

Recent studies of the language that emerges after homesigners come together to form a linguistic community indicates that within a relatively short period, such a gestural-based system develops into a full-fledged language (Senghas 1995; Senghas and Coppola 2001; Sandler et al. 2005). However, this requires a community of users and early linguistic input. Even after many years of homesigning, adult homesigners do not show all of the properties of formal language (Coppola 2002).

Thus far, we have seen evidence that the age and type of input received are crucial factors in the acquisition of a full-fledged language. Although a full-fledged language does not develop, we still see certain properties appearing in a linguistic system (based on gestures). For such properties, Goldin-Meadow introduces the term ‘resilient properties’, which she defines as those present even in a homesigner’s gestural linguistic system (i.e. even in the absence of a ‘language
model’\textsuperscript{8}. These are created by the individual rather than learned or set by the input. However, there are some problems with this definition because it cannot predict which properties of language will be present in homesigned systems. Furthermore, on this approach, the question of innateness is not addressed. The questions are now raised as to what these ‘resilient’ properties are, how do they develop in a homesigned system without full linguistic input, and how prominently does Universal Grammar (UG) figure in their development?

This study investigates these issues with a look at several syntactic components of language, with a view of innateness expressed by the idea of ‘rootedness’ rather than ‘resiliency’, based on what is predicted by UG, ranging from those expected to be strongly ‘rooted’, to somewhat ‘rooted’, and to least ‘rooted’, examining the ability of homesigners in Brazil, late learners of Brazilian Sign Language (Libras), and native signers of Libras to produce or comprehend these structures\textsuperscript{9}. We now turn to a discussion of Universal Grammar and ‘resiliency’ versus ‘rootedness’.

1.4 Theoretical background

Even children with full exposure to a complete language from birth experience ‘poverty of the stimulus’, in that not every fact about language they come to know is evident from the input (Crain 1991; Lillo-Martin 1997). The aspects of language that are missing from the input are assumed by many to be ‘filled in’ by UG (Chomsky 1975; 1981; Chomsky & Lasnik 1993; Crain 1991, among others). That is, the child is able to deduce from the impoverished input what

\textsuperscript{8} More on this notion of ‘resilient’ properties will be discussed later in section 4.1.

\textsuperscript{9} In this project, we study Deaf signers who have learned Brazilian Sign Language (Libras) as ‘very late’ learners of Libras (beyond puberty). Some of them attest to some acquisition of Brazilian Portuguese as a spoken language. However, as noted by Mayberry (2003, 2010), even if a Deaf child acquires a spoken language to some degree of fluency, it is more often not the equivalent of a child acquiring the same language as a native language. That is, most, if not all, Deaf children cannot be considered a native speaker due to inaccessibility to the spoken language from birth and all their life. However, as Mayberry discusses, if a Deaf child learns a spoken language first, but subsequently acquires a sign language later, that child’s acquisition of sign language may be as a L2 learner, but often, the child is learning the sign language as a ‘late’ first language.
the rules are for the target language because information about what is uniformly present across languages is already present.

It can be asserted that all children experience a form of poverty of stimulus (PoS) with respect to input. That is, there are syntactic structures not typically used with children or reduced forms of syntactic constructions that appear in the input, which constitute a gap in the children’s exposure to these forms. The child is then constrained to produce or comprehend the grammatical form of these syntactic constructions. Proponents of innate language learning will argue that the child does this through Universal Grammar, an innate mechanism of a linguistic nature, geared specifically towards guiding the child in acquiring language (Chomsky 1975, 1981; Chomsky & Lasnik 1993; Crain 1991, among others). Others argue for a more general cognitive mechanism that is utilized for learning language along with other domains (Saffran et al. 1996; Lewis & Elman 2001; Bates & Elman 1996; Seidenberg 1997; among others).

One well-known argument for UG comes from the poverty of the stimulus with respect to structural dependency. In order to form a yes/no question corresponding to the declarative in (1a), a simple, structure-independent rule would suffice, i.e., ‘move the first auxiliary to the front’ of the sentence, as shown in (1b).

(1) a. The man is tall. b. Is the man tall?

Other data, however, such as (2), show that the structure-independent rule does not suffice, and the more complex structure-dependent rule is needed, i.e., move the auxiliary that is in the main clause to the front of the sentence.

(2) a. The man who is singing is my father.
   b. *Is the man who singing is my father?
   c. Is the man who is singing my father?
There are certain facts about grammar that are not expressly demonstrated in the input for the learner. That is, ‘negative’ data (ungrammatical sentences) are not presented to the child as a form of input. Thus, the child receives input about the grammaticality of (1), but not about the ungrammaticality of (2b). On the assumption that input such as (2c) would rarely be provided, the structure-independent rule might be tempting. (See papers in the special issue of *The Linguistic Review* 19.1-2, 2002, for discussion of this issue).

Crain and Nakayama (1987) tested this issue by having children between the ages of 3 to 5 years old respond to prompts such as, “Ask Jabba if the man who is beating a donkey is mean”. If children follow a structure-independent rule, they should sometimes produce questions such as ‘Is the man who beating a donkey is mean’. The children in this study made errors of other kinds, but not once in this study did they make this kind of error. The findings of this study provide support for UG, in particular that structure dependence is available to learners from a very young age.

While agreeing with the premise of the PoS argument, Pullum and Scholz (2002) argue that there is not sufficient empirical evidence for it. Even with the well-known work by Crain and Nakayama (1987) discussed above, which is usually presented as strong evidence for structural dependency, they raise questions with regard to the putative frequency of auxiliary fronting in the input. That is, Pullum and Scholz discuss four cases in which they argue sufficient positive evidence is provided for the child’s acquisition. They argue that evidence of constructions with auxiliary fronting is present with the use of wh-questions in child-directed speech in the CHILDES corpus as in ‘Where’s the other dolly that was in here?’ They also discuss evidence from television shows, the Wall Street Journal, and other sources as evidence for input (which admittedly is not child-directed, but they argue these sources can provide an
estimation of the frequency of such constructions). They also address input for other constructions such as plurals in noun-noun compounding, auxiliary sequences, and the use of the anaphoric ‘one’, which will not be discussed further here.

However, Legate and Yang (2002) provide a strong challenge to Pullam and Scholz’s claims, arguing that there is sufficient empirical evidence for PoS. First, they consider the age of acquisition of auxiliary fronting, i.e. around 3;2, in Crain and Nakayama’s study, and they consider another construction that is also acquired around the same time, namely subject-drop. Using there-expletives as the benchmark for disconfirming an optional subject grammar, they calculated the frequency of there-expletives in the child-directed input at 1.2 percent. Another construction, V2 grammar, was also considered in which the input for V2 constructions, i.e. OVS, was calculated also at 1.2 percent.

Using child-directed input from the same corpus (Nina) that Pullam and Scholz cited in their study and another corpus (Adam) from the CHILDES database, Legate and Yang showed that there were no yes-no questions for which only the structure-dependent rule would work in the input, and only .068 percent of wh-questions in the Nina corpus and only .045 percent in the Adam corpus provided such evidence, both well below the 1.2 percent mark. Thus, they argue that the evidence for auxiliary fronting is ‘negligible’ and the argument for PoS is sufficiently supported by empirical evidence.

As discussed above, there are syntactic constructions that are highly unlikely to be used around children and, yet, children do make few errors with respect to these. This dissertation will provide more evidence showing that a case can be made for grammatical knowledge despite PoS, especially when considering the case of homesigners developing a linguistic system from their own self-generated “input”. That is, homesigners experience an extreme form of impoverished
input, with what Pullum and Scholz (2002) call the most narrowly defined form of PoS, such that there are minimal to no instances of such constructions in the input (signed or spoken) provided to the homesigners\(^{10}\) and yet, we will see that they show evidence of structural dependency in their linguistic systems.

1.5 Universal Grammar

A central concept in the generative framework is Universal Grammar, which is ‘the system of principles, conditions, and rules that are elements or properties of all human languages… the essence of human languages’ (Chomsky 1975). Universal Grammar is a theory of knowledge. The internal structure of the mind goes hand in hand with the problem of how knowledge is acquired. The theory of UG contains the premise that the child knows a set of principles that apply to all languages, and parameters that vary within a set of constraints from one language to another, i.e. these principles and parameters are part of the language acquisition device that is present in the human mind (Chomsky 1975, 1981; Hyams 1986; Williams 1987; Chomsky and Lasnik 1993).

In the ‘parameter-setting’ model of language acquisition, the principles and parameters guide the acquisition of language, preventing the learner from arriving at a grammar that deviates from possible adult grammars. Errors are expected to be of limited types, and crucially, not to violate the universal constraints. Wexler (1998) argues that many parameters are set ‘very early’ (Very Early Parameter Setting, VEPS) For example, children exhibit evidence of adult-like basic word order in their target language, with little deviation, at the age of 18-24 mos., showing

\(^{10}\) By the very nature of their deafness, they do not have access to spoken language in the same way that a hearing child would (Mayberry 1993) and by the nature of their isolation from other Deaf people, they do not have access to signed languages (Kegl 1994; Coppola 2002). Their only input would be via gestures with other hearing people who do not use gestures as a linguistic system (Coppola 2002; Goldin-Meadow 2005). Recall also our discussion regarding the nature of gestural input with homesigners in section 2.3.1.
knowledge of whether their language is a head-initial language such as English, French, Italian or head-final language such as Japanese or Turkish (Wexler 1998; Bloom 1970; Leopold 1949; see Brown 1973, among others). Also, it is well known that children begin to acquire the lexicon of their target language around 10-12 months of age (Huttenlocher 1974; Benedict 1979; Oviatt 1980), with sensitivity noted to familiar words in their native language as young as 8 months old (Jusczyk and Hohne 1997).

Regarding more protracted acquisition of other parameters and choices from UG, these are related to areas of limited variability that are supported innately but must be acquired based on input from the target language, i.e. parametric options that are provided to the child from UG. Such properties of languages would exhibit a range of variability in their settings. Some examples of these would be those that are based on movement rules: wh-questions, topicalization, or focus. Using wh-questions as an example, some languages require wh-movement to the specifier of CP (English); some languages do not employ wh-movement, i.e. wh-in-situ (Japanese); a few languages allow either (French, ASL) (Bošković 2000; 2002; Pesetsky 1987; Wood 2009, among others). The limited variability of the possible settings for wh-movement suggests that UG constrains the possible settings for wh-questions, but the language decides which settings are instantiated for their wh-questions. This innately constrained variability predicts early language acquisition for native speakers/signers due to early input of the settings required for the target phenomena and this is borne out by child language acquisition of wh-questions (Guasti 2000 for English; Santelmann 1998 for Swedish; Haegeman 1995 for Dutch; Clahsen, Kursawe, and Penke 1995 for German; Hamann 2000 for French; Clancy 1985 for Japanese, among others).
Given the theory of UG, what can be expected for cases of late learners of a given sign language or homesigners as compared with native signers? Properties such as the types of movement allowed and which syntactic structures are present in the language are language-specific properties, including the settings of parameters, and must be set on the basis of linguistic evidence. It can be expected that late learners may struggle with the language-specific aspects of these properties, such as derived word orders, and that homesigners will potentially evince an absence of these properties due to a lack of input from a full-fledged language. However, since universal principles such as recursion, merge, and hierarchical structural dependency, by hypothesis do not have to be learned, they are expected to be present in all linguistic systems. That is, we expect to see a limited set of errors with respect to these components.\(^{11}\)

1.6 ‘Resiliency’ versus ‘rootedness’

What is known so far is that delayed linguistic input affects language acquisition in particular ways, but additional research on the range of these effects is sorely needed. The discrepancies found in previous studies between aspects of language which are more or less affected by delayed input leads to the question, which properties of language are what Goldin-Meadow (2003) calls ‘resilient’, and which are ‘fragile’? Goldin-Meadow (2003) suggests that ‘resilient’ properties are such that all homesigners have them and these properties will appear in the gestural system of homesigners. ‘Fragile’ properties are those that must be learned or acquired and will be absent in homesigner’s system. She does not discuss how these properties

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\(^{11}\) This discussion has focused on linguistic competence. However, it is well-known that actual linguistic performance is affected not only by competence but also by factors such as processing efficiency, memory limitations, etc. Previous research with late learners has demonstrated performance effects which may overlap with competence effects. Thus, in this study we will examine posited rooted properties keeping in mind the possibility that greater processing difficulty in late learners and homesigners may affect their performance more than that of native signers.
may evince themselves in acquisition of language as a late first language, nor does she discuss acquisition of language by native speakers/signers.

In this thesis, I suggest that attempting to relate the concept of ‘resiliency’ to components of Universal Grammar (UG) does not satisfactorily predict which properties of language will occur in the linguistic systems of homesigners, late learners, and native signers. Goldin-Meadow’s definition of ‘resiliency’ does not explicitly connect this idea to linguistic universals; i.e. it avoids any discussion of what exactly is innate and what is not. However, in her definition and discussion of ‘resilient properties’ of language, the assumption is implicit that whatever is found in a homesigner’s system will be a universal property of language, i.e. present across other languages as well.

However, I want to go one step further than Goldin-Meadow. I propose that the properties that are universal across established languages will be found in a homesigner’s system and late learners of a first language due to the guidance of UG, all things being equal\textsuperscript{12}. I want to suggest that another way of looking at the development of linguistic properties in homesigners’ systems can be viewed through the notion of ‘rootedness’ in UG. ‘Rootedness’ refers to the degree that UG provides guidance in the acquisition of a particular property of language. If some language property X is strongly rooted, then, all things being equal, X will be found in a homesigner’s system and late learners of a first language.

Rootedness is defined in terms of linguistic universals. Language universals are properties that occur in all languages, such as Lexicon, Merge, and Recursion. In my system, universals are strongly rooted. Choices provided by UG have variable degrees of rootedness, lying along a continuum, rather than a well-defined separation from one degree of rootedness to

\textsuperscript{12} There may be cases when a universal is blocked from appearing in a homesigner’s system, due to processing difficulties or other deficits in linguistic development, or other factors.
the next, due to a wider range of variability in their settings, i.e. they are ‘somewhat rooted’. In general, the more options provided by the parameters in UG, the less rooted some property X will be.

I propose that the rootedness of X is proportional to the probability of finding X in a linguistic system, despite impoverished or late input. More specifically, there are degrees of ‘rootedness’ that correspond to components of UG: (a) language universals, and (b) choices that are provided by UG, as shown in Figure 1.

Fig. 1 Degrees of rootedness and UG

My prediction is that the more strongly rooted a phenomenon is, the more likely it is to be present in homesigned systems and in late learners as well. The less rooted properties, i.e. ‘somewhat rooted’, may or may not be present in the homesigners but if they are, there will be variability in their development from one homesigner to the next. Also, with respect to L1 learners with delayed input, ‘somewhat rooted’ properties will evince variability, depending on the nature of the input provided to each late learner. Properties that are input-driven, i.e. are
completely idiosyncratic and must be learned rather than acquired, are defined as the ‘least rooted’, having little or no guidance from UG, for reasons that will be discussed later. One can see the similarities between my definition of ‘rootedness’ and the Principles and Parameters model. Further discussion with respect to the premises of rootedness (i.e. definitions and hypotheses) is presented in section 1.6.1.

Thus far, we have seen evidence that the age of exposure and type of input received are crucial factors in the acquisition of a full-fledged language. When one of these components is missing, although a full-fledged language does not develop, we still see certain properties appearing. We will see in the following chapters that my proposal regarding ‘rootedness’ and ‘degrees of rootedness’ of some language property X can help predict and explain what components of UG are expected to occur in the development of a homesigned system, in late acquisition of a first language, and in native signers/speakers.

1.6.1 Definitions and hypotheses

Further defining ‘rootedness’, strongly rooted properties of language are innate aspects of the human language faculty that are universal to all languages such as lexification, recursion, and Merge. Lexification does not include idiosyncratic development of lexical items in each language, but more precisely, the property of lexification refers to an innate mechanism that drives the acquisition or creation of words. All typically developing children acquire the words in their target language. We have seen from Goldin-Meadow (2003) and Richie et. al (2012), that both young and adult homesigners develop a stable lexicon of gestures referring primarily to nouns, verbs, and adjectives. In my model, homesigners are expected to have a self-generated lexicon that is stable with respect to the meaning of the gestures and late learners are expected to
readily acquire the words in their target language\textsuperscript{13}. Recursion is postulated by Chomsky to be an innate mechanism that provides the means for expanding an utterance or a sentence (Chomsky 1981; see Hauser, Chomsky & Fitch 2002 for a deeper discussion on recursion). Merge allows the speaker/signer to create a sentence by syntactically joining two or more words in a single utterance.

Strongly rooted properties of language are evident in early acquisition in children and are the first to appear in their linguistic system. Evidence for this is substantiated by child language data in which merge and recursion are illuminated in linguistic phenomena such as dependency on hierarchical structure at a very young age as discussed above in section 1.4. Thus, the premise of rootedness based on innateness of such language universals predicts early language acquisition or development in a linguistic system of these properties and the data supports this prediction.

Likewise, my model also predicts that these properties will be evident in homesigners, late learners of a first (formal) sign language, and native signers. I hypothesize that the most rooted properties are acquired by late learners, native learners, and, by those subject to extreme cases of stimulus poverty, i.e. in the linguistic system of homesigners, as seen in Goldin-Meadow’s extended studies of young homesigners (Goldin-Meadow and Feldman 1977, and many other articles, summarized in Goldin-Meadow 2003) and studies of adult homesigners (Coppola 2002; Morford 1996).

\textsuperscript{13} We will not pursue the issue of lexification in this thesis, but offer it as one such property that is ‘strongly rooted’. As noted earlier, homesigners studied by Goldin-Meadow (2005) and by Richie et. al (in press) suggest evidence of a stable lexicon in their self-generated linguistic system. From casual observation, the homesigners in our study also show evidence of a stable lexicon individually, with gestures that have the same meaning in different contexts. Each of the homesigners has their own ‘signs’ for everyday objects such as ‘man’, ‘woman’, horse’, ‘dog’, and so on. One homesigner has signs for ‘remember’ and ‘understand’. Some of the gestures may overlap such as ‘pray’ or ‘marry’ which most likely reflects a borrowed gesture that is conventionally used by the hearing people in their community. We save this topic for future research, which in itself, is a major undertaking.
Variability is predicted in the acquisition of less rooted properties of language in late learners of a first language and homesigners, but not in native signers. More precisely, I hypothesize that late learners will acquire less rooted properties once their exposure to the target language has begun and that native learners will also exhibit knowledge of these properties. Homesigners may or may not evince these properties in their linguistic systems, as they are not receiving any input for these parametric options. The variable nature of these ‘less rooted’ properties indicates that ‘degrees of rootedness’ will range from ‘less rooted’ to ‘even less rooted’, running along a continuum rather than moving abruptly from one degree of rootedness to the next. In my model, these properties fall under the category of ‘somewhat rooted’.

Although we will not address this area of rootedness in the dissertation study, the question comes up regarding properties of language that are even less ‘rooted’ in UG than the ‘less rooted’ properties. The ‘least rooted’ properties are defined as those of increased variability, even more so than the ‘somewhat rooted’ properties. One possibility for inclusion in this group is options for morphology such as verb agreement or noun agreement. Our prediction for ‘least rooted’ properties is later acquisition and more variability in child language acquisition. By extension, I predict that there will be greater variability in late learners and possible absence of these properties in homesigners. Native signers will pattern similarly with what is found in data from child language acquisition.

In summary, I hypothesize that there are certain aspects of UG that are strongly rooted (i.e. completely accessible from UG), and others that are somewhat rooted (i.e. require some input from a full, naturally-acquired language), and then some are least rooted (i.e. require linguistic input at an early age).
In this dissertation, there will be three experimental studies, plus an in-depth analysis of each homesigner’s spontaneous production to test the hypotheses described above. The studies described in the following chapters test these hypotheses using elicited production, spontaneous production, and comprehension involving aspects of language, which fall into the categories of ‘strongly rooted’ and ‘somewhat rooted’ properties. The table below summarizes the relation between the hypotheses and the proposed studies. We will conduct and show results for production and comprehension tasks for the four properties shown in the chart: word order, hierarchical structural dependency, topic, and recursion.

Table 1: Predicted degrees of rootedness

<table>
<thead>
<tr>
<th>Properties</th>
<th>Word order</th>
<th>Hierarchical Structural Dependency</th>
<th>Topic</th>
<th>Recursion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly rooted</td>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Somewhat rooted</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

1.7 Pilot study

A pilot study was conducted with a Puerto Rican Deaf homesigner, using spontaneous narrative production elicited via pictures with no printed text, and spontaneous conversational production with one of her friends. The goal of this study was to investigate the linguistic system of the homesigner and to determine what syntactic structures appeared in her system. Consistent word ordering of the subject, verb, and object were observed to consist primarily of SV and OV word orderings. This has also been observed with other homesigners studied in research by others (Goldin-Meadow 2003; Coppola 2002). Of particular interest is the Noun + Adjective ordering that was exhibited by the homesigner in this pilot study. In this proposal, we

14 As noted earlier, we will not look at ‘least rooted’ properties in this dissertation but save this for future research.
also propose an experiment to determine if hierarchical structural dependency and consistent word ordering is exhibited by all three groups (homesigners, late learners of Libras, and native signers of Libras).

1.8 Experiments in this study
1.8.1 Background

In Brazil, there are numerous deaf adult homesigners who have reached well past the age of twenty-years old without significant (or sometimes any) exposure to a systematic linguistic system, either spoken/written or signed. These people typically find themselves in social and geographic isolation, which too often results in a lack of access to formal education (Fusillier-Souza 2004). Many of them eventually learn Brazilian Sign Language, henceforth referred to as Libras\textsuperscript{15}, albeit very late- well past the age of puberty.

While the first school for the Deaf in Brazil was founded in 1855 (Campello 1989) and some schools for the Deaf are thriving to this day, particularly in the south of Brazil (Skliar and Quadros 2004), there are many Deaf people who have not been integrated into the educational system and, instead, experience a kind of societal neglect and discrimination that keeps them from receiving educational and linguistic support (Campos de Abreu 1989). There has been a concerted effort to increase literacy in the Brazilian population, including the deaf population. However, as Ronice Müller de Quadros (personal communication, December 2006) notes, in order to increase literacy for Deaf adults, they first need to learn a formal signed language, i.e. Libras. Hence, there is a sizeable population of Deaf adults in Brazil, who (may) have been former homesigners, now learning Libras as a first language well past the age of puberty in

\textsuperscript{15} In the research literature, Brazilian Sign Language is typically shortened to LSB. However, Deaf Brazilians refer to their sign language as Libras. In fact, many Deaf Brazilians are not even aware of the term LSB nor are they aware that Libras is typically denoted as LSB outside of Brazil, especially in the research field (Ana Campello, personal communication, December 2006). This paper will use Libras, respecting the designation used by the Brazilian Deaf community for their sign language.
educational programs geared towards adults. Literacy and education for Deaf people is a still an ongoing issue, however, with a large segment of homesigners who are not learning Libras (or any other spoken/written language).

1.8.2 Subjects

Our primary subjects are adults with severe to profound hearing loss who were not exposed to conventional sign language until past the age of fourteen years (if at all). One group consists of homesigners – adults who have no conventional language who developed their own homesign system and have persisted in using their self-initiated linguistic system to their current age. Each of the homesigners has her/his own linguistic system comprised of gestures and used with their communication partners, most often their family. There are three homesigners, ages 23, 32, and 53, in this study. They were identified by their lack of conventional Libras vocabulary and structures. We did not use experimental data for assessment of their proficiency levels, but instead, relied on personal histories collected previous to the experiment and an informal conversation with the participant, which illustrated their level of exposure to Libras prior to the actual task. A near-native signer of Libras who has extensive linguistic understanding of Libras structure and vocabulary and was one of the experimenters interacting with the participants informally assessed whether the homesigners had exposure to Libras. This experimenter also assessed the level of proficiency in the late learners and native signers of Libras.

Another group of participants consists of six Deaf signers, ages 23-29, who learned Libras as very late learners. Most of the late learners have previously used a mixture of some type of homesigned system and some Brazilian Portuguese to communicate with their parents and family, before they started to learn a conventional sign language, Libras, at the age of 18 years or
older. One learned Libras at the age of 14, around puberty. One was a homesigner for 28 years, with minimal or no exposure to written or spoken Brazilian Portuguese, before she started learning Libras and at the time of testing, she had been learning Libras for only a year. One of the late learners learned Libras possibly as a second language, asserting that she was fluent in Brazilian Portuguese, spoken and written, but prefers to use Libras now as her primary language. All of the late learners learned Libras as a first or second language by or well after the age of puberty, (≥14 years old).

In some cases, the late learners obtained some degree of capability with spoken/written Brazilian Portuguese. Three of the signers indicated that they knew some Brazilian Portuguese but did not feel comfortable with the language. One late learner learned Libras as a first language at the age of 14 years old, using homesigns to communicate with his family still. All consider Libras to be their primary language and showed sufficient knowledge of Libras to be included in the late learners group.

As control subjects, we have five Deaf native signers of Libras, ranging from age 26 to 43. These control subjects have acquired Libras as their first language from birth- all are second-generation Deaf, and all have a large, extended family with Deaf relatives (brothers, sisters, cousins, aunts/uncles) with third-generation Deaf children. Two of them have parents or family members who were homesigners before learning Libras as a very late learner.

A table with the acronyms, ages (in years), and language level for all three groups is presented below (3):
(3) Participants, ages, language level

<table>
<thead>
<tr>
<th></th>
<th>Homesigners</th>
<th></th>
<th>Late Learners</th>
<th></th>
<th>Native Signers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages</td>
<td>H1</td>
<td>Ages</td>
<td>H2</td>
<td>Ages</td>
<td>H3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Ages</td>
<td>53</td>
<td>Ages</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>L1</td>
<td>Ages</td>
<td>L2</td>
<td>Ages</td>
<td>L3</td>
<td></td>
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<tr>
<td></td>
<td>29</td>
<td>Ages</td>
<td>23</td>
<td>Ages</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ages</td>
<td>L3</td>
<td>Ages</td>
<td>L4</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Ages</td>
<td>N1</td>
<td>Ages</td>
<td>N2</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Ages</td>
<td>29</td>
<td>Ages</td>
<td>29</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Ages</td>
<td>N3</td>
<td>Ages</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ages</td>
<td>N4</td>
<td>Ages</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ages</td>
<td>N5</td>
<td>Ages</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

1.8.3 Methodology

Our methodology in this study primarily focuses on gathering data concerning participants’ production and comprehension of various syntactic structures. Narrative production was sampled from the interview segments and “chunks” of spontaneous dialogue in which the homesigners elaborated upon the material in the experiment or provided stories about themselves or others during the experiments. For the transcription of the narrative production of the homesigners, one hundred syntactic units were transcribed from video, which is to provide a “mini-snapshot” of their syntactic structure. Of particular interest were the following: (1) word orders for the subject, object, and verb; (2) word ordering for nouns and their modifiers (i.e. adjectives, numbers, quantifiers and so on); (3) position for “old information” and any accompanying non-manuals; and (4) null subject or object.

Three experiments were designed to elicit production and comprehension of certain syntactic components from UG: (1) elicitation of Noun-Noun Compounds; (2) comprehension of Noun + Adjective ordering; (3) comprehension of topicalization. The spontaneous production and experimental results of the late learners of Libras are compared with the Deaf native Libras signers, using the same methodology. Native signers are expected to perform at ceiling on all
measures. In each of the following chapters, more detailed methodology for each experiment along with spontaneous narrative data that help explain the experimental data is provided.

1.9 Outline of the dissertation

In this dissertation, I show that the conceptual framework in which I propose that there are ‘degrees of rootedness’ corresponding to particular properties of language can account for the variability in acquiring these properties with regards to the late learners. Moreover, I show that predictions can be made with respect to which properties will evince themselves in homesigners, late learners, and native signers due to the strength of the “rootedness”, which is aligned with the level of guidance UG is expected to provide. In Chapter 2, I will discuss the results of an experiment designed to test comprehension of noun + adjective ordering, which provides evidence for Merge as strongly rooted, but also shows support for classifying word order as ‘somewhat rooted’ from to the variability seen in homesigners. We will also see evidence of structural hierarchy in the spontaneous production of the homesigners and late learners of Libras, supporting ‘structural hierarchy’ as a ‘strongly rooted’ property. As for Chapter 3, I present the results of the ‘topic’ experiment in which comprehension of ‘topic’ is tested and predicted to exhibit variability, supporting my hypothesis that topic is ‘somewhat rooted’. Chapter 4 reports the results of an experiment designed to test whether novel, three-noun compounds are produced, which shows that recursion is evident even with homesigners, providing further support for the hypothesis that recursion is ‘strongly rooted’. This experiment also provides additional support for structural hierarchy as ‘strongly rooted’, evidenced in the elicited production of both homesigners and late learners of Libras. Finally, Chapter 5 provides a summary of the results
and discuss in relation to my framework of ‘rootedness’, with implications for current and future research.
Chapter 2
Degrees of rootedness- Merge and Word Order

2.1 Introduction

In this chapter I use the framework of ‘rootedness’, as discussed in the previous chapter, to formally present a way to predict what properties of language will be evident in all linguistic systems, regardless of absent or present input. Universal Grammar is assumed to be the mechanism for innate guidance of language acquisition for the language learner. There has been a plethora of research arguing for innate mechanisms guiding the acquisition of language. However, most, if not all, of that research has been conducted with children or L2 learners of a given language, i.e. those who are provided with frequent input.

If it is clear and uncontestable that a child is not provided with the input necessary to acquire certain grammatical constructions, we can then ask what are the necessary innate mechanisms of language that allow that child with absent input to acquire these constructions. One such ‘experiment of nature’ that is available for our investigation involves homesigned systems\textsuperscript{16}. Rather than acquiring language as children or late learners do, homesigners create language. They create their own linguistic systems in the absence of spoken or signed input.

\textsuperscript{16}Crucially, I focus on the absence of spoken or signed input in contrast to gestural systems used by the homesigner’s family or primary caretaker. My observation is that the gestural system used as the input for the homesigner is typically quite impoverished. If we look at the data from Goldin-Meadow (2003, 2005) and Carrigan and Coppola (2012), we see that mothers of the homesigners typically do not have the same components in their gestures as the homesigners and do not comprehend their own child’s homesigned system as well as they do for their (hearing) children speaking Spanish. This plausibly indicates that the gestural input is not the same as spoken or signed input with regards to certain properties of language.
More precisely, I predict they will evince robust properties of language in their systems, namely, those properties which I propose are ‘strongly rooted’, such as ‘merge’, recursion, constituency or (hierarchical) structural dependency, and lexification, among others not discussed in this thesis.

As opposed to homesigners, late learners of a given language typically fall into two general camps- one involves those who are learning a first language after the age of five or even later and another involves those who are learning a second language after having already learned a first language. We focus our investigation with the former group - typically consisting of Deaf children who receive little to no input until they learn their first language at a later age.

In this chapter, I examine the existence of two types of linguistic properties in homesigners and late learners. I consider those aspects of language which are fundamental linguistic universals to be ‘strongly rooted’, and I predict that they will be found in both homesigners and late learners. Here, my focus is on the operation ‘merge’. I also look at linguistic properties which find some guidance /constraints from UG, but are also subject to cross-linguistic variation – in my framework, these properties are ‘somewhat rooted’. I propose that such properties require clear input from the target language in order to be acquired. Then, homesigners may not show evidence of such properties, and, in turn, we expect to see variable results with respect to the acquisition of these ‘somewhat rooted’ properties with late learners. In this chapter, we will look at one such property of language which we argue is ‘somewhat rooted’, namely, word order.
2.2 Merge

One goal of the Minimalist Program (MP) proposed by Chomsky (1995) is to obviate the need for X-bar theory in favor of a ‘bare phrase structure’ that captures the computational system $C_{HL}$ (an innate system of rules and constraints) in terms of the most economical operations that apply to derivations allowing the user of a given language to build a sentence. These operations are assumed to be linguistically universal, i.e. part of Universal Grammar. Operations such as Select, Merge, or Recursion (among others) are under the purview of the $C_{HL}$. Simply speaking, in order to initiate the derivation, the $C_{HL}$ selects from the lexicon two syntactic objects, which then undergo Merge, combining them into a new syntactic object, with the previous syntactic objects eliminated. Using Chomsky’s (1995) formulation, the new syntactic object $K$ consists of a label $\gamma$ and two objects $\alpha, \beta$ that are constituents of $K$. The label $\gamma$ determines what kind of properties $K$ has, i.e. nominal, verbal, inflectional, and so on. The syntactic objects are:

a. lexical items

b. $K = \{ \gamma \{\alpha, \beta\}\}$

Merge combines the objects $\alpha, \beta$ and creates a new object $K$ with the label $\gamma$ as in (1).

(1) \[
\begin{array}{c}
\gamma \\
\alpha \\
\beta
\end{array}
\]

At the simplest level, Merge combines two elements that are constituents to create a phrase, which is then allowed to undergo ‘merge’ with another syntactic object. For instance, consider two lexical items ‘red’, ‘dog’, which are then merged to create a new syntactic object, a phrase ‘red dog’. The phrase is an adjectival phrase, i.e. $K$ is adjectival. $K$ can be merged with another lexical item such as ‘the’, as in ‘the red dog’ which creates a new syntactic object $K$ that now has a different label, i.e. determiner phrase. At each level of the operation, the previous syntactic objects are eliminated, so Merge only applies to the root.
The operation Merge allows us to create phrases that can be combined with new syntactic objects to create larger phrases all the way up to the sentence-level. Chomsky (2004) adds two further distinctions regarding Merge—Internal Merge and External Merge.

External Merge relates to what we have discussed so far, i.e. taking two separate syntactic objects and combining them to become one syntactic object, which then can be merged with another syntactic object. Internal Merge involves ‘movement’ in which a syntactic object that is part of a given structure is merged with that structure again as shown in (2)\textsuperscript{17}.

\begin{equation}
\text{(2)} \quad \alpha \quad \text{\rightarrow} \quad \beta \\
\end{equation}

Chomsky (2005) suggests that the two types of merge are correlated with interface properties. External Merge is related to argument structure while Internal Merge is related to edge properties, i.e. those relating to scope or discourse.

At this time, there are several theory-internal accounts of Merge, mostly those addressing issues of ‘movement’ or displacement in which an element from a syntactic object undergoes another instance of Merge, i.e. ReMerge vs. Copy or Move vs. Merge (Bobaljik 1995, Starke 2001, Zhang 2004, among others), but also other types of ‘merge’ such as Parallel Merge or Multidominance in which one syntactic object is simultaneously merged with two syntactic objects (Citko 2005; DeVries 2005; 2009). It is beyond the scope of this dissertation to adjudicate between the various theory-internal accounts. For present purposes, we only require

\textsuperscript{17} There are objections to the dichotomy of External/Internal Merge with those arguing for only External Merge. Koster (2007) argues that Internal Merge creates a ‘backtracking’ since it merges a syntactic object that was previously merged and eliminated. He provides an account for ‘movement’ using only External Merge and syntactic triads consisting of sisters and/or their immediately dominating node \([\beta \alpha \delta]\).
the ‘classic’ version of Merge as an abstract operation that allows syntactic objects to be combined to create a larger syntactic object. This operation is a core component of UG.

Hauser, Chomsky, and Fitch (2002) argue that Recursion is the only operation in UG, or in their words, ‘faculty of language in the narrow sense (FLN)’. Although they do not explicitly discuss ‘merge’, recursive operations are instances of Merge (Chomsky 2007). Even in their account, by assumption and conceptual necessity, Merge is in UG. However, Chomsky (2007) states that Merge is not ‘language-specific’ (in the sense that it is specifically used only for language) and is not an operation reserved for linguistic expression, but is nevertheless appropriated for linguistic use by UG.

For the purposes of this dissertation, we will not enter into the debate regarding the nature of Merge. However, we assume that Merge is in UG and, as such, is expected to show up in the homesigner’s linguistic system. Let’s assume that ‘merge’ is instantiated when syntactic objects become available, i.e. input is provided to the learner and UG provides the learner with the non-linguistic mechanism for combining these elements. The question is can self-generated lexical elements serve as input for Merge? We will see later from the results of their spontaneous production that homesigners do exhibit the use of the operation Merge, despite the lack of external input. There must be some linguistic aspect of Merge that recognizes the self-generated lexical elements as possible syntactic objects that can be combined to create new syntactic objects in order to allow homesigners to create their own linguistic system.

I take it that ‘merge’ is in UG and that it is a unique aspect of human language. Language, or more specifically I-language in the Chomskian sense, requires Merge in order to allow the structure to build a sentence. As Chomsky (1995) says, Merge comes for ‘free’ and is a costless operation since it is an integral part of UG. As such, Merge is ‘strongly rooted’ and is
expected to appear in all linguistic system, even in those with minimal to no input, i.e. homesigned systems.

2.3 Word order

Since Greenberg (1963), languages have been classified into six possible types with respect to the ordering of the subject, verb, and object: SVO, SOV, OSV, OVS, VOS, VSO. All languages tend to have a basic word order, which will be either SVO, SOV, or VSO, but may allow other word orders to be used in their grammar because of derivational processes. Dryer (1997) argues that the six-way typology (mentioned above) can be collapsed into a four-way typology, i.e. languages that are: VS and VO; SV & VO; SV & OV; VS & OV. He argues that the six-way typology cannot capture those languages that are typically “non-configurational”, but the four-way typology can present a predictable pattern for those.

Dryer shows how this is exemplified in the typology for Hanis Coos (an extinct language previously found in Oregon), taken from a set of texts from Frachtenberg (1913; cited in Dryer 1997). Using the table from Dryer (1997), we repeat his data below:

(4) Table of frequency of word order in HC

<table>
<thead>
<tr>
<th>Word order</th>
<th># of clauses</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVO</td>
<td>6</td>
<td>.38</td>
</tr>
<tr>
<td>VOS</td>
<td>4</td>
<td>.25</td>
</tr>
<tr>
<td>VSO</td>
<td>3</td>
<td>.19</td>
</tr>
<tr>
<td>OVS</td>
<td>3</td>
<td>.19</td>
</tr>
</tbody>
</table>

As Dryer shows in the table (4) above, using the typology with both subject and object included, the variation seems quite a bit greater as to which is the basic word order. With the four-way
typology as in the table (5) below, we can see a clear pattern of preferences in the possible orderings which tightens up the variation a bit more, showing that Hanis Coos has a stronger preference for the VS and VO as the basic order.

(5) 4-way Typology for HC

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SV</td>
<td>30</td>
<td>.23</td>
</tr>
<tr>
<td>VS</td>
<td>98</td>
<td>.77</td>
</tr>
<tr>
<td>OV</td>
<td>17</td>
<td>.30</td>
</tr>
<tr>
<td>VO</td>
<td>39</td>
<td>.70</td>
</tr>
</tbody>
</table>

Moreover, Dryer (1997) presents an argument for the four-way typology based on several arguments, which I will not go into detail here. His strongest argument is that, in a four-way typology, a pattern emerges showing VS ordering is predominantly exhibited in intransitive clauses and SV in transitive clauses cross-linguistically. This observation offers us a possible expected pattern based on the type of verb. We see an example of this in (5) above. Hanis Coos has predominantly two ‘basic’ word ordering: VS, which is used with intransitive subjects, and VO. This approach may prove to be useful for evaluating homesigned systems so we will return to this later in section 2.6.5 where we will be looking at the ordering used for intransitive/transitive subjects. We will find that the four-way typology does reveal more of a pattern than the six-way typology does for homesigned systems so this seems to support Dryer’s argument.

Before the Minimalist program, word order was defined primarily in terms of X-bar theory, which constructs hierarchy based on the position of the head and its complement, i.e. head-initial or head-final, and the position of the specifier and the X’-unit. If a language has
basic word order SOV, say Japanese, the language is classified as head-final, since the head of the VP follows its complement as in (5).

(5a) Taroo-ga piza-o tabeta
    Hanako-NOM pizza-ACC ate
    ‘Taroo ate pizza.’

More precisely, all heads in Japanese follow their complements in NPs, VPs, IPs, and so on. English is a head-initial language since the head precedes its complement. For example, English clauses follow basic word order SVO. Biberauer, Holmberg, and Roberts (henceforth BHR) (2010) provide a minimalist account of the Head parameter, attesting that many, if not most, languages exhibit variation with respect to the head-complement order across different categories. That is, a given language can have head-complement ordering for one category and complement-head for another category. To consider a potential example of such language-internal inconsistency, Matsuoka (1997), following Romano (1991), argues that functional categories in American Sign Language (ASL) are head-final. BHR argue that it is, in fact, more common to see ‘disharmonic’ word orders in languages than to see languages that follow a completely harmonic ordering. Therefore, we can expect to see variation in word order, not only cross-linguistically, but within the same language. However, languages tend to have some consistency with respect to a basic word order. Hence, word order is ‘somewhat rooted’ and we expect to see variation in its acquisition with homesigners and late learners of Libras.
2.3.1 Word order in signed languages

As can be expected, word order in signed languages also varies cross-linguistically.

Below is a table of different ‘basic’ word orders attested in the literature for signed languages\(^{18}\):

(7) Word orders found across signed languages

<table>
<thead>
<tr>
<th>Signed Language</th>
<th>SVO</th>
<th>SOV</th>
<th>VSO</th>
<th>OSV</th>
</tr>
</thead>
<tbody>
<tr>
<td>American SL</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazilian SL</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentine SL</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>French SL</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austrian SL</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italian SL</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexican SL</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colombian SL</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portuguese SL</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish SL</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Japanese SL</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese SL</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Many of these sign languages allow other word order permutations as well, based on the verb type and classifier constructions. The word order OSV is also available for some of these signed languages, but it is not clear whether it is actually a basic word order or a derived word order, i.e., by topicalization. Topicalization is extensively used across signed languages so OSV

\(^{18}\) Data collected from the following sources: Wilbur (2005); Sandler and Lillo-Martin (2006); Quadros (2003); Massone and Curiel (2004); Johnston and Schembri (2007).
appears quite frequently. In order to determine the ‘basic’ word order of a language, researchers often take into consideration frequency and pragmatically unmarked cases. However, as Dryer (1995, 1997) notes, the use of ‘pragmatically unmarked’ as a criterion must be taken cautiously as this often means different things for different researchers.

Both Libras and ASL were once thought to be flexible with respect to word order\textsuperscript{19}. Libras has SVO, OSV, and SOV ordering allowed but OSV and SOV are derived word orders, dependent on discourse or restricted to certain syntactic constructions. ASL allows almost all of the possible permutations except for VSO. However, like Libras, the basic word order in ASL is SVO (Quadros 2003; Sandler and Lillo-Martin 2010). For example, as discussed in Chapter 4, both Libras and ASL make extensive use of topicalization of the object and verb phrase (see Sandler and Lillo-Martin 2006 for a detailed discussion on this), creating O,SV and VO,S ordering.

Also, Wilbur (1997) argues that ASL, like Catalan, reserves the sentence-final position for elements that are focused. Any constituent in the sentence can be focused. Wilbur proposed that all other material is preposed leftward in order to leave the focused material in sentence-final position. Quadros (2003) also shows that focus in Libras occurs sentence-finally, but provides a different analysis for how the focused material appears in this position. With respect to syntactic restrictions, both ASL and Libras allow SOV in many contexts, but not when the object is in an embedded clause (Fischer (1975; Quadros 2003).

In Libras, VOS and OVS are never allowed, but they are allowed in ASL when the S is a pronoun (Quadros 2003; Sandler and Lillo-Martin 2006). However, both languages do not allow

\textsuperscript{19} We discuss both ASL and Libras in this section with respect to word order and headedness for two reasons. One is that ASL is the most extensively researched signed language thus far and secondly, Libras and ASL are very similar in syntactic structure (Quadros 2003; Quadros and Lillo-Martin 2010), with some differences. Thus, we can see that even in two signed languages that are very similar in syntactic structure have differences constrained by UG.
VSO. Derivation of VSO order requires moving the Verb to a higher position, but this operation does not seem to be available in ASL or Libras. Thus, we see a wide range of permutations of the SVO typology occurring in ASL and Libras, with some differences between the two languages. We see how variation in word order is expressed cross-linguistically not only in spoken but signed languages too. Thus far, we have looked at evidence from spoken and signed language showing that variation in word order is attested cross-linguistically and variation for the head and complement order (mixed heads) is often attested in the same language with respect to different syntactic categories.

Based on the evidence we have seen, it seems clear that word order is a point of variation across languages and there are many choices possible for different categories. Thus, we classify word order as ‘somewhat rooted’, which requires the language learner to have ‘clear’ input, i.e. with respect to quality, frequency, and accessibility and their choices for word order are constrained by UG. As such, we expect native signers (L1) and late learners to acquire word order readily and early. If the input is variable with late learners of L1, we expect variable results in their acquisition of word order. Homesigners, having absent input, are expected to show variable word order, both across and within. We now look at evidence from acquisition of word order in L1 children and late learners in spoken and signed languages and homesigners to ascertain whether this hypothesis holds true.

2.4 Acquisition of word order in L1 children

Previous studies with children show that acquisition of word order is exhibited at a very early age, between ages 18-24 months, with few errors. Children are able to ascertain at a very young age whether their language is head-initial, such as English, French or Italian or head-final
such as Japanese or Turkish (Wexler 1998; Slobin 1982; Bloom et al 1975; Leopold 1949; see Brown 1973, among others).

Even with languages that have an underlying order that is different than the surface word order provided in the input, children will acquire the adult word order. One example comes to mind, i.e. Irish (Hickey 1990). In Irish, the adult input is robustly VSO, but this has been analyzed in previous studies as a derived word order from an underlying word order of either SVO or SOV (Bobaljik and Carnie 1992; McCloskey 2005). Hickey (1990) shows that children produced verb-initial utterances far more frequently than subject-initial between the ages of 1;4-3;0. However, they do produce subject-initial utterances in high proportions, which Hickey ascribes to a process of be-verb omission, thus indicating the children quickly attain the adult basic word order.

2.5 Noun and adjective order

Another area of ordering that is of interest in this chapter relates to noun and adjective position. All languages have either a pre-nominal or post-nominal position for attributive adjectives. Some languages allow both orderings (Dryer 1988). Dryer (1988, 2005) shows that the NA ordering is quite common with both OV and VO languages, negating the claim of previous studies that there is a correlation with the ordering of the verb and object and the ordering of the noun and adjective. Dryer (2007) suggests one way to determine the basic ordering for the noun and adjective is to look at their distribution syntactically or lexically. The ordering that has the least restricted distribution is typically considered the basic order. In languages that allow either AN or NA ordering, Dryer suggests that one can determine the basic order of the noun and adjective from the ordering that is syntactically less complex. For
example, in English, as in (6, examples taken from Dryer 2007) below, an adjective can be ordered either pre- or post-nominally. In all four examples, the ordering cannot be reversed as seen in the ungrammatical examples. But, in 6 (c-d), the postnominal adjective phrases are more complex. Therefore, based on this (and other factors), the AN ordering is considered to be the basic ordering for English.

(6) a. the tall woman vs. *the woman tall
    b. the very tall woman vs. *the woman very tall
    c. the woman taller than John vs. *the taller than John woman
    d. the woman angry at John vs. *the angry at John woman

So there is a distributonal pattern noted for the adjective and noun cross-linguistically. In general, languages have either AN, NA, or both but even with languages that allow both, the structure of the adjectival phrase is relevant to its position as the modifier of the noun\(^\text{20}\). As in our discussion of word order above, we also classify noun and adjective ordering as ‘somewhat rooted’ with the same predictions for homesigners, late learners and native signers of Libras.

2.5.1 Acquisition of noun and adjective order in L1

As Cardinaletti and Guisti (2011) note, it is difficult to find literature on child acquisition of noun and adjective ordering due to the paucity of adjectives in spontaneous production databases, and the fact that adjectives often appear by themselves. As we have discussed earlier in this chapter, there are structural components to the ordering so it is important to look for

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\(^{20}\) Cinque (1996, 2005), following Greenberg (1963), shows that a single pattern emerges cross-linguistically for prenominal adjectives: Dem > Num > Adj > Noun (i.e. *Adj > Num > Dem > N) in comparison to postnominal adjectives which tend to occur in two possible patterns:

a.) N > Dem > Num > Adj
b.) N > Adj > Num > Dem

Cinque argues that this is a universal constraint on Merge and shows how the NP moves upward structurally. We would expect to see a similar pattern in homesigners with respect to the ordering of the adjectives and nouns. As noted earlier, word order is assumed to be ‘somewhat rooted’, so we predict variable results between the AN and NA ordering. However, if Cinque is correct and they have AN ordering in their linguistic system, then the ordering should follow the pattern found cross-linguistically for prenominal adjectives in relation to other structural components. This makes an interesting, testable prediction for future research.
instances of noun and adjective constituents occurring in child language. Cardinaletti and Guisti (2011) look at early production of adjectives in child Italian, assuming they are generated likewise as adult grammar.

Italian allows both pre- and post- nominal adjectives, especially those that are attributive and possessive as shown below in (7, examples taken from Cardinaletti and Guisti):

(7) a. una simpatico ragazza
    ‘a nice girl’
b. una ragazza simpatico
c. sua (bella) macchina
    ‘her/his (nice) car’
d. (bella) macchina sua

When a quantifier or determiner modifies the nominal along with a possessive, the quantifier or determiner always occurs pre-nominally but can occur either before or after the possessive as in (8, examples from Cardinaletti and Guisti):

(8.) a. molti suoi amici
    ‘many her/his friends’
b. suoi molti amici

However, stage-level adjectives (those that describe the nominal at that point in time) can only occur post-nominally as in (9, examples from Cardinaletti and Guisti):

(9.) a. la bottiglia vuota/sporca
    ‘the bottle empty/dirty’
b. *la vuota/sporca bottiglia

With this distribution of adjectives/modifiers and the nominal in mind, Cardinaletti and Guisti (2010) analyzed several transcriptions of four Italian children during ages 1;6 -3;0. They also analyzed a corpus of adult Italian and found a very low incidence of adjectives used—9% of the 219,635 lexical categories were adjectives, compared to almost 40% for verbs, 35.49% for nouns, and 15.15% for adverbs. Clearly, the input for Italian children is not high in frequency with respect to adjectives, but nevertheless all of the children showed adult-like
patterns in their acquisition of adjectives modifying nominals at a very early age. Even when
the child produced the adjective without a nominal, the adjective was marked for agreement with
the nominal as early as 1;6.29. Quantifiers were produced pre-nominally as early as 1;8.7.
Possessive adjectives were produced both pre- and post-nominally at the age of 2;0.28, with the
pre-nominal occurring earlier (age 1;9.07). Descriptive adjectives were used first pre-nominally
(age 1;9.10), but used almost always post-nominally. Stage-level adjectives were never used
post-nominally, as in adult Italian. First use of stage-level adjectives occurring pre-nominally
was at age 1;9.10.

Thus, the literature with regards to L1 acquisition of word order indicates, as predicted,
that children robustly acquire the word order of their language at a very young age, with few
errors. However, as previously discussed, ‘word order’ is hypothesized to be ‘somewhat rooted’,
and we predict that there will be variable results with respect to acquisition of ‘word order’. We
now take a brief look at two studies of L2 acquisition, which are predicted to show variable
results, one relating to SVO ordering and one relating to NA/AN ordering.

In one study by Westergaard (2003) investigating Norwegian children learning English in
grade school (grades 2-7; ages 7-12), the question was would the children show the V2 word
ordering used in Norwegian when speaking English or would they be able to master the strict
SVO ordering? In the study, the children participated in both orally elicited production tests and
they also were given written tests that consisted of both grammaticality judgments and
translations. The results showed that children in grades 2-7 overwhelmingly choose V2 ordering
in their English even after many years of instruction. For instance, children who were in 5th
grade chose V2 ordering 70% of the time.
Westergaard (2003) argues that the children were not provided with enough cues at a frequent rate as would be required for them to acquire the SVO ordering for English. She suggests that the children assume, on the basis of questions, that English is like Norwegian, and it is not until they learn do-support, that they realize not all verbs raise in English. This is not taught to the children until they are in 6th or 7th grade, at which time they show a marked increase in their knowledge and use of SVO ordering in English. So, variability in acquisition is noted with respect to the acquisition of SVO ordering in L2 learners.

We move on to discussion of another study by Bernardini (2003) regarding L2 acquisition of noun and adjective ordering. She analyzes transcribed conversations between an Italian interviewer and a middle-aged Swedish couple, Stina and Karl, learning Italian as a second language for a year’s period of time. As we discussed earlier, Italian allows adjectives to occur both pre- and post-nominally, except for quantifiers (pre-nominally) and stage-level adjectives (post-nominally). Bernardini only looks at possessive and attributive adjectives as they are both required to occur pre-nominally in Swedish. Stina and Karl both produced possessive adjectives pre-nominally, never using post-nominal adjectives. They both produce attributive adjectives pre- and post-nominally, but Karl made more errors with respect to ungrammatical occurrences of pre-nominal adjectives, while Stina did not make any errors with AN constructions. She did make one error with a post-nominal adjective. We see that variable results occur in L2 acquisition in acquiring noun and adjective ordering.

So we now see that input is crucially required for a robust and early acquisition of ‘somewhat rooted’ properties. The nature of ‘somewhat rooted’ properties lies in their variability, i.e. the choices that are provided by UG. If ‘clear’ input is provided early, the child will acquire these properties on target. However, in some cases L2 learners are not provided
with ‘clear’ instances of input with respect to quality, frequency, and accessibility and the variation in choices lead to variability in their acquisition, as predicted.

2.5.2 Acquisition of word order in signed language

Research with respect to acquisition of word order in American Sign Language (and other sign languages) initially showed what appeared to be a great deal of variability in the ordering of the subject, verb, and object. Studies by Hoffmeister (1978), Schick (2002), Schick and Gale (1996) for ASL and Coerts and Mills (1994) for Netherlands Sign Language (SLN) showed that young Deaf children of Deaf parents routinely did not show a preference or robust ordering for either SV or VS and VO or OV. At the time, consensus was primarily that there must be some pragmatic aspect or some syntactic operation that was yet not clearly defined. Coerts (2000) shows that Deaf children master Subject Pronoun Copy (SPC) by around age 2;2, a common feature in sign languages in which the subject is dropped and a subject pronoun copy remains in the sentence-final position as in SVS → ___ V S . When SPC is accounted for, the variability reduces in the data, which then shows that children robustly acquire the same word order used by the target sign language, SLN by age 2;8. Chen Pichler (2001, 2010) shows that her study on word order acquisition in ASL confirms Coert’s findings with respect to the SPC and shows that OV ordering can be attributed to rightward movement of the verb as instances of ‘reordering morphology’, i.e. aspect, spatialization, and handling (classifier) inflections, and ‘early’ topicalization in which the object is fronted as a topic. She (2001) also argues that once we take into account the SPC, reordering morphology, and ‘early topicalization’, the data shows robust acquisition of ASL word order by around 24-28 months. Thus, in even in languages that use non-canonical ordering for different syntactic structures, children acquire these robustly along with the canonical word order, which explains the variability in the ordering of the subject,
verb, and object. Therefore, acquisition of word order in sign languages is parallel to what is seen in spoken language. As noted earlier, word order, as a linguistic property is classified as ‘somewhat rooted’ due to the variability offered in the choices of ordering for the subject, verb, and object. However, the robustness of the acquisition of word order by native signers of the target sign language is expected, given that the input is ‘clear’ and frequent.

Acquisition of word order by L2 learners of ASL shows a similar pattern to that of spoken language (as discussed above). Studies by Newport (1990), Boudreault and Mayberry (2006) seem to show potentially conflicting results with respect to acquisition of word order. Newport (1990 and other works) tested three groups of Deaf adults (ages 40-50 years): those who acquired American Sign Language (ASL) as native signers; early learners, who learned ASL at the age of 4 to 6 years; and late learners, who acquired ASL after the age of twelve. The tests involved a series of tasks on the production and comprehension of complex morphology (verb agreement and verbs of motion), among others. Compared to the native signers, the early learners had a significant decrease in accuracy on the tasks, even though many of them had been using ASL for well over forty years. Those who acquired ASL after the age of twelve presented even less accuracy on the same tasks. On these tasks there was a correlation of -.6 to -.7 between age of acquisition (AoA) and the test score. However, AoA was not a factor on all the tasks. On a test involving basic word order, all three groups had an accuracy of 95% or better. In the current context, it is most relevant to note that the late learners are able to acquire basic word order with ease.

Boudreault and Mayberry (2006) also found that adults who were late learners of American Sign Language (ASL) showed a significant decrease in mastery of various sentence-types (simple, negative, agreement, wh-question, relative clause and classifier sentences), which
correlated with the age of exposure to ASL. They tested three groups of Deaf adults (ages 18-79 years): those who acquired ASL as native signers (ages 18-41); early learners (ages 31-62), who learned ASL at the age of 5 to 7 years; and delayed late learners (ages 24-79), who acquired ASL between the ages of 8 and 13 years. Signed stimuli with grammatical and ungrammatical counterparts of a particular syntactic construction were presented to the participants. The early late learners and the delayed late learners of ASL made significantly more errors on ungrammatical constructions than on grammatical constructions, except for negative sentences and classifier sentences. The more pronounced the delay of exposure, the less accurate the signers were. That is, syntactic knowledge of the target language is affected by the length of delay for the acquisition of that language as a first language. Boudreault and Mayberry also assert that, unlike Newport (1990), basic word order was also found to be problematic for the late learners, especially without any non-linguistic cues to assist them, such as pictures accompanied by a signed syntactic construction illustrating the picture with the subject and object in either grammatical or ungrammatical positions.

Lillo-Martin and Berk (2003) investigate acquisition of word order in ASL, by two Deaf children, MEI and CAL, who were initially exposed to ASL as a first language at the age of approximately six years old, i.e. early late learners. When they were first evaluated at the school for the Deaf, they were found to have a basic system of gestures with approximately 20 gestures relating to basic, everyday needs such as “eat”, “drink”, “sleep”, etc… They did not start learning ASL until they were enrolled at the school for the Deaf. Recordings of the two children were studied with respect to their acquisition of basic, i.e. SVO, and derived word orders in ASL, ages 6;6.25-7;1.5 for MEI and 6;10.6-7;4.6 for CAL. Their utterances were compared to two ASL Deaf native signers, ages 1;11.23-2;1.30 and 2;1.27-2;4.9.
Initially, MEI and CAL produced two-word utterances and gradually increased to three-word utterances, much like a native signer would. As in the Newport (1990) study, the children showed competency with the basic SVO word order for ASL and were approximately at the same stage as the two-year old native Deaf ASL signers. However, unlike the native signers, their production of derived word orders, such as topicalization, was limited and prone to errors.

Thus, we have three different studies looking at different tasks in which word order was tested with the early and delayed late learners of ASL. It would seem to be the case that ‘basic’ word order was readily acquired but derived word orders showed the most variability.

Boudreault and Mayberry (2006) claim that even basic word order was problematic for the early/delayed late learners. However, the results may be an artifact of the methodology they used. In their word order task, they showed a video with a signed sentence with the verb ‘moved’ to an ungrammatical position. They do not provide a list of the test sentences (with glosses) so it is unclear exactly how they made it “ungrammatical”. Recall earlier that ASL allows almost any word order, except for VSO, because ASL has SVO as a basic word order but other word orders are allowed as derived and used in particular discourse contexts. However, these derived word orders almost always have corresponding non-manuals, so if the test stimuli has no non-manuals or non-manuals do not match the putative structure, this could be confusing for the participant. In any case, derived word orders have been shown to manifest variability in the results, so the variability with the late learners is not unexpected. Again, this parallels what we have seen with spoken language, as we discussed earlier in section 2.5.1.

2.6 Why test Noun + Adjective ordering with homesigners?

As mentioned earlier in this chapter, word order is variable from language to language and often within the same language. Based on this, we classify word order as ‘somewhat
rooted’, in which we expect variability or a lack of consistency with respect to ordering in homesigned systems, due to a lack of input from any such target language. If the late learner has ‘clear’ input, he should be able to acquire the word order robustly, but if the input is not clear, variability should appear in their production, especially with derived word orders. We have discussed some studies already showing that this hypothesis is supported. Moreover, with respect to the Noun + Adjective ordering, we expect similar results as with the word order. However, we do expect the noun and adjective to co-occur together, (with no linguistic element inserted between them) providing evidence of ‘merge’, which we assume is ‘strongly rooted’ and should be evident in homesigned systems and late learners of Libras. There are some previous work that indicate this hypothesis is possible.

A previous study by Sandler, Meir, Padden, and Aronoff (2005) with a young sign language, Al Sayyid Bedouin Sign Language (ABSL), shows consistency of word order for subject, object, and verbs and also for nouns and adjectives. ABSL is a relatively young, emerging sign language that has been created in an Al Sayyiid Bedouin community, which both Deaf and hearing people use to communicate with each other. ABSL shows consistent SOV word order, with one-argument clauses in SV or OV orders. All nominal modifiers occur postnominally, which means that ABSL has a robust ordering of Noun + Adjective.

Also, Goldin-Meadow (2003, 2005) studied ten young Deaf children of hearing parents, ranging in age from 1;4 to 4;1 for a number of sessions (see Goldin-Meadow 2003 for further details). One homesigner, David, was the most prolific in his gestural system, having the most number of utterances compared to the other children in the study. David showed a preference for ordering the adjective after the noun (an indexical gesture pointing to an object or person) but
also produced instances with an adjective preceding the noun as (10 a-b, examples from Hunsicker and Goldin-Meadow 2012).

(10) a. [point to self  point at paddle in room  LONG] point downstairs
    [my paddle long] there
    My long paddle is there

b. [ROUND point at straight track-piece] MOVE
    [round  track-piece] move
    (You) move round track-piece (here).

The gesture for the adjective is morphologically produced similarly to a noun, i.e. non-inflected. When David produces a noun, it is produced before an indexical gesture. Thus, nouns are produced in a different order with the indexical gesture than adjectives (Goldin-Meadow 2005, Hunsicker and Goldin-Meadow 2012).

Given the instances of nominal gestures co-occurring in young homesigners and ABSL (a young sign language), and the fact that children produce nominal phrases modified by an adjective showing an adult-like pattern in their language (or adjectives alone) at a very young age, it seems reasonable to use a noun + adjective task as a useful way to look for ‘merge’ in the linguistic systems of the homesigners and late learners of Libras. We will do this two ways-through a comprehension task and analysis of spontaneous production. The spontaneous production study will not only look at ordering of noun + adjectives but also at basic word order for the subject, object, and verb, providing a look at structural dependency, indicating evidence of ‘merge’. We do not necessarily expect consistency of word order in either case as ‘word order’ is ‘somewhat rooted’, but we do expect to see a preference and indications that ‘merge’ is in their systems. Even if there is no marked ordering, we expect to see ‘merge’, as a linguistic principle provided through UG, operating in one form or another. In the next section, we look at
the experimental task for the ordering of Noun + Adjectives and data from the spontaneous production of homesigners and late learners and native signers of Libras.

2.7 Merge and word order hypothesis

In this study, we hypothesize that Merge, being strongly rooted, will be evident in homesigners, late learners, and native signers of Libras. Word order is ‘somewhat’ rooted’ due to its variability across languages but is predicted to follow the attested word order in Libras for late learners and native signers (due to clear instances of input provided). In homesigners, word order is predicted to be variable due to no clear instances of input provided.

2.7.1 Spontaneous production and Noun + Adjective test

There are two goals in this study. One is to search for instances of Merge, i.e. constituent structure, in spontaneous production of homesigners. We also look for instances of grammatical constituent structure produced by late learners and verify that ungrammatical constituent structures are not produced by late learners.

Another goal is to test whether the late learners and native signers accurately comprehend instances of Noun + Adjective ordering provided in signed utterances, thus showing evidence of Merge and consistency of word order for the noun and its adjectival modifier. We also ask whether homesigners consistently choose the same ordering for the noun and its adjectival modifier.

2.7.2 Participants

As discussed in Chapter 1, fourteen Deaf Brazilian adults were recruited (23-53 years old), through a Deaf Brazilian local who also assisted in the experiment. Five were native signers of Libras, six were late learners of Libras, and three were homesigners.
2.7.3 Spontaneous narratives

We now look at spontaneous production to answer two questions, as discussed earlier in this chapter. The first question relates to evidence of ‘merge’ in the homesigners’ linguistic systems. More precisely, do they show instances of phrasal-level categories? If so, we expect to see certain elements co-occurring with each other, i.e. nouns and their modifiers, subjects and verbs, verbs and objects and so on. Also, in utterances in which there are more than two gestures, do these evince repeated applications of ‘merge’? If they only produce one-gesture utterances, then it could not be concluded that they have evidence of ‘merge’ in their linguistic systems.

Secondly, if they do have phrasal-level categories, do they have consistent ordering for these? It is not required for them to have consistent ordering in order to assume that ‘merge’ is operational in their systems, but we would like to see if they evince a preference or tendency for one ordering over another. That is if they have a hierarchical structure for [Subject [Verb Object]], but there is no fixed ordering required within the phrasal categories, we would expect to see four possible permutations: Subject Verb Object, Object Verb Subject, Subject Object Verb, and Verb Object Subject. However, we would not expect to see Verb Subject Object or Object Subject Verb, since these orders disrupt constituency\(^{21}\). That is, constituent order is expected to occur robustly for homesigners as well as for late learners and native signers. If the homesigner exhibits the expected patterns, this provides one type of evidence of ‘merge’ being applied recursively. In other words, we could then say that homesigners have syntax and their grammar is not paratactic.

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\(^{21}\) If all six orders were found in their linguistic system, we would have to assume that ‘merge’ is not operational and their syntax is paratactic rather than structural. However, that does not rule out the possibility of VSO or OSV occurring in their linguistic system. If we do see VSO or OSV, this may indicate a possible instance of word order derivation from their basic word order.
2.7.4 Procedure

In this study, we transcribed ‘chunks’ of spontaneous dialogue in which each homesigner individually conversed with the experimenters for some time. They would often go off tangent while doing the experiments and tell us stories about their childhood, families, or experiences they had. This gave us a rich source of data from which we can glean a picture of the syntax in their linguistic systems.

In those narratives that we transcribed, we look at syntactic aspects of the systems developed by the three homesigners. In a given utterance, the homesigner may produce several gestures, ranging from 5 to 8 gestures per “sentence”. To identify an utterance as a sentence, we relied on prosodic cues such as eye gaze and duration of hands in the air, which is a technique commonly used in sign language research (see reviews in Brentari et al 2011; Sandler and Lillo-Martin 2006). If the hands dropped considerably below the signing space, it is considered a break between two utterances.

For our analysis, it was necessary to parse the utterances into smaller syntactic units, consisting of subject and verb, object and verb, or single-sign utterances (which could be from any possible grammatical category). One hundred syntactic units were transcribed from sustained spontaneous and elicited production by each of the three homesigners. It has been shown that the grammatical category ‘subject’ is available to homesigners (Coppola 2002; Coppola and Newport 2005), so we assume that there is a subject, verb, and object category for each of the homesigners, and analyze their syntactic units in these terms. We analyze noun phrases and their modifiers (quantifiers, numerals, and adjectives), along with basic S, V, O ordering in each of the syntactic units. This approach is useful for providing a current
representation of the homesigner’s grammar and the range of syntactic structures occurring at that time.

2.8 Constituent structure
2.8.1 Subject, Object, Verb
2.8.2 Homesigners

The three homesigners showed a preference for ordering of the subject and verb (for both transitive and intransitive verbs (unaccusative and unergative), but not for the object and the verb (see (11-12)). Both H1 and H3 showed a preference for their object and verb ordering but not the same for each. That is, H1 showed a strong preference for OV ordering and H3 showed some preference for VO ordering. H2 did not show a preference for ordering of the object and verb either way. The following table (11) shows the pattern of the SV/VS and VO/OV in syntactic units with either one argument or two arguments. For instance, if a syntactic unit is VOS, the analysis will include both VS and VO.

(11) Ordering of SV and OV

<table>
<thead>
<tr>
<th>HS</th>
<th>Total S &amp; V</th>
<th>S-V order</th>
<th>V-S order</th>
<th>Total O &amp; V</th>
<th>V-O order</th>
<th>O-V order</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>43</td>
<td>35 (81%)</td>
<td>8 (19%)</td>
<td>22</td>
<td>3 (14%)</td>
<td>19 (86.4%)</td>
</tr>
<tr>
<td>H2</td>
<td>58</td>
<td>47 (81%)</td>
<td>11 (19%)</td>
<td>17</td>
<td>8 (47%)</td>
<td>9 (53%)</td>
</tr>
<tr>
<td>H3</td>
<td>73</td>
<td>55 (75%)</td>
<td>18 (25%)</td>
<td>16</td>
<td>10 (63%)</td>
<td>6 (38%)</td>
</tr>
</tbody>
</table>

Further analysis was done with intransitive verbs, separating them into categories of ‘unaccusative’ and ‘unergative’ verbs, based primarily on their meaning and verb frame as in (12). That is, unaccusative verbs do not have an agent and cannot take an internal argument, and unergative verbs can have an agent or experiencer argument (Perlmutter 1978, Burzio 1986; Dowty 1991, Levin and Hovav 1992). Examples of unaccusative verbs used by homesigners are: GROW-UP, GO, FALL-DOWN. Examples of unergative verbs used are PRAY, HUG,
WRITE. The question is whether the homesigners show a pattern for ergativity as Goldin-Meadow (2003) shows for the young homesigners in her study. The total in the table below (12) for each homesigner includes the verb type with and without an argument.

(12) Data for Intransitive verbs in HS Production

<table>
<thead>
<tr>
<th>Signers</th>
<th>Total Intrans</th>
<th>Unaccusative</th>
<th>Unergative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SV</td>
<td>VS</td>
<td>V only</td>
</tr>
<tr>
<td>H1</td>
<td>34</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>H2</td>
<td>16</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>H3</td>
<td>34</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

The homesigners do not show a strong preference for one ordering over another for either verb category. However, there are more SV orderings for both unaccusative and unergative verbs for all three.

This table does not include predicates, which are often used by the homesigners, and the pattern for predicates is also predominantly Subject-Predicate, regardless of whether the predicate could be construed as ‘unaccusative’ or ‘unergative’. If a predicate was exemplified by a lack of ‘control’ by the agent or was descriptive such as FAT, this could possibly be classified as unaccusative. If the predicate had some type of ‘control’ or ‘experiencer’ interpretation such as EARRING (as in to ‘make some object into an earring’), it could possibly be classified as unergative. Following this possible analysis, none of the homesigners had any ‘unergative’ predicates. All of the predicates were ‘unaccusative’, i.e. descriptive and non-agentive. In this case, it appears that even the Subject-Predicate pattern is not that of ergativity.

All three homesigners tend to sign utterances consisting of one argument, i.e. SV, VS, OV, VO. Also, many of the utterances do not have S and/or O overtly produced as shown above.
in (12). The data for the single-argument utterances are shown below in (13), which include both predicates and verbs.

(13) Number of single-argument utterances in HS

<table>
<thead>
<tr>
<th>Signer</th>
<th>Total One-Arg.</th>
<th>SV/VS</th>
<th>OV/VO</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>49</td>
<td>36 (73%)</td>
<td>13 (27%)</td>
</tr>
<tr>
<td>H2</td>
<td>50</td>
<td>44 (88%)</td>
<td>6 (12%)</td>
</tr>
<tr>
<td>H3</td>
<td>84</td>
<td>76 (90%)</td>
<td>8 (10%)</td>
</tr>
</tbody>
</table>

Also, we looked at simple, declarative utterances in the syntactic units to determine whether the homesigners exhibited constituent structure. First, we looked for full syntactic units with all three categories (subject, verb, and object), which were not often exhibited in the utterances as the homesigners prefer to sign utterances with only one argument, i.e. SV, VS, OV, VO. However, when two-argument utterances did occur, there were indications of possible preferences, but variations of other ordering were also observed, which were predicted to follow from constituent structure (as discussed above).

The table below shows the percentages of different orderings of S, V, O used by each homesigner (see (14)). Note that the percentages are not high, indicating that word order appears to be variable, but with some preference for one order over the others, for these homesigners, which supports my prediction that word order will be ‘absent’ or ‘variable’ in homesigners, due to absence of input. Recall that word order is ‘somewhat rooted’ due to its variability cross-linguistically and requires early, clear input. It would appear that self-generated input is not sufficient in this case to determine a positive setting for one word order over the others.
(14) Variability of word orderings for S, V, O

<table>
<thead>
<tr>
<th>HS</th>
<th>Total Nbr</th>
<th>SVO</th>
<th>SOV</th>
<th>OSV</th>
<th>OVS</th>
<th>VSO</th>
<th>VOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>8</td>
<td>0</td>
<td>5 (63%)</td>
<td>1 (13%)</td>
<td>2 (25%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>H2</td>
<td>6</td>
<td>3 (50%)</td>
<td>1 (17%)</td>
<td>1 (17%)</td>
<td>1 (17%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>H3</td>
<td>11</td>
<td>4 (36.4%)</td>
<td>4 (36.4%)</td>
<td>1 (9%)</td>
<td>1 (9%)</td>
<td>0</td>
<td>1 (9%)</td>
</tr>
</tbody>
</table>

Note that H1 and H2 exhibit OSV word ordering in at least one of their utterances, which is not one of the orders expected from a grammar that has SVO or SOV (with flexible ordering within the phrasal category). However, upon closer observation, in both instances, the utterance is not a simple three-gesture syntactic unit. In both H1 and H2, the construction used for OSV as shown in (15-16) seems reminiscent of what we would consider a ‘topic’ in sign language (see chapter 3 for discussion on ‘topics’). Recall the results discussed earlier in which H1 shows a preference for SVO in 2-argument clauses and SV, OV for one-argument clauses and H2 shows a preference for SVO in 2-argument clauses and SV for one-argument clauses (but ‘equal’ preference for OV/VO).

(15) GO-AROUND-MEOW, ME PET  
walking-around-cat, I pet  
‘I pet the cat that’s walking around’

(16) PT-(OUT-THERE), HOUSE-ROOF, PLANE-FLY-OVER  
over-there, house, plane fly over  
‘The plane flew over the house.’

We suggest that the OSV ordering seen below is a derived word order, possibly for ‘topic’.

Also, in both cases, the homesigner had been talking about the ‘fronted’ object in his/her narrative, so this is relevant to the idea of ‘topic’ as ‘old, given’ or ‘previously discussed’ information. As discussed in chapter 3, the topic position tends to be associated with this type of
information. Interestingly enough, these two did not do well in the topic experiment, but that may be for other reasons we will discuss in chapter 3.

One other possible counterexample to constituency is (17) below signed by H1, in which the utterance contains a clause in which the adjective is separated from the nominal. However, upon closer observation, this example appears to display an embedded clause with a adjectival predicate, which indicates a possible recursive CP. H1 is the only homesigner that produces utterances containing mental verbs with a complement clause (also shown in (18-19)). In (18), we see OVS in the complement clause, suggesting a possible embedded topic. Notice that he respects constituency with the quantifier and the noun it modifies.

(17) PT-(ME) THINK BABY PT-(ME) SMALL (H1) ‘I think I was a small baby.’

(18) PT-ME SMALL THINK (H1) ‘I think I was small’

Other instances of constituent structure can be seen with respect to the noun and its modifier. We expect to see these two placed together within the utterance. For instance, we would not expect to see a construction such as “MAN HUG BIG” produced, where the noun and its modifier are separated. In (20-21 and 24 below) the modifiers precede the nouns, but in (22-23), the modifier occurs post-nominally. There were few instances of nouns and their modifiers in their utterances and thus the data is not sufficient for ascertaining their preferred order for the noun and modifier.22 From the spontaneous production, H2 and H3 showed a slight preference

22 Recall that the current data is composed of only one hundred syntactic units. Plans for future research include transcribing more of the videotaped production, which are approximately 2-6 hours per participant. This should give us more insight as to their preferred ordering for nouns and their modifiers.
for N A ordering\(^{23}\), but also showed A N. H1 did not show a clear preference either way.

Examples of when the modifier preceded the noun are shown below in (20-21).

(20) \([\text{PT(to picture) BIG, [SMALL] BABY}]\)
\(\text{‘This (baby) is big, (the other is a) small baby.’}\) (H1)

(21) \([[[\text{SMALL BORN-BABY}] \text{GOOD}]\]
\(\text{‘(A) small newly-birthed baby is good.’}\) (H2)

Examples of constituent structure with noun with modifiers produced by homesigners are shown in (22-24):

(22) \([[[\text{MAN} \text{BIG} \text{HUG}]]\]
\(\text{‘(The) big man hugged (the bear).’}\) (H3)

(23) \([[[\text{BAG PT(bag)}] \text{PUT-IN PT}]\]
\(\text{‘You can put (the stuff) in the bag.’}\) (H2)

(24) \([\text{PT} [[\text{SMALL BABY}]] \text{GROW-UP}], \text{PT}\]
\(\text{‘That small baby grew up.’}\) (H1)

In these constructions, we see evidence of both constituent structure with respect to the noun and its modifier, plus ‘merge’ is applied more than once. Example (22) signed by H3 has the noun and its adjectival modifier occurring within a larger construction. H2 in (22) uses PT as a demonstrative for the noun BAG. With (24), the homesigner H1 uses a demonstrative to modify a noun and its adjectival modifier in a construction with several applications of ‘merge’.

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\(^{23}\) All three frequently used adjectival predicates as in (i-iii). One way of determining whether it was a nominal being modified by an adjective or a noun followed by a predicate adjective was to look at whether there were verbs being used in the clause or the clause had the adjective functioning as the predicate.

(i) \(\text{PT(me) SMALL}\)
\(\text{‘I (was) small.’}\) (H1)

(ii) \(\text{THIS-EAR GOOD}\)
\(\text{‘This ear (hears) good.’}\) (H2)

(iii) \(\text{GIRL VERY-FAT}\)
\(\text{‘He/She/Her (is) very fat.’}\) (H3)
In sum, the analysis of the spontaneous productions for homesigners supports my prediction that ‘merge’, as a strongly rooted property of language, will be evident. We see this through constituency and recursive applications of ‘merge’. Word order, as a somewhat rooted property, was predicted to be absent or variable in homesigners. The results from the spontaneous production shows that homesigners do produce a variability of word order with respect to S, V, O and do not evince a consistent word order.

Now, we ask whether constituency for noun and adjectives is respected with late learners and native signers of Libras. Libras requires the adjective to follow the noun it modifies. From the spontaneous production, we were not able to ascertain a clear pattern with respect to the ordering of nouns and adjectives with the homesigners. We now look at an experimental test for noun and adjective ordering with homesigners, late learners and native signers of Libras.

2.9 Noun and adjective test

In this study, we hypothesize that Merge, being strongly rooted, will be evident in homesigners, late learners, and native signers of Libras. Libras requires the adjective to follow the noun it modifies as in (28):

(28) GIRL STAND-IN-FRONT HOUSE YELLOW
    ‘The girl stood in front (of the) yellow house’.

In our test, participants interpreted noun and adjective test sequences. We predict that the late learners will reliably select the picture corresponding to phrasal Noun + Adjective ordering, showing evidence of ‘merge’ through constituency. Word order is ‘somewhat’ rooted’ due to its variability across languages but is predicted to follow the attested word order in Libras for late learners and native signers (due to clear instances of input provided). In homesigners, word
order for the noun and adjective is predicted to be variable due to no clear instances of input provided.

2.9.1 Procedure and materials

We explained to each participant that they would see two related pictures and an utterance would be signed. The participants were asked to select the picture that best matches the utterance. We encouraged them to pick the best one even if they thought it could be either one. They were allowed to discuss their reaction or response after answering.

Each participant was shown a total of twelve items, each with a noun and an adjectival modifier. Four of these items had Adjective Noun Noun ordering, four had Noun Noun Adjective ordering, and four had Noun Adjective Noun ordering (which is crucial for this test as it is ambiguous to which noun the adjective modifies). Examples of the test items with the three different orderings are as follows:

(29) a. Adjective Noun Noun (ANN)- FAT MAN WOMAN EAT-SANDWICH
    b. Noun Adjective (NNA)- CAT DOG FAT EAT-FOOD
    c. Noun Adjective Noun (NAN)- COW FAT HORSE EAT-HAY

An example of how a test item is presented is shown below in (30). A list of test items is presented in Appendix A to this chapter.

(30) Example of test item:

First, the experimenter signs the NAN sentence CAT FAT DOG EAT.

The participant decides which one of the two pictures below best matches the utterance signed.
If the participant assumes an AN ordering, she will select (a). If she assumes an NA ordering, she will select (b).
When testing the late learners and native signers of Libras, the experimenter signed in Libras with them, but did not include any revealing prosody that would possibly bias them towards selecting NA, which is the attested ordering for nouns and their adjectival modifiers in Libras. For the homesigners, we previously asked them in spontaneous discourse their gesture/sign for each of the characters and action in the pictures. Then, we signed the test utterance using their own gestures and asked them which picture it was that we just signed to them.

2.9.2 Results

Late learners and native signers of Libras show similar patterns and present a preferential ordering of Noun + Adjective, as expected. If ‘merge’ is not operational in the late learner’s system, we would expect that person to show random ordering. On the other hand, we expect a preference for Noun+Adjective, following native signers, if the late learners are relying on the operation merge. That is, as discussed earlier, the phrase-level category of AdjP provides evidence of ‘merge’ being applied. Crucially, as mentioned earlier, we look at the results for NAN items, which are structurally ambiguous as to which noun the adjective modifies. Late learners chose the NA ordering 100% of the time, patterning after the native signers, on all four items as illustrated in the table below:
For the NNA test items, native signers consistently selected the interpretation in which both nouns are modified by the adjective. Late learners also selected the conjoined nouns modified by the same adjective most of the time. One former homesigner L6 chose NNA for three out of four test items and selected NA for one of the test items. That is, for the sentence CAT DOG FAT EAT-FOOD, she selected the picture that had a fat dog and regular-sized cat instead of the picture that had both animals being fat, thus choosing the interpretation where only one noun was modified by the adjective instead of the conjoined nouns. One native signer N4 showed the same results as L6 with the same item. Possibly, this sentence may have been confusing for them or it may have been signed a bit differently for them, causing them to err on the side of caution. However, all of the other late learners and native signers selected NNA for all of the items, including this sentence. The results for the late learners and native signers are shown in the table (31) below:

(31) NNA and NA results

<table>
<thead>
<tr>
<th>Participants</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
<th>L6</th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
<th>N4</th>
<th>N5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>AN</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(31) Total selected of possible NA or AN ordering in NAN test (four items)
The results for the homesigners are mixed at best. If ‘merge’ is operational in their system, we assume that they will show comprehension of hierarchical structure and phrase-level categories. Moreover, we were also interested in learning about their preferences for noun and adjective ordering. That is, do they prefer NA or AN order?

First, we look at the results for the NAN ordering (Fig. 1), keeping in mind that these items are structurally ambiguous. Two of the homesigners were evenly divided between NA and AN ordering for these the test items. One homesigner H1 chose NA three out of four items.

Fig. 1  NA or AN ordering in NAN items

Secondly, we look at the results for NNA to see if they interpret the adjective as modifying only one noun or both nouns (Fig. 2). Two of the homesigners chose the NNA interpretation three out of four times, while one homesigner H3 was evenly divided between the two possible instances. If H2 truly had NA word ordering, we would expect her to chose NA more often in the NAN test items, so the picture is not as clear as we would like.
Finally, we look at results for ANN to see if they show any preference for either AN or ANN ordering. Recall that homesigners H2 and H3 were evenly divided with the NAN test items. With the ANN test items, they chose AN three out of four items. Homesigner H1 chose ANN three out of four items.

Looking at the current data for the homesigners, we do not have a clear picture of their preferences for the ordering of the noun and adjective and they do not show a clear pattern of hierarchy, with the possible exception of H1. Following his results, it could be argued that he
shows a clear preference for NA ordering with one noun modified by the adjective, and ANN ordering for conjoined nouns modified by the adjective. However, we cannot use this experimental data to conclude that ‘merge’ is operational in each one of their systems.

In one way, the results show that the homesigners have variability in word order for noun and adjectives, which supports the hypothesis. However, it’s not clear whether the results are due to the nature of word order being ‘somewhat rooted’, i.e. lack of input, or due to the nature of the test. This study did not work out as well as hoped. It may be due to lack of familiarity with ‘taking a test’ and trying to figure out what we wanted from them so they basically guessed at the test items. The spontaneous production analysis provides a clearer picture with respect to ‘merge’ being operational for the homesigned systems.

However, for the late learners, the noun and adjective test shows that, without a doubt, the input is clear enough for them to acquire the requisite ordering for Libras, even after the critical period of acquisition. This was attested even for the former homesigner L6 who had only been learning Libras for a year at the time of testing. Constituency is not violated, especially when presented with ambiguous test items in which the late learner had to decide which order to select for Libras. Word order is ‘somewhat rooted’, but is constrained by UG with respect to variation. With the right input, late learners will acquire this reliably. However, we will see a difference between acquisition of ‘basic’ word order and ‘derived’ word orders. In the next chapter, we will discuss a derived word order with respect to ‘topic’ in which there is considerably more variable results.

2.10 Discussion of data

One area of interest with respect to the results found with word ordering for the homesigners is whether they show an accusative or ergative pattern in their linguistic system. It
is widely accepted that languages tend to divide cross-linguistically between accusativity or ergativity with respect to how the subject and the object behaves morphologically and/or syntactically (Comrie 1978; Dixon 1994). In ergative-absolutive languages, the subject of an intransitive verb is morphologically marked or appears in the same position as the object of a transitive verb. However, in nominative-accusative languages, the subject of the intransitive verb and a transitive verb are either morphologically marked the same or in the same syntactic position. Intransitive verbs can be split between ergative verbs and unaccusative verbs in which there is one argument allowed with the verb. Intransitive ergative verbs allow agentive or experiencer thematic roles for the subject, but unaccusative verbs do not. For instance, in the sentence ‘The train arrived’, ‘train’ is not an agent or experiencer, whereas in the sentence ‘The boy laughed’, ‘boy’ is the experiencer of the verb ‘laughed’.

Goldin-Meadow (2003) argues that young homesigners in her study show evidence of a preference for action gestures produced in sentence-final position, i.e. PATIENT-ACT and Intransitive ACTOR-ACT. Nine of the ten children produced PATIENT-ACT ordering in their gestures. Seven out of the ten produced Intransitive ACTOR-ACT ordering in their gestures. David is the only child to produce ordering for transitive actors, which manifested as Noun-ACT-Transitive ACTOR. Based on this and another study with young homesigners in Taiwan (Goldin-Meadow and Mylander 1998), Goldin-Meadow (2003) suggests that ergativity is the default pattern in ‘organization’ of language.

However, as the results for the homesigners in the current study show, the pattern manifested is more like accusative. If the homesigners employed SV ordering for unergative verbs and VS with unaccusative verbs, this would be indicative of an ergative pattern. However, all of the homesigners showed a preference for SV ordering for both unergative and unaccusative
verbs, which indicate an accusative pattern. Goldin-Meadow (2005) did not separate the verbs according to their type, but instead showed a general pattern for thematic roles.

Some previous studies by Scroggs, 1981; Emmorey et al., 1995; and Morford, 1996 with older homesigners (ranging in age from 9 to 16 years) indicated more variability in the preference for ordering. Two homesigners preferred PATIENT-AGENT-ACT and one preferred AGENT-ACT-PATIENT. It is interesting here to note that these homesigners also showed evidence of other orderings in their two-argument clauses, but indicated a preference for these, which fits in with what we have seen with the homesigners in their spontaneous production in our study. Again, variability in word ordering across individuals were seen with adult homesigners in a study by Senghas et al. (1997). However, each homesigner had their own system for marking arguments and roles of nouns in the utterances along with spatial grammar. However, in all of these studies, it is not clear which order they follow or prefer for intransitive verbs so it is difficult to directly compare with our study here and Goldin-Meadow’s study. The fact that these homesigners, across individuals, all also exhibited variability in their ordering for the subject, verb, and object provides strong support for the hypothesis presented in this chapter that word order is ‘somewhat rooted’.

However, a study by Coppola (2002) with adult Nicaraguan homesigners (ages 15, 19, 24 at the time of the most recent analysis in the study) shows that agents and non-agents that were subjects regardless of semantic roles were marked in the same manner and always appeared in clause-initial position (see also Coppola and Newport 2005). Coppola (2002) noted that the same occurred in the set of intransitive clauses, i.e. the subject was always clause-initial. Again, this contrasts with Goldin-Meadow (2003)’s assertion that ergative patterns must be the default ordering. More interestingly, the adult homesigners in our study and in the Coppola and
Newport (2005) study show a strong preference for SV ordering in both transitive and intransitive clauses. This is opposite what Goldin-Meadow (2003) found with the young homesigners. Clearly, more research is needed to understand further the differences in the grammars for young homesigners and adult homesigners. One area of research could be to look into the age group in between, i.e. ages 5 to 14, to see if there is a gradual or abrupt change from ergative to accusative systems in the gestural system.

As Coppola (2002) discusses, the older homesigners show a greater complexity in their grammatical systems with morphological marking, grammatical roles, and spatial grammar that is not seen in the young homesigners, perhaps as a result of maturity or increased self-generated input from interacting with the environment and more conversation partners. Although, we did not specifically look at these features, we note that these were also evident in the homesigners in the current study. Moreover, we found evidence of hierarchical structure, embedding, and repeated applications of ‘merge’ within the same syntactic unit, all of which have not yet been specifically attested in previous studies. At this point, my analysis thus far has been on the conservative side, but I suggest that adult homesigners are capable of more complex syntax. This is clearly an area for future research.

One other issue regarding the spontaneous production data with the homesigners is the preponderance of small clauses in their utterances. That is, homesigners tend to have one argument in their clauses with single instances of Merge. There are some instances of recursive Merge, i.e. N Adj V clauses or S, V, O clauses. It is evident that homesigners do have ‘merge’ in their operational system but they do not necessarily apply this operation in every clause or utterance. Another thing is that many of their responses are simply single utterances of verbs or predicates.
Interestingly enough, this preference for single-argument clauses is echoed in ABSL and early Nicaraguan Sign Language (*Idioma de Señas de Nicaragua* - ISN)\(^{24}\), both young languages at the time of testing and exhibiting a “simpler” syntax than seen in mature, established languages (spoken and signed). Sandler et al. (2005) show that ABSL has a strong preference for SV and OV clauses, with intransitive subjects for SV used twice as much as transitive subjects. For instance, in a scenario in which a woman gave an apple to a man, they would commonly sign as ‘WOMAN APPLE GIVE, MAN GIVE’ or as ‘WOMAN GIVE, MAN TAKE’.

Likewise, Senghas et al. (1997) tested two groups of ‘cohorts’ who were the first and second generation of ISN users and found the first cohort were much more likely to sign one-argument clauses than the second cohort. In a scenario in which a man pushes a woman, they were likely to sign “MAN PUSH, WOMAN FALL” or “MAN PUSH, FALL”. However, the second cohort exhibited new word orders for the same scenario, such as “MAN WOMAN PUSH FALL” or “MAN PUSH FALL WOMAN”. They still express one-argument clauses and require two verbs to express a transitive event (i.e. two-argument verb), but show a new word order requiring the verbs to be adjacent, a move towards more complex syntax.

Considering the cases of the homesigned systems, ABSL, and ISN, it would suggest that Merge is a linguistic universal, but at a primitive level, perhaps. More complex applications of Merge may possibly require understanding of the syntactic frame for the verb allowing one and two argument slots for the verb. The second cohort of ISN appear to be moving towards this

\(^{24}\) ISN is a very young signed language that was spontaneously developed by young Deaf children in Nicaragua when a center for special education became more widely accessible to Deaf students in the late 1970s. The first generation, i.e. ‘cohort’, ranged in age from 4 years to mid-teens. These children used homesigned systems to communicate with their families and went through a process of formalizing ISN via successive generations of cohorts. The original form of ISN was based on spontaneous negotiation and development from what the homesigners already had in their gestural system (Coppola et al. 1997; Senghas et al. 1997).
actualization and, by the third cohort, they were regularly expressing more complex syntactic frames for the verb. What is needed for this ‘development’ is regularized input, which is provided through others using the same language and is not something that the homesigners or the first ISN cohort has.

However, ABSL has been in use for more than seven generations. It is puzzling why they continue to prefer one-argument clauses. Perhaps an explanation based on discourse can be suggested. Dubois (1987) suggests that discourse plays a role in languages that prefer one-argument clauses due to a preference for using transitive subjects in association with old information. That is, new information is used with intransitive subjects. In one discourse study of an ergative language, Sacapultec, one-argument clauses were produced 51.2% of the time, with no argument clauses produced 47.6% of the time. Two-argument clauses were only produced at a rate of 1.1%. These NPs for these one-argument clauses were typically non-agents and are ‘seven times less likely’ to contain new information. Dubois found that this pattern was also manifested in accusative languages (English, Hebrew, German, Portuguese, among others) in their discourse. A preliminary look at the homesigners’ spontaneous production seems to confirm this possible hypothesis regarding new information used with intransitive subjects. Future research will be providential in testing this hypothesis.

2.11 Conclusion

We have seen that Merge is a ‘strongly rooted’ property of language that is operational in homesigned systems and the linguistic system of late learners and native signers of Libras. All three homesigners showed constituency, i.e. hierarchical structure, in their spontaneous production, but exhibited variability with respect to word order for the noun and adjective and
for the subject, object, and verb, which confirms that word order is a ‘somewhat rooted’ property of language. Late learners respected the basic word order due to ‘clear input’ being provided and we will see in the next chapter that derived word orders in late learners of Libras exhibit greater variability, as predicted.
Chapter 3
Degrees of rootedness- Topic

3.1 Introduction

We have seen candidates for ‘strongly rooted’ properties of language that will occur in all linguistic systems, regardless of input being provided or not, and linguistic properties that are ‘somewhat rooted’ – properties related to linguistic universals that are present in all languages, but which may show some variability in outcomes. The examples of ‘strongly rooted’ properties previous discussed include Merge and Recursion. In Chapter 2, I suggest that homesigners apply the operation Merge to their grammar, because it is readily accessible from UG. Merge is 'strongly rooted' and will be evident in home-signed systems regardless of the absence of spoken or signed input. Late learners and native signers will also exhibit this property in their language. However, we saw that the word order resulting from operations of merge may be variable, and concluded that word order as a linguistic property is only ‘somewhat rooted’. In Chapter 4, Recursion as a ‘strongly rooted’ property is evident in the use of NNC with homesigners, late learners and native signers of Libras. However, we also propose that NNC as a property of language is ‘somewhat rooted’ and may show variability in its use. We see this supported in the variability in the head + modifier ordering used by late learners even though Libras requires noun + modifier ordering.

All languages have Merge and Recursion. However, all languages have points of variation in which they differ cross-linguistically. When the variation is limited by UG, I call these properties ‘somewhat rooted.’ For instance, there is cross-linguistic variation with respect
to the expression of topics. Research suggests that all languages have a position in the left periphery (typically sentence-initial) for topic, but languages differ with regards to how the topic appears in that position, i.e. through topicalization (topic movement) or base-generated, along with either obligatory or non-obligatory topic-markers (Prince 1981; Vallduví and Engdhal 1996; De Cat 2002, among others).

Some have suggested that topic is a language universal (Prince 1981; De Cat 2002). More precisely, De Cat (2002) argues that information structure, which is responsible for topic operations, is part of UG. However, due to the many choices available for the realization of topics, ‘topic’ is here classified as ‘somewhat rooted’ and not as a core universal of UG.

In this chapter, we will consider the cross-linguistic evidence for classifying ‘topic’ as a ‘somewhat rooted’ property of language and investigate whether topicalization as a linguistic mechanism is available to homesigners, late learners and native signers of Libras.

### 3.2 Topic

The topic position refers to a position within the sentence in which a constituent is base-generated or to which it moves in order to highlight ‘old or given’ information that has already been previously discussed in the discourse\(^{25}\) (Prince 1981; Vallduví and Engdahl 1996). If a

\(^{25}\) There are also instances of focus movement and Yiddish-movement in which an NP is fronted (Prince 1981). In focus movement, the NP must be given or salient and is an attribute of the subject in the main clause as in (i):

(i) Context: John bought a new car.
   A: What kind of car was it?
   A: Toyota, it was.
language employs topicalization, the topicalized constituent is typically fronted to the sentence-initial position. Examples of topicalization are shown below in (1), (5), and (6). Base-generated topics in sentence-initial position are shown in (2), (3), and (4).

(1) Chocolate, I like!

(2) As for cars, I prefer Hondas.

(3) Sono hon wa, minna ga yonda
   ‘As for the book, everybody read (it).’

(4) L’ultima unit la sto facendo
    the last unit it(CL) be.1SG do.GER
    ‘As for the last unit, I’m working on it.’

(5) O teu livro, comprei de certeza.
    ‘Your book, I bought, for sure’

(6) I chayk-un Mary-ka ecey secem-eyse sa-ss-ta.
    This book-TOP Mary-NOM yesterday bookstore at buy-past-C
    ‘As for this book, Mary bought (it) at a bookstore yesterday.’

With respect to the position, the constituent or NP argument moves leftward to a higher position in the syntactic structure to the maximal projection TopP. Rizzi (1997) states that NP arguments are fronted to the hierarchical Spec-Top position in the articulated CP, higher than FocusP but lower than ForceP: ForceP > TopP > FocusP… However, others have argued against a fully articulated CP, instead arguing for a reduced CP in which ForceP and TopP are subsumed together (see Haegeman 2004 for a deeper discussion regarding this). It is beyond the scope of this dissertation to discuss the many different syntactic analyses for topicalization, but

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Yiddish-movement refers to a fronting of new information that is assumed to be a part of shared knowledge to both the speaker and addressee as in (ii):

(ii) Context: Both know that the son tends to want new toys or new items a lot.
   A. How’s your son doing?
   B. Don’t ask! An IPhone he wants now!

The same analysis for topicalization, i.e. movement of the NP to Spec-TopP, applies in these cases as well. We will not delve into the different pragmatic/semantic types of topics here, preferring instead to look at the overall pattern of topics syntactically.
we assume, following Rizzi (1997), that the functional projection TopP is in the CP-layer and the Spec-TopP is to where the NP argument representing old/given information moves as an instance of topicalization.

Topic is property of language shared cross-linguistically, but handled in different ways. All languages have a position for topic, which is primarily sentence-initial (Gundel 1988; Vallduví and Engdahl 1996), but topic marking is a point of variation cross-linguistically. For instance, in many languages including signed languages, topic is accompanied by an intonational marker, (Gundel 1988; Prince 1981; Sandler and Lillo-Martin 2006). Spoken languages that use intonation to mark the topic typically have a rising inflection (L*+H) in the voice on the ‘topic’ part, i.e. focused clause, with some languages requiring a high pitched accent on the topic (Gundel 1988; Prince 1981; Frascarelli and Hinterhölzl 2007). Signed languages typically use non-manuals such as raised brows (as in ASL and Israeli Sign Language) or squints (as in Swedish Sign Language or Israeli Sign Language) to indicate the topic (Liddell 1980; Aarons 1994; Sandler and Lillo-Martin 2006; Dachkovsky and Sandler 2009)\(^26\). In other languages, a morphological marker is required, such as -wa in Japanese and –nun in Korean (Nagata 1994; Jung 2001, among others). However, not all languages require the insertion of a topic marker, even among those that have topic markers.

In languages like Arabic and French, topicalization is not allowed but instead they use CLLD- Clitic Left Dislocation. In this process, the topic is base-generated in the sentence-initial position (presumably in Spec-TopP) and a resumptive pronoun/clitic (or shadow pronoun) appears in the base position of the topic NP and coreferential with the topic-NP (Gundel 1988;\(^26\) Although, Wilbur and Patschke (1999) argue that the function of the non-manual marker for topics is syntactic in nature rather than intonational. See Sandler and Lillo-Martin (2006) for a deeper discussion regarding this. Following Sandler and Lillo-Martin (2006), I assume that non-manuals are primarily intonational. This does not mean that they are completely divorced from the syntax, but that they are intonational markers associated with a particular construction.

\(^{26}\)
Cinque 1990; Aoun and Benmamoun 1998; VanKampen 2004; De Cat 2007, 2009). CLLD can apply to a subject or object NP as seen below in (7-8). Also, topics that are base-generated can be left-dislocated (as in 7-8) or right-dislocated (as in 9-10).

(7) Les frites, c’est bon. (De Cat 2009)
The fries is good
‘Fries are good.’

(8) Il tuo libro, lo ho letto (Barbosa 2001)
‘Your book, I read it

(9) Ils sont dans la remise, tes fûts. (De Cat 2009)
They are in the shed your barrels
‘Your barrels are in the shed.’

(10) ‘I ate them, the beans’ (Gundel and Fretheim, 2004)

Many languages, such as English and Norwegian, allow both topicalization and dislocation (left- and right-).

Based on the many choices we have seen for topic, topic is not ‘strongly rooted’, but instead must be classified as ‘somewhat rooted’, even though topic is widely used cross-linguistically. According to my approach, this predicts that native signers should acquire topic as it is used in their language, Late learners will exhibit variable results, and homesigners may or may not show topic in their systems due to lack of input for setting the parametric values.

With all this in mind, the learner must be able to distinguish between the syntactic operations for topic in the target language, i.e. movement or base-generation. Also, they must learn whether both subjects and objects can be topics in either a left-dislocated or right-dislocated position, and whether both can undergo topicalization movement. That is, languages can differ with respect to how topic is constructed.

27 However, Barbosa (2001) analyzes CLLD as instances of the topic base-generated as an adjunct to FocP.
acquisition of topics in child language. Do L1 children acquire the process for constructing topic early or does it take time for the child to master the tools for establishing the topic in her language?

3.3 Acquisition of topic

As mentioned earlier, the child must be able to discern what type of ‘topic’ his language constructs, through either topicalization or right-/left- dislocation, along with any accompanying (non)obligatory topic markers. Recall that we predict that children should acquire the construction for ‘topic’ in his/her language early and with ease, given that the input has been provided early. We will see that although children seem to use the sentence-initial position for topics at an early age in some languages, there is also some variability in the success that children have with topics across languages.

One of the earliest studies on acquisition of topicalization in English is by Gruber (1967) on one child, Mackie, from birth to age 30-34 months. Gruber found that Mackie produced utterances that contained a topic such as ‘Salt, I taste it in this food’ at just over 2 years of age. Topic constructions with the subject as topic were also found as in ‘Car, it broken’ and with the object as topic as in ‘Car, he take the wheel’, which Gruber analyzes as relating to the ‘wheel’ as in ‘As for the car, he took its wheels’. This is reminiscent of a non-gap topic in which the noun in the topic position is related to the object. However, some of the constructions Gruber analyzes as containing a topic with a null subject such as ‘Dump truck all fixed’ could have an alternative analysis in which the noun phrase is not a topic but the subject of the predicate. Another example that he cites as topic-comment as in ‘him bear’, in which he analyzes ‘him’ as the topic, is more suggestive of focus on ‘bear’ or even possibly ‘him’ as subject of a predicate nominal.
However, Gruber (1967) argues the interpretation is analogous to ‘him, he’s a bear’ rather than ‘him’s a bear’ because a construction with ‘him’ and a copula do not co-occur in his utterances. In this study, it appears even though Mackie is not using topicalization in which the NP is moved and a gap is left behind, but constructions that are more similar to left dislocation, he has acquired the sentence-initial position for a NP-topic at a young age.

In Romance languages, base-generated topics are frequently the only type of syntactic constructions allowed for establishing topic. French-speaking children are attested as acquiring right-dislocated topics at a very early age (Labelle and Valois 1996; De Cat 2002), along with left-dislocated topics. De Cat (2002) looks at three French-speaking children and investigates the acquisition of left-dislocated topics, finding instances of such as early as 2;2.30. Instances of right-dislocated topics occur even earlier at age 2;1.11. In adult French, the rate of right- or left-dislocated topics are about the same, 7-8% of the clauses uttered. Children in the study were found to parallel this distribution in their utterances. Also, De Cat found that the rate of right- and left-dislocation was about the same for subject clitics. That is, there was no degree of difficulty associated with either direction of dislocation for the children. De Cat further argues that dislocation of topic can and does occur during the null-subject stage in French-speaking children, showing evidence of their knowledge of the topic position at an early age. Based on this, she argues that topic is a language universal. In my framework, even if the general notion of topic is universal, it is considered ‘somewhat rooted’, since the mechanism varies across languages with choices constrained by UG.

It seems the case in the general literature that children do acquire topic in their language early, but there is some variation in the acquisition of topics, relating to subject-object asymmetry and word order in the target language.
German is well-attested in its use of topicalization in the adult language, owing much to its status as a V2 language. However, as Spinner and Grinstead (2006) note from their extensive review of the literature, German-speaking children have some difficulty with the left periphery and a notable absence of object-fronting is observed in their utterances. Spinner and Grinstead (2006) compared one group of German-speaking children to another group of Catalan-speaking children. In the Catalan-speaking children, fronted objects were found in their utterances between the ages of 1;10.06 to 2;1.23, occurring around the same time as their acquisition of overt subjects and wh-movement. Spinner and Grinstead found evidence of topicalization in the German-speaking children around the ages of 2;1.16. However, overt subjects that occur as a result of discourse are acquired much earlier than the fronted objects. Spinner and Grinstead concluded that in child Catalan, overt subjects, object topics, and wh-questions are acquired around the same time, but in child German, these constructions are acquired separately and at different times.

In contrast to the relatively early acquisition of topic structures for children acquiring languages such as French, studies of the acquisition of Mandarin find an absence of topicalized constructions produced by young Chinese children until after the age of 4:0 years old (Erbaugh 1983), even though Mandarin is a topic-prominent language. In Mandarin, topics are not required to be overtly marked, but can be marked with the particles –ne, -a, -ya, and –ba. Chen (2009) followed up Erbaugh’s study by looking at 44 transcripts of four groups of children, ages 2;2, 2;8, 4;0, and 6;0. He looked at four different types of topic constructions, two of which I will discuss here- dislocated topics, topicalization, adverbial topics and double-nominative topics. Only 1.2%-3.55% of the children’s utterances contained any type of topic construction, with the higher percentage produced in the older groups (4;0 and 6;0). The topicalized object
was produced the least frequently. Chen concluded that the children begin producing topic constructions by the age of 2;2 but do not show adult-like mastery of topics until age 4;0.

In Japanese, the canonical word order is SOV, but the word order OSV can be achieved through scrambling. In OSV scrambled sentences, the accusative marker –o is affixed to the fronted object; this order can also be obtained through topicalization, in which the topic marker –wa is affixed to the topicalized object (Sano 2004). In the literature that Sano (2004) discusses, Japanese children comprehend scrambling with the fronted objects as long as context is provided, and as long as the scrambled objects are definite, marked with –sono, which Sano calls a definite marker.

Sano investigates, in 50 Japanese children, ages 3-6, comprehension of topicalization and scrambling in utterances with and without the definite marker –sono attached to the topicalized object. In the topicalization items, the topic marker –wa is affixed in contexts with and without –sono. Sano hypothesizes two possibilities: (1) If all a child needs to understand topics is the topic marker, it will not make any difference whether –sono is attached or not; or (2) A child needs both –sono and the topic marker to successfully comprehend instances of topicalization.

In the group tested without –sono, all age groups performed poorly on the topicalization items, much worse than on the scrambling items. In the group tested with –sono for both scrambling and topicalization items, all age groups performed very well. Thus, context is required for the child to successfully comprehend topicalization and a distinction between comprehension of scrambling and topicalization is noted when there is no –sono attached.

Sano (2004) does not discuss why there’s such a difference in comprehension of scrambling over topicalization. One aspect to consider is the interpretation of the fronted object in scrambling and topicalization. Bošković (2004, 2009) shows that Japanese scrambling is
distinguished from topicalization in that the scrambled object is interpreted in its base position whereas the topicalized object is interpreted in its preposed position through operator-variable relations. Thus, semantics is involved in understanding the use of topicalization, which could conceivably lead to decreased comprehension without the use of context for the Japanese children.

To date, it appears that topicalization or CLLD is attested in child language and knowledge of the position for topic is distinguished from the subject position at an early age. However, there’s quite a bit of variability in the acquisition of topic with respect to mastery of topicalization, comprehension and production-wise, regardless of the ‘form’ in which the topic construction appears. This is consistent with my conclusion based on cross-linguistic evidence that topic structures are ‘somewhat rooted’.

One additional study regarding L2 learners shows that there is variability even in mastery of base-generated or non-gap topics. Mandarin allows base-generated topics or non-gap topics. That is, in these cases the topicalized object does not undergo movement. Yuan (1995) investigated whether 102 English L2 learners of Chinese can provide accurate judgments as to the grammaticality of utterances with base-generated/non-gap topics. The participants were tested as to their proficiency in Chinese and placed into five different groups according to their score, ranging from ‘Elementary’ to ‘Most Advanced’. Yuan found that the participants who were in the elementary to intermediate groups showed a marked decrease in grammatical accuracy of judgments compared to the advanced group, even between those who were 3rd year students and 4th year students. This disconfirmed Yuan’s (1995) hypothesis that the students

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28 These were students at a university and had been learning Chinese between 1-4 years. Some were teachers of Chinese.
would show relative mastery of base-generated topics in Chinese. Yuan attributed this to processing factors or a possible misanalysis of the NP as a subject rather than object.

Thus far, we have been looking at topic constructions in spoken languages and we now consider the literature on signed languages, in which the morphological markers of topics are not lexically realized but occur as an instance of nonmanual markers, i.e. “facial” morphemes.

3.4 Topic in signed languages

As noted earlier, signed languages typically have an accompanying nonmanual marker associated with the topic position such as ‘brow raises (br)’ or ‘squints’. Ever since Liddell (1980), it has been assumed that the ‘br’ is obligatory with topics in ASL. Aarons (1994) presents an extensive analysis of three different types of ‘br’ associated with topics. Type one, \( tm1 \), is associated with moved topics and marks topics that are objects of contrastive focus or emphasis (11). Type two, \( tm2 \), is similar in production to Type one, but is associated with new information and the topic is base-generated (12). Type three, \( tm3 \), is clearly different from the other two types in its production\(^{29}\) and is associated with given information as in ‘You know ____’. According to Aarons, this type is base-generated (13).

(11) Context: John doesn’t like Jane. It’s Mary he likes.
\[
\begin{array}{l}
\text{tm1} \\
\text{MARRY, IX-3-sg LIKE} \\
\text{‘Mary, he likes’}
\end{array}
\]

(12) JOHN, IX-3-sg LIKE MARY
\[
\text{‘As for John, he likes Mary’}
\]

\(^{29}\) Aarons (1994) describes this as a ‘br’ occurring with rapid headnods, raised lip, and a fixed gaze on the addressee. The other two types have ‘br’ also, but \( tm1 \) occurs with the head tilted slightly back and then moved forward and \( tm2 \) occurs with the head tilted sharply back and then moved forward. She claims these distinguish moved and base-generated topics respectively.
(13) JOHN, MARY LIKE IX-3-sg
‘You know John, Mary likes him’

However, Lillo-Martin and Quadros (2008) analyze tm1 as an instance of Information focus (I-focus, which is discussed more in depth in section 3.8) rather than as a topic marker, since it is used to provide new information. In their analysis, the focused material appears in Spec-FocP, which is located between the highest projection T-CP (base-generated topics) and TopP (moved topics)\textsuperscript{30}.

Rosenstein (2001), using spontaneous discourse and narratives in Israeli Sign Language, was unable to find a consistent non-manual marker associated with topics in this language. As in ASL and other signed languages, there is an intonational break between the topic and the rest of the clause. Based on this and the fact that ‘br’ is also observed as co-occurring with many other syntactic constructions such as yes/no questions, conditionals, and rhetorical questions with wh-phrases in ASL and other signed languages, Sandler and Lillo-Martin (2006) argue that nonmanual markers may best be understood as intonational markers rather than syntactic particles\textsuperscript{31}.

Following this line of reasoning, the rest of this chapter (and elsewhere in this thesis), I do not include nonmanuals as a criterion of syntactic correlation with the position for ‘topic’, preferring instead to focus on the sentential structure itself. However, this does not mean that I reject the premise of a topic nonmanual. It is assumed when a topic occurs, there will be some type of ‘br’ or other nonmanual markers produced, but the pause and separation from the rest of the clause is the intonational break that readily identifies it as a topic, comparable to what we

\textsuperscript{30} See Lillo-Martin and Quadros (2008) and Quadros and Lillo-Martin (2010) for more discussion on this.
\textsuperscript{31} Such optionality for topic marking is not unusual. Nakanishi (2001) argues that the topic marker –wa is used for both ‘theme’ and ‘contrastive’ topics. Syntax and morphology cannot distinguish between the two, but they can be identified through prosody.
observe in spoken languages. Thus, the ‘br’ in association with topic will not be discussed or transcribed further except as ‘top’ for topic, when necessary.

ASL and Libras share many similarities in syntactic structure and the constructions for topic and topicalization are presented as occurring in the same manner (Lillo-Martin and Quadros and 2008, Quadros and Lillo-Martin 2010). As in spoken languages, we see evidence of left-dislocated topics and topicalization in ASL and Libras (as seen above in 11-13). Although the following examples are primarily taken from ASL, it is also possible to sign these constructions in Libras (Quadros and Lillo-Martin 2010). As for right-dislocated topics, Neidle et al. (2000) claim that in ASL, Spec-CP is on the right periphery of the syntactic structure rather than the left. Most of the literature on the location of Spec-CP in ASL tend to agree that evidence points to Spec-CP (with some disagreement about where $C^0$ is) being on the left side (Wilbur 1997; Petronio 1993; Petronio and Lillo-Martin 1997; Wood 2009). Moreover, the picture is complicated by other analyses of sentence-final elements such as doubled focus, tags, or focused constituents (Sandler and Lillo-Martin 2006). At this time, we will not go further into this, but leave this for future research to tease apart the differences between these constructions and right-dislocated topics in ASL. Crucially, what we want to keep in mind is that both subjects and objects can undergo topicalization (14-15)\(^\text{32}\) or left-dislocation (16-17) in ASL and Libras.

\[
\text{top}
\]

(14) \_JOHN, e BUY HOUSE

‘John bought a house’

\[
\text{top}
\]

(15) \_HOUSE, JOHN BUY

‘John bought a house’

\[^{32}\text{ASL is a pro-drop language and, as such, null subjects or objects are commonly observed (Sandler and Lillo-Martin 2006). In this case, the ‘br’ is an additional marker for the topic, along with the prosodic break, confirming the subject’s status as a topic.}\]
In these sentences, no asymmetry between the subject and object is observed. Adult grammar allows either to be topicalized or base-generated as a topic.

However, the case for child grammar and L2 acquisition is not as clear. We will review some relevant research in the following sub-section, and return to this topic in section 4.7 where we discuss the issues regarding variability in the late learners’ acquisition of topics in Libras. There is scant research about acquisition of topics in signed languages. Most of it focuses on acquisition of the ‘br’ that accompanies topics, as expected from the emphasis placed on the ‘br’ in the literature on topics in signed languages. Much more research is crucially needed to understand fully the structural aspects of topics, i.e. topicalization and dislocated topics, along with their acquisition by Deaf children, both native and late learners.

### 3.4.1 Acquisition of topic in signed languages

As we have discussed earlier, ‘br’ are typically associated with several different syntactic constructions such as yes/no questions, conditionals, and topics. Reilly et al. (1990, 1991) analyze the acquisition of ‘br’ with respect to these constructions in Deaf children acquiring ASL. Because the face is also host to both affective and grammatical facial markers, expressions that show emotions such as surprise, happiness, anger, and sadness also look very similar to grammatical nonmanuals such as ‘br’ accompanying the above-mentioned constructions, and brow furrows ‘bf’ which accompany negation and wh-questions (Reilly et al. 1990, 1991). The child has to learn that a form very similar to the affective nonmanual marker can also be projected
as grammatical nonmanuals. Reilly et al. (1991) investigated ten Deaf native signers of ASL (with Deaf parents) ranging between 1;0 and 7;5, looking at both spontaneous and elicited production of brow raises. Children produced the ‘br’ for yes/no questions as young as 1;6 but did not produce ‘br’ with topics until much later, by age 3;0. Reilly et al. (1991) assume a conservative analysis, preferring to label constructions with object fronting as ‘topic’ only if accompanied by a ‘br’. However, they mention one utterance produced by one of the children in the study apparently before the age of 3;0 shown below in (18), although no mention of his/her actual age is made. Reilly et al. suggested it was “topic-like”, but refrained from labeling as such due to the absence of the ‘br’:

(18) BANANA, MOTHER EAT  
‘Banana, Mommy (is) eat(ing) it.’  
‘As for the banana, Mommy is eating it.’

(1.13, Reilly et. al)  
(their translation)

However, as mentioned earlier, I assume that nonmanuals are primarily intonational, following Sandler and Lillo-Martin (2006). Also, Nespor and Sandler (1999) argue that what distinguishes topic constructions is a prosodic break between the topicalized sign and the rest of the construction, rather than the brow raise, which is only one of the possible accompanying nonmanuals for topic, which may lend more support to the idea that ‘br’ are primarily intonational in nature, rather than grammatical.

In the case of the “topic-like” constructions (i.e. absent the “obligatory” brow raise) mentioned in Reilly et al. (1991), Chen Pichler (2001, 2010) argues that they are indeed topic constructions. Chen Pichler studies one Deaf child, native to ASL, with respect to her OV constructions, which are not instances of what she calls ‘reordering morphology’ (see Ch. 2 for a discussion of this). Of these non-reordered OV utterances, 41% were produced with a prosodic break by this child, ABY, by the age of 24.5 months, well before the age of acquisition of topics.
suggested by Reilly et al. (1991). However, there were also three other Deaf children, native to ASL, who did not produce the prosodic break in any of their OV utterances. Thus, we see more variability in the acquisition of ‘topic’ constructions in ASL, which further supports my proposal that ‘topic’ is ‘somewhat rooted’, i.e. derived word orders will be less rooted than basic word order, which in itself is also a ‘somewhat rooted’ property. That is, basic word order is probably “closer” to the ‘strongly rooted’ line than derived word orders. However, as discussed in the next section, topic is widely prevalent cross-linguistically, so the question arises to where topic as a property of languages lies on the continuum between ‘strongly rooted’ and ‘less rooted’.

3.5 Topic is ‘somewhat rooted’

Now that we have considered a wide range of evidence with regards to acquisition of topics in both spoken and signed languages, it is clear that topic is ‘somewhat rooted’. This seems to be attested by the different forms that topic can adopt in various languages, i.e. dislocated (base-generated) topics, topicalization, and (non)obligatory topic markers. We have seen topic cannot be classified as a ‘strongly rooted’ property of language, especially on the basis of the evidence presented by Japanese, Mandarin, and German.

Thus, contra De Cat (2002), even if a general notion of topic is universal, on my account it cannot be defined as strongly rooted - there is variability in the implementation of the notion topic across languages. It may be the case that topic is very close to the ‘line’ that divides somewhat rooted properties from the strongly rooted properties (as shown in Figure 1 in Chapter 1), and it is therefore accessible to learners as a means of indicating information structure. Topic is a ‘somewhat rooted’ property of language that is nonetheless prevalent cross-linguistically. This now brings up a new prediction with regards to its operation in homesigned
linguistic systems, late learners of a first language, and native signers/speakers, which we will discuss more in detail in the following sections.

3.6 Topic in homesigned systems and late learners?

Previously, we have looked into the ‘rooted properties’ of UG by testing native signers, late learners, and homesigners. There are certain components that we hypothesize to be ‘strongly rooted’, as discussed in Chapters 2 and 4. These should show up even in homesigners and late learners. The candidates so far for ‘strongly rooted’ properties are Merge, recursion, and structural dependency. With respect to ‘somewhat rooted’ properties, we looked at word order in Chapter 2 and will discuss Noun Noun compounding in Chapter 4.

In this chapter, we now look at another ‘somewhat rooted’ property of language by examining the comprehension of items containing a topicalized object in homesigners, late learners and native signers of Libras. We will consider the evidence for late learners of Libras and homesigners with regards to topicalization, which is constrained by UG but not required for language. We predict that homesigners will not reliably employ topic. More precisely, homesigners, having neither spoken nor signed input, may not exhibit ‘topic’ or utilize topicalization in their linguistic system. We also predict late learners will exhibit variable success, and native signers will be reliably successful.

3.7 Experiment

The goal of the experiment is to test whether the participants are able to comprehend instances of topic constructions with objects in the sentence-initial position, which are ordered OSV in comparison to SVO utterances. If the late learners and native signers of Libras are able
to comprehend instances of topic significantly above chance, then they are aware that their language constructs topic in the sentence-initial position. If the homesigners are able to comprehend instances of topic significantly above chance, then this may be evidence that their own linguistic system allows topic constructions in which the object occurs sentence-initially.

3.7.1 Participants

As discussed in Chapter 1, fourteen Deaf Brazilian adults were recruited (23-53 years old), through a Deaf Brazilian local who also assisted in the experiment. Five were native signers of Libras, six were late learners of Libras, and three were homesigners.

3.7.2 Procedure and Materials

For reasons of linguistic competence, two slightly different, but quite similar, experiments were run: one for native and late learner signers, and a separate one for homesigners.

Each native signer and late learner is shown a picture of some activity (for instance, the dog biting the cat in the picture (5) below), while the experimenter signed a sentence possibly corresponding to the action in the picture (as shown below the picture). The participant then has to determine whether the signed sentence ‘correctly’ or ‘incorrectly’ matches the picture. An example of the task with a sample picture given to the native signers and late learners of LIBRAS is presented in (19).

(19) A: Picture: dog is playfully biting a cat.
B: Experimenter: GATO, CÃO MASTIGAÇÃO
    cat, dog chew/bite
    ‘As for the cat, the dog is biting (it).’

C: Participant: CERTO/CORRETO or ERRADO/ INCORRETO
    right/correct or wrong/incorrect
    ‘That’s right/correct’ or ‘That’s wrong/incorrect.’

Before the task, each participant was given training, in which they were asked a series of
statements that would elicit the answer “correct” or “incorrect”, such as pointing to the female
experimenter and stating “She’s a boy”. Once the participant understood that he/she was free to
correct the experimenter (that is, to say the experimenter was right or wrong), the experimental
task was then initiated. A total of fifteen test items were administered with each participant.
Eight SVO sentences and seven OSV (topic) sentences were given, with “incorrect” and
“correct” corresponding pictures in each group. For instance, the answer for (5) above would
be to sign “correct”.

The homesigners had difficulty answering test questions as “correct” or “incorrect”, so
the experimental design was revised slightly. We provided them with two contrasting pictures
side by side, and the experimenter would sign a sentence derived from the homesigner’s gestures
that would correspond to the action depicted in one of the pictures but not in the other. The
participant then would choose the picture that matched the sentence. Again, half the sentences
involved the OSV order and half had SVO order.

3.7.3 Results

For each participant, their responses were scored as correct or incorrect. The results are
illustrated in Figure 2. A significant difference was found among the three groups using one-way

33 Actually, eight items were given with the OSV ordering, but one had to be removed because it was a
double object construction.
34 The order of the items was pseudo-randomized within each group.
ANOVA (F (2,9) = 54.67, p < .001). Post-hoc Tukey tests reveal that the homesigner group was significantly different from the other two groups. Indeed, homesigners were unable to comprehend topicalized sentences and, further, their performance on this experimental task was no better than chance.

In contrast, no significant difference was found between the late learners (LS) and the native signers (NS) (NS vs LS nonsignificant; NS vs HS, p < .01, LS vs HS, p < .05). Late learners and native signers of LIBRAS as a whole were able to comprehend topicalization significantly above chance.

However, two very late learners had particularly poor performances. Because of this variance in the late learners group, a follow-up analysis was performed. A single-sample t-test, using the mean score of the native signers (15.4 items out of 16 correct) as the baseline, showed that the homesigner group’s performance was significantly below the baseline (two-tailed p = .008) but the late learner group’s performance was not significantly different from the baseline.

![Performance on Topicalization Task](Fig. 2: Mean performance on topicalization task by Group)
An analysis using an exact binomial, one-tailed test sought further differences among the individual participants with respect to SVO and OSV utterances. An illustration of these results appears in Figures 3 and 4. All of the native signers performed significantly above chance (p < .004) with the SVO items; all of them correctly comprehended eight out of eight test items (see Figure 3). All but one of the native signers performed significantly above chance (p < .008) on the OSV items, correctly comprehending seven out of seven items (see Figure 4). One native signer was marginally significant (p < .06), correctly comprehending six out of seven items.

With respect to the late learners, on the SVO items, four participants performed significantly above chance (p < .04), correctly comprehending at least seven out of eight items. These four performed nearly as well as the native signers. Two of the late learners performed no better than chance, with L5 correctly comprehending six out of eight items and L6 correctly comprehending five out of eight items. Additionally, none of the homesigners performed significantly above chance.

On the OSV items, three late learners performed significantly above chance (p < .008), correctly comprehending seven out of seven items. Three late learners performed at chance, with L4 and L5 correctly comprehending five out of seven items and L6 correctly comprehending four out of seven items. None of the homesigners performed significantly above chance.
Looking more specifically at native signers and late learners of Libras, we see that participants in both groups were clearly able to comprehend all or most instances of topicalization in the task.
There were individual differences found in the late learner group, in which three participants were not able to comprehend all or most instances of topicalization.

3.8 Discussion
3.8.1 Spontaneous production of ‘topic’?

Although the homesigners in this study did not do well with the experiment involving topicalization, there were some interesting questions raised in the spontaneous production analysis, as mentioned in Chapter 2. Two homesigners produced constructions that were ‘topic-like’ (repeated below):

\begin{align*}
\text{(20)} & \quad \text{GO-AROUND-MEOW} \land \text{ME PET} \\
& \quad \text{walking-around-cat, I pet} \\
& \quad \text{‘Roaming cats, I pet (them)’} \\
\text{(21)} & \quad \text{PT-(OUT-THERE), HOUSE-ROOF} \land \text{APLANE-FLY-OVER} \\
& \quad \text{over-there, house, plane fly over} \\
& \quad \text{‘The plane flew over the house’}
\end{align*}

So, in both of these utterances, the homesigners produce the nonmanuals ‘br’ and a prosodic break (\land) that are traditionally associated with topics in signed languages, along with ‘bf’ which is not. The homesigner in (20) uses a ‘brow furrow’ and a prosodic break to separate the ‘topic’ from the rest of the utterance, which is marked with a ‘br’ and widened eyes. He had been talking about where he lived up in the hills and what he and his father would be doing. In those hills, there were roaming (i.e. outside or wild) cats up there and he would pet them. In (21), the homesigner had been talking about an event that had happened quite some time ago in which a musical group all died in a plane crash not far from where she lived. She had already mentioned the accident several times prior to this utterance and was telling me about it again, asking me if I
knew about it. In her utterance, she uses ‘br’ and a prosodic break to separate the ‘topic’ from the rest of the utterance, which is marked neutrally.

Clearly, the homesigners are utilizing some form of information packaging in their utterances, but the question arises as to exactly what type of information packaging they are using. These two constructions seem quite different in terms of which aspect of the information they are highlighting but both seem to be along the lines of a ‘topic-comment’ construction, which is commonly attested in signed languages (see Sandler and Lillo-Martin (2006) for a discussion of the literature on this). In (20), the homesigner is emphasizing his action of petting the cat. In (21), the homesigner is emphasizing the houses over there because that was near by where she lived where the plane crashed. The constructions in (21) appear to have two ‘topics’, one for ‘locative information’ and another for the NP, which has a relationship to the verb. However, in (20), the utterance has ‘new information’ as a ‘topic’ and a comment about that information.

Lillo-Martin and Quadros (2008) analyze topic and focus in ASL and Libras. They argue ASL and Libras employ information structure packaging to distinguish between focus, topic, and information-focus (I-focus) in what is traditionally considered ‘topic-comment’ constructions. Focus constructions tend to appear rightwardly, i.e. in sentence-final position, whereas topic constructions appear sentence-initially. I-focus appears sentence-initially, but contains ‘new’ information (in contrast to topic which is ‘old’ information). Both ASL and Libras allow I-focus and topic elements to co-occur in the same utterance as in (22-23):

(22) a. FRUIT, WHAT JOHN LIKE?  (Lillo-Martin and Quadros 2008)
   ‘As for fruit, what does John like?’

   t-c  i-foc
b..FRUIT, BANANA, JOHN LIKE MORE
   ‘As for fruit, John likes bananas best.’
(23)  a. WHAT YOU READ IX SCHOOL?  
    ‘What did you read at school?’ 

          I-foc _______ top 

    b. BOOK STOKOE, IX SCHOOL I READ 
    ‘I read Stokoe’s book at school.’ 

In (22), FRUIT is a base-generated topic, which they call ‘t-c’ as in ‘topic-comment’, while in (23), IX-SCHOOL is a topic that has undergone movement.

Likewise, the topic element in (20) ‘sets the scene’, which would be similar to someone saying “Those roaming cats up there, I petted them.” In this case, I would suggest that this is analogous to a left-dislocated topic. Most left-dislocated topics require a resumptive pronoun, which is not present in (20), but, as discussed in Beninca’ and Poletto (2004), only if they are associated with direct or partitive objects. At the moment, there isn’t enough information from the data to fully determine the nature of the topic, but the interpretation of the utterance comes the most closely to a left-dislocated topic, which is base-generated, i.e. ‘topic-comment’.

If the construction in (21) produced by the homesigner is a similar type of construction to (23), it would assume a more complex structure rather than simply ‘topic-comment’, which could be either a flat CP structure or none. Lillo-Martin and Quadros (2008) assume separate projections for base-generated topics, focus, and topic, shown respectively in (24):

(24) 

    T-C P 

          FocP 

            TopP 

Is this the case for (21)? Friedman (1976) argues that ASL has ‘topic-comment’ structure with no moved elements, with no relationship between the subject, object, and verb but Liddell (1980) argues against this, showing that derived word orders are instances of topicalization, i.e. NP or
VP movement. Rosenstein (2001) argues that ISL has ‘topic prominence’, i.e. topic-comment constructions, since topics are not necessarily required to be marked or to be arguments of the verb, which is one possible analysis for (20-21). At this time, we do not have enough data to decide the nature of these ‘topic-comment’ constructions in homesigners and clearly need more research into this.

If topics are indeed present in a homesigned system, this clearly shows that there is some mechanism available for positively setting the topic parameter. Goldin-Meadow (2003) did not find any clear preference for a position associated with ‘old’ information in her study of young homesigners, i.e. no indication that of ‘topic’ in their system. Also, one of the homesigners in my study did not produce any topic-like constructions. However, this does not necessarily mean that she does not have ‘topic’ in her system. It could be the case that the data collection was not large enough to find any. In any case, there is clearly some variability across homesigners as to the setting of this parameter.

However, it is clearly possible to assume there is an innate mechanism for setting the topic parameter. Singleton (1989) did a study with a young Deaf child, Simon, who learned ASL from Deaf parents who themselves learned ASL very late, around the age of eighteen (see also Singleton and Newport 2004). This child went beyond the input given to him by his parents, which is especially telling in his mastery of topic constructions. His parents were able to recognize constructions in which the subject was the topic, but not when the object was the topic. In an OSV utterance in which the object was the topic, the object was interpreted to be the subject, i.e. as an SOV utterance instead. However, Simon was able to interpret the object as the topic of the utterances, i.e. as an OSV utterance. Simon did not follow his parents’ assumption about the subject always being the topic. We assume that he was able to set the value for
topicalization positively and apply it accordingly, probably initially from the input that topics are allowed in ASL. From this and the spontaneous utterances produced by the homesigners that have ‘topic-like’ constructions, I argue that it is possible to set the topic on a positive setting in spite of impoverished or no input, due to UG being present in the system. That being said, topic is still a ‘somewhat rooted’ property, and not ‘strongly rooted’ since there is so much variation with regards to the type of topics and morphological markings for and variability in its occurrence.

3.9 Issues with the experiment
3.9.1 Results from homesigners

As mentioned above regarding the Singleton (1989) study on Simon, the responses of his parents only permitted the subject to be a topic. We discussed in Chapter 2 how late learners or second language learners readily learn the basic word order for ASL, which is SVO. His parents did well on their testing with respect to word order in ASL. However, they did not do so well with derived word orders. This was also seen in the study by Lillo-Martin and Berk (2003) with the two young children, MEI and CAL. They had more errors with respect to derived word orders, including ‘topic’, than with basic SVO order35.

Now, the question is- did this happen with the homesigners in the experiment? As we showed earlier, they did not do well on the experiment with either the SVO or the OSV ordering, with each person performing at chance. Let’s start with what possible grammars they might have: SVO, SOV, OSV, OVS. Out of these possible grammars, we can surmise that a NVN

35 Although Lillo-Martin and Berk (2003) were primarily looking at the orders produced by MEI and CAL (not comprehension of OSV items), it would be interesting to see if they made the same type of error as Simon’s parents did, assuming a SOV order rather than OSV ordering.
ordering would elicit either SVO or OVS interpretation and a NNV ordering would elicit either SOV or OSV interpretation.

There are several possible scenarios with respect to which results are predicted with the homesigners if we assume different word orders. If we assume that SVO is the basic ordering for the homesigner(s) in question, we would expect them to perform above chance on SVO items and below chance on OSV items since the object could be interpreted as the subject. Likewise, if we assume OVS is the basic word order, we would expect them to perform below chance on SVO items because they may switch the N items, i.e. O is interpreted as S or S is interpreted as O and they would perform at chance on OSV items because they may be uncertain how to interpret the ordering of the items so they would “guess” at the answer. Another scenario is that we assume SOV is the basic word order and if so, we expect them to perform at chance on SVO items because they would not know how to interpret the ordering of the items and “guess”. On the OSV items, they would be expected to perform below chance because they may reliably misinterpret the test items, switching the N items. Finally, if we assume the basic order is OSV, we should expect them to perform at chance on SVO items since they may not know how to interpret the ordering of the items and “guess”. They would be expected to perform above chance on the OSV items.

None of the homesigners show a pattern consistent with any of the possible scenarios described above because none of them performed significantly below or above chance on the test items. Using binomial exact probability, if a homesigner had performed significantly above chance on SVO or OSV test items, they would have at least 7 or more out of 8 correct, p=.035 on the SVO items or 6 or more out of 7, p=.0625 on the OSV items (which is marginally significant). If a homesigner performed significantly below chance on the SVO test items, 7 or
more out of 8 would be incorrect, $p=.035$ or on the OSV test items, 6 or more out of 7 would be incorrect, $p=.0625$ (which would be marginally significantly below chance).

If the test was run successfully, we would expect at least one of the patterns to emerge, but none of the patterns emerged in the results. The homesigners performed at chance for both SVO and OSV tests. We know from Chapter 2 that they have a strong preference for SV, and OV ordering, but their S, O, V ordering preference is not so clear, so maybe it is more difficult for them to work with constructions that have two arguments. We have seen that two of the homesigners produced in their spontaneous utterances ‘topic-like’ constructions, albeit only one example out of 100 syntactic units. Again, if we delve more deeply into this or construct better experiments, we may find more instances of ‘topic’ constructions. Why did they not do so well on the experiments, even if they did produce at least one ‘topic-like’ construction? Perhaps it is due to the nature of the experiment. It is easier to produce them spontaneously than it is to comprehend them via an experiment, especially when one has had no experience with ‘testing’.

### 3.9.2 Results from Late Learners

Another aspect of the results to consider is that regarding the variability with the late learners of Libras. As a group, the late learners of Libras performed significantly above chance, illustrating that acquisition of topicalization in Libras is dependent on some form of linguistic input, but not necessarily before the end of the critical period.

Further, since the premise of this chapter is that there are ‘degrees of rootedness’ in the acquisition of language, results were expected to correspond to the degree of input received by the signer, especially with regard to the very late learners of Libras. In fact, the results from this topicalization experiment nicely support the hypothesis that topicalization belongs in the middle level of the pyramid in Chapter 1, Fig.1; that is, it is somewhat rooted.
Recall that all of the native signers and all, but three, very late learners of Libras performed significantly above chance in their comprehension of topicalization. We will discuss two very late learners, L5 and L6 who performed at chance. The question arises as to why they did so poorly compared with the other late learners. Details of the performance of these two signers will now be presented. The participant L5 was a late learner of Libras, having learned it when she was approximately 21 years old. At the time of the testing, she was 29 years old. She has had very limited contact with the Deaf Libras community. Her family members were all hearing, as were her husband and children. She was discouraged from socializing with the Deaf community. This relative isolation from other signers obviously affected the consistency and continuity of Libras input for L5. I suggest that the requisite input she received was not of a sufficient quantity and quality to allow her to access the syntactic mechanism for topicalization in Libras. In contrast, another late learner in the group, L1, who started learning Libras at the age of 18 years and was 29 years old at the time of testing, performed significantly above chance. So, L5 and L1 had very similar backgrounds and acquired Libras at around the same age. They had both been using Libras for about the same amount of time. However, L1 had extensive contact with the Deaf Brazilian community, being very involved in activities and events, and maintained close relationships with other Deaf members of the community. This enabled him to receive the requisite input from the community of Libras signers on a consistent basis; his exposure had sufficient quantity and quality to allow him the access denied to L5.

The other late learner who performed at chance, L6, was a previous homesigner. At the time of testing, she had been using Libras for less than a year and a half (in contrast to most of the other late learners who had ten years or more of experience with Libras). Her lexical production was dominantly Libras. However, her results in the topicalization task pattern more
with the homesigners than with the other very late learners (who were, generally speaking, not previous homesigners). She was unable to comprehend instances of topicalization (as also seen with homesigners), unlike the other late learners. Since she clearly learned Libras well past the age of puberty, one could conclude that her results on this experiment follow from critical period effects on acquisition. However, it seems to be more the case that input (exposure to Libras) evinces different roles for L5 and L6 for reasons that relate to degree of rootedness for topicalization.

However, given that other late learners in this study and in other studies show evidence of understanding topicalization, we must acknowledge that, along with AoA being a secondary factor, the degree and length of exposure to Libras is of crucial importance for successful acquisition of topicalization. I argue that the degree of rootedness of certain syntactic constructions is relevant to the variability of the timing of acquisition, given different amounts of exposure in the following way. The more rooted a property is, the more likely it will be acquired early in the learning process, once exposure begins. If it is somewhat rooted or less rooted, then there is a greater degree of variability as to when it will be acquired in the learning process. The quantity and quality of exposure adds to the variability of acquisition. Quite possibly, only in least rooted language phenomenon will AoA be the most relevant (or only) factor to language acquisition.

Recall the study done by Lillo-Martin and Berk (2003) in which they observed the production of topicalization utterances of two deaf children, MEI and CAL, and found it to be significantly different from that of a two-year old Deaf native signer. MEI and CAL used fewer instances of topicalized utterances and made more errors when they did use them than the native signer. The period of time studied in that paper with these two children was approximately one
year (MEI 6;6 -7;1 and CAL (6;10 – 7;4). These children pattern similarly to the former homesigner L6 in my study, who had been learning Libras for only approximately a year and half. In both instances, a year and half or less of exposure to their sign language as a first language is not sufficient for the acquisition of topicalization. However, based on what we have seen in this study with the late learners of Libras, my prediction would be that MEI and CAL should eventually be able to use topicalization with a near-native level of competence.

Ideally, follow-up studies with L6 (or even MEI and CAL) would be conducted, to see whether she eventually acquires the syntactic mechanism for topicalization, as predicted by the results of the topicalization experiment. That is, these signers should pattern after the other late learners who had long-term and continuous exposure to Libras. L6 would be expected to show near-native comprehension of topicalization, given the assumption that she is being continuously exposed to Libras, unlike L5 who learned Libras but was not able to continue her exposure. Although, one question that could arise from the follow-up studies would be how much time it would take for L6 (or MEI and CAL) to reach the point of near-native comprehension. The answer to this would be interesting since we know that a year and half is not enough time, but ten years is. This is a testable hypothesis with other late learners of ASL or other signed languages that would provide illuminating results with regard to the degree of variability with somewhat rooted properties of language.

3.10 Conclusion

We have seen that ‘topic’ is a ‘somewhat rooted’ property of language that is associated with variability in its acquisition in homesigners and late learners of Libras. All three homesigners did not do well with the topicalization task, although not necessarily due to them
not having ‘topic’ in their linguistic system. Two homesigners produced ‘topic-like’ constructions in their spontaneous production, which will be the basis for future research exploring the nature of these constructions. Late learners of Libras, as predicted, showed variability across the group due to the nature of input being variable and not of a consistent quantity and quality with certain individuals. As a group, the late learners of Libras showed near-native acquisition of topicalization
Chapter 4
Degrees of rootedness- Noun Noun Compounds

4.1 Introduction

In Chapter 2, we looked at a property of language that is considered to be a linguistic universal, i.e. Merge. In my framework of ‘rootedness’, I proposed that this property is ‘strongly rooted’ in UG and will be evident in all linguistic systems, including those of homesigners. Merge is formally recursive and, therefore, if Merge is ‘strongly rooted’, then recursion as a linguistic property is also ‘strongly rooted’. In this chapter, we will pursue this dialogue and look at whether recursion as a generative mechanism of grammar is available to homesigners, late learners and native signers of Libras.

4.2 Recursion

Central components of UG include recursion and structural dependency. All languages are postulated to operate on the basis of recursivity because a mechanism for expanding a sentence must be in place (Chomsky 1976; Hauser, Chomsky, and Fitch 2002). As such, recursion is ‘strongly rooted’ and would be expected to appear in all linguistic systems. Later in this chapter, I will discuss further why we should see evidence of recursion even in homesigned systems.

Recursivity is reflected in the set of phrase structure rules (Chomsky 1976), understood in Minimalist terms as repeated applications of the process Merge, which we discussed in the
 Phrase structure (PS) rules, which generate syntactic structures in a given language, can apply over and over through recursivity, because the rules can apply to their own output (Crain and Lillo-Martin 1999). For instance, a recursive application of the PS rule for possessives is required to generate “Mary’s brother’s car…” The rules for the possessive phrase include:

\[
\begin{align*}
(1) & \ NP \rightarrow \ PossP \ N' \\
& \ PossP \rightarrow NP \ Poss
\end{align*}
\]

“Mary’s brother” would require one application of the PS rules, and then because the NP is inside the rule PossP → NP Poss, another application of the rules is needed to create the structure for “Mary’s brother’s car”. This application of the phrase structure rules can be repeated infinitely, giving rise to recursion. There’s no limit to how many possessive phrases we can insert. More precisely, recursion occurs with components of the same syntactic category. For instance, PS rules as in (2) introduce embedded sentences that can in turn insert another embedded sentence inside the first, as in ‘Bob believes that Mary thinks that Jim will dance with Sue’.

\[
\begin{align*}
(2) & \ IP \rightarrow NP \ I' \\
& \ I' \rightarrow I \ VP \\
& \ VP \rightarrow V' \\
& \ V' \rightarrow V \ CP \\
& \ CP \rightarrow C' \\
& \ C' \rightarrow C \ IP
\end{align*}
\]

There are different types of recursion- self-embedding, which we’ve just seen in examples (1-2), iterative, which employs repeated iterations of the same lexical item as in ‘very, very, very rich’,

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36 Of course, even with the infinite number possible, we have a maximum limit for processing the phrases. However, the point here is that Merge can be applied infinitely in a recursive loop.
and scopal, which generates semantic information recursively down the tree, such as variable binding and negative polarity (Roeper and Snyder 2005).

In this chapter, we will be looking at a type of self-embedding recursion that is expressed in the use of noun-noun compounds (NNCs). Each nominal in the compound can itself be composed of a noun-noun compound as in (3 a, b):

(3) a. 
```
  N       N
  dog     house
```

b. 
```
  N       N
  dog     house
```

We can create a recursive compound (seen above in (b)) ‘dog house door’ from the output ‘dog house’ which is a lexical compound, i.e. a compound with a fixed meaning. However, the recursive compound ‘doghouse door’ is a novel compound which could have different meanings, such as a door that has a doghouse drawn on it, a door that is designed for doghouses, a door that is cut out in the shape of a doghouse, and so on.

Novel, productive compounds involve a morphological operation in which the NNC has the properties of a ‘single, complex word’ (Snyder 1995, 2001). As discussed earlier with respect to Principles and Parameters postulated by Chomsky (1981), parameters are set according to specific values for different languages, thus providing an impetus for language variation. Snyder (1995, 2001) proposes that UG contains a parameter which he calls The Compounding Parameter (TCP):

(4) The grammar \{disallows*, allows\} the formation of endocentric compounds during the syntactic derivation. [*unmarked value]

The compounding governed by the Compounding Parameter concerns novel, productive compounds. Lexical compounds are not under the purview of the Compounding Parameter.
Endocentric compounds are those in which there is a head. For instance, in the compound ‘doghouse’, ‘house’ is the head of the compound as the compound is about what type of house it is. In the novel compound ‘doghouse door’, the head is ‘door’ as the compound refers to the type of door. Note that in English, the head is always on the right, but this is not always the case in other languages. Languages differ with respect to whether endocentric compounds are left-headed or right-headed, but typically they are right-headed (Scalise and Fábregas 2010; Meir et al. 2010). Exocentric compounds are those in which neither member of the compound can be interpreted as the head of the compound, as in ‘flat-foot’ which refers to a policeman rather than feet that happen to be flat, ‘egghead’ which refers to an intellectual, not a head shaped like an egg (Zwicky 1985; Bauer 2008, among others). There are languages such as French that allow lexical compounds (consisting of bi-nominals) but do not permit novel, productive compounds (Snyder 1995, 2001). Recursive noun compounds such as ‘basketball program book’ or ‘zoo book box’ would be not allowed in French-like languages.

4.3 Acquisition of NNC

Previous studies in English, German, and Chinese (and others not mentioned here) show evidence of novel, productive NNC in child language. Children in these languages readily

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37 There are other types of compounds that combine words from different categories, i.e. V + N as in ‘pickpocket’ or Adj + N as in ‘roughhouse’. Hence, compounds can combine words from different lexical categories as one word. However, we will focus on noun-noun compounds in this thesis.

38 To be clear, we are looking at studies of languages that allow productive, novel compounding. As mentioned above, there are languages such as French (or Spanish) that allow lexicalized compounding, but not productive compounding, in which new words are readily innovated via compounding. Also, there are languages such as Arabic or Hebrew that appear to have productive compounds but are not under the purview of TCP. These compounds are construct-state expressions, a process of nominal compounding with the definite marker inserted (see Borer 2009 for some discussion on construct-state compounds in Hebrew).
innovate new lexical items using NNC at a relatively young age (Augst 1975 cited in Mills 1986; Chen et al. 2009). In English, Snyder (2001) shows that production of novel compounds occurs before or around the age of 2.5 years, suggesting that English-speaking children have possibly set TCP at the marked setting around this age. However, Roeper, Snyder, and Hiramatsu (2002) suggest that it is not enough for the child to consider bi-nominal compounds as sufficient evidence for TCP. Instead, they argue that recursive compounds, which use three or more nouns in the compound, are a possible trigger for [+TCP], (but not the only one). As cited in Snyder (1999), a robust number of recursive compounds were used by adults, such as ‘Christmas tree cookie’ or ‘baby doll napkin’, as the input for children acquiring English.

Snyder’s (1995, 2001) crosslinguistic survey shows that the availability of NNC is strongly associated with the availability of complex predicate constructions in a given language, including adjectival resultatives, V-particle constructions, make-causatives, perceptual report, put-locative, to-Dative, and double object datives. In particular, languages that permit adjectival resultative constructions (e.g. 'John wiped the table clean') and/or separable-particle constructions with directional particles (e.g. 'Mary tore the lid off') are reliably languages that also exhibit creative NNC. On the other hand, the specific types of complex-predicate constructions that are available in a [+TCP] language varies. For example, Japanese and ASL have NNC and resultatives, but no separable-particle construction.

Based on this evidence, Snyder argues that the Compounding Parameter (TCP) given above also governs complex predicates. Specifically, when set on the positive setting, TCP provides the operation for NNC and for the formation of complex predicates in a language. Therefore, if a language has complex predicates, it will have NNC.
Acquisitional evidence for the Compounding Parameter has been provided by studies with data from English and Japanese. In Snyder (2001), the transcripts of ten children from the CHILDES database were studied. The first clear use of a given construction, if followed soon after by additional uses, with different lexical items, was deemed as the age of the acquisition of that particular construction. Snyder identified the age of acquisition of novel noun-noun compounding and correlated these ages with the ages of acquisition of the verb-particle construction (as reported in Snyder and Stromswold, 1997). There is a robust correlation ($r = .98$, $t(8) = 12.9$, $p << .001$) between the age of the first clear use of NNC and the age of the first clear use of complex predicate (verb-NP-particle construction). Therefore, in English the value of the Compounding Parameter is set at the positive setting and, typically, it is set before or around 2.5 years of age (Snyder 1995, 2001).

However, in Japanese, the Compounding Parameter appears to be set much later than for children acquiring English. Miyoshi (1999) argued, contra Snyder (1995), the Compounding Parameter is set for the positive value in Japanese\(^3\). Sugisaki and Isobe (2000) confirm Miyoshi’s claim regarding NNC and resultatives in Japanese, but found that the mean age of acquisition for NNC in their sample was 3;7. In their study, a robust contingency was obtained between the acquisition of NNC and of resultatives in Japanese ($p = .0194$ by the two-tailed Fisher exact Test). Their experiment involved twenty children between the ages of 3;4 and 4;11 years old, and it tested their production of NNC (in an elicited production task) and comprehension of resultative constructions (in a truth value judgment task). Ten children who

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\(^3\) Snyder (1995) analyzed Japanese resultatives as adverbials. He concluded that Japanese does not allow complex predicates, according to his criteria that if the construction in question has an ‘adverbial construction’, then it is not considered as a complex predicate. Miyoshi shows that resultative constructions which superficially appear to be adverbial are allowed to undergo long-distance scrambling (unlike adverbs) and must be base generated within $V'$, hence resultative constructions are distinct from adverbs.
passed the NNC test also met the criterion for passing the Resultative test. Also, six children who failed to meet the criterion for passing the NNC test likewise were not able to pass the Resultative test.

This bears out the prediction set by the Compounding Parameter. If a child has acquired the operation for resultatives, s/he should be able to show evidence of NNC. Likewise, if the child has not yet acquired NNC, s/he should not be able to produce or comprehend resultatives. Although there were also a few Japanese children who passed one test and failed the other in both directions, this was attributed to the test design itself. The contingency test showed that there was a strong relationship between passing/failing the two tests. The Compounding Parameter was shown to be set by about age 3;7 in Japanese, which is considerably later than for children acquiring English. This delay was suggested to occur from the paucity of input with respect to NNC in Japanese, therefore requiring more time for children to arrive at the correct value of the Compounding Parameter.

In order to understand more about why there’s a considerable delay in setting the Compounding Parameter in Japanese child language, Sugisaki (2002) investigated the number of recursive noun compounds, i.e. more than two nominals in the compound, in the input to Japanese children and found only two examples of such from 21,056 utterances. Based on this, he proposes that in order to set the value of the Compounding Parameter, children must have access to a certain number of recursive noun compounds before deciding whether their language is English-like or French-like in NNC. Sugisaki suggests that it may take some time before that input becomes sufficient for the child to positively set TCP. On the assumption that adjectival resultatives are rare in Japanese input (as they are in the English input), and that there are few if any other triggers available in Japanese, it follows that TCP will be set to the positive value considerably later in
Japanese than in English. Hence, a delay occurs in the acquisition of both recursive noun compounds and resultatives for Japanese.

4.4 Compounding in signed languages

Compounding is well-attested in signed languages cross-linguistically as a means for creating words. The languages studied so far illustrate processes of lexical compounding and/or productive compounding: American Sign Language (Klima and Bellugi 1979), Swedish Sign Language (Wallin 1983), Israeli Sign Language (Sandler 1993), British Sign Language (Brennan 1990), Arabic Sign Language (Abdel-Fattah 2005) among others. The table in (5) below from Meir et al. (2010) provides examples of compounds in different sign languages:

(5) Compounds in signed languages

<table>
<thead>
<tr>
<th>Language</th>
<th>Compound</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Sign Language</td>
<td>BED-SOFT</td>
<td>‘pillow’</td>
</tr>
<tr>
<td>British Sign Language</td>
<td>WORK-SUPPORT</td>
<td>‘service’</td>
</tr>
<tr>
<td>Israeli Sign Language</td>
<td>HEART-OFFER</td>
<td>‘volunteer’</td>
</tr>
<tr>
<td>Australian Sign Language (</td>
<td>NOSE-FAULT</td>
<td>‘ugly’</td>
</tr>
<tr>
<td>Johnston and Schenbri 1999)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al-Sayyid Bedouin Sign Language</td>
<td>CAR-LIGHT</td>
<td>‘ambulance’</td>
</tr>
<tr>
<td>(Aronoff et al 2008)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indo-Pakistani Sign Language (</td>
<td>UNDERSTAND-MUCH</td>
<td>‘intelligence’</td>
</tr>
<tr>
<td>Zeshan 2000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand Sign Language</td>
<td>MAKE-DEAD</td>
<td>‘fatal’</td>
</tr>
<tr>
<td>(Kennedy 2002)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note that these compounds are signed as one word and do not always have a meaning that is directly observable from the words in the compound. For instance, NOSE-FAULT in Australian Sign Language means ‘ugly’, but a car could be described as ‘ugly’ although it has no nose.

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40 ASL and Libras have productive novel and lexical compounding (Snyder 2001, Wood 2004 (for ASL); Quadros (p.c. for Libras). As for the other signed languages listed here, it is not clear whether they have productive novel compounding or if the process of compounding only extends to lexical compounds.
Klima and Bellugi (1979) were instrumental in demonstrating the processes of creating a compound in American Sign Language (ASL), which have also been observed to hold true in other signed languages.

In spoken languages, compounds are distinctively identified by the patterning of stress, timing, and rhythm exhibited in the component words. For instance, in English, the phrase ‘black bird’, has stress equally marked on both ‘black’ and ‘bird’, but if one hears this phrase as a compound ‘blackbird’, i.e. one lexical item, the stress is assigned to the first word ‘black’. So if I were to say ‘black bird tree’, the meaning would refer to a tree that is for birds that happen to be black or a black tree for birds. On the other hand, ‘blackbird tree’ would refer to a tree that is for blackbirds, i.e. a particular species of birds and the stress would be marked on ‘black’ since ‘blackbird’ is a lexicalized compound, with word-initial stress. Moreover, ‘black bird tree’ is probably a compound as well, but it has not been lexicalized with a specific stress pattern.

Similar processes are observable in sign languages as well. Five processes of creating a compound in ASL are generally identified as in (6) below (Klima and Bellugi 1979; Liddell and Johnson 1996):

(6) a.) shortening or reduction of movement in the first sign; WATER-RISE (‘flood’) The sign for WATER in ASL is typically repeated several times in its location, but in the compound for ‘flood’, the movement is reduced to a single movement.
b.) Deletion of repetition in the second sign; TRUE-WORK (‘actually/seriously’) The sign for WORK in ASL is typically repeated twice but in this compound, it is only produced once. This is not as prevalent as the process described in (a) and there are several exceptions noted.
c.) Anticipation of the handshape of the second sign: HEART-HIT (‘heart attack’). This is a process in which the second sign immediately moves up in space to join with the first sign. We see this in compounds far more frequently than with individual signs in a sentence.

d.) Transition between signs is smoother and more fluid rather than when signed as two distinct words. As discussed earlier, the reduction and deletion of movement creates a distinctive prosody that identifies the compound signed as a single sign.

e.) Duration of compounds is compressed and takes approximately half the time it takes to sign the phrase as two separate words.

Using these criteria to identify compounds in ASL and other signed languages allows us to observe the processes of creating lexicalized and novel, productive compounds\(^{41}\). As discussed in Meir et al. (2010), sign language compounds are typically sequential compounds\(^{42}\); some have a head (endocentric) such as TREE-HOUSE, but in others, neither word is a head (exocentric) as in FACE-STRONG ‘family resemblance’; or they can be coordinate compounds such as NECKLACE-RING-BRACELET for ‘jewelry’, which are similar to dvandva compounds in which all of the constituents are part of a superordinate category.

\(^{41}\) However, these properties seem less pronounced for novel compounds and more prominently featured in lexicalized compounds.

\(^{42}\) Another type of compounds that is not found in spoken languages but can be found in signed languages due to the modality is simultaneous compounds (Meir et al 2010, Brennan 1990). Brennan (1990) suggests one example from British Sign Language can be seen with the sign TYPE-TELEPHONE for ‘MINICOM’, which is a classifier compound for a device that allows Deaf people to make phone calls to others. The sign for TELEPHONE is signed simultaneously and directly over the sign for TYPE. This type of compounding is rare and has not been extensively studied, but it does exist, which is not necessarily surprising given the relative independence of the two main articulators (hands) afforded by the signed modality.
4.4.1 NNC and Resultatives in signed languages

As noted earlier with respect to Snyder’s (2001, 2012) discussion of the Compounding Parameter, languages that allow endocentric novel, productive noun-noun compounds are [+TCP], and may also exhibit complex predicates such as resultatives. On his approach, a point of classification arises with respect to whether a language has the default [-TCP] setting (French-like), or the positive setting (English-like). There is no current data for the sign languages discussed above with respect to whether they display complex predicates such as adjectival resultatives, except for ASL. In adult use of ASL, productive compounding is clearly noted and adjectival resultatives are grammatical, as illustrated in (7).

(7) IX PAINT BIKE YELLOW
   ‘He painted the bike yellow.’

This would point towards a positive setting for the Compounding Parameter in ASL. However, there are other constructions, such as verb-particle structures, that are also associated with the acquisition of novel, productive compounding. ASL does not have verb particles in its grammar. It would not be possible sign something like ‘John looked up the phone number’ with a separate particle for ‘up’. For many complex predicate constructions, ASL often uses classifiers, which are signs that have both the noun and the predicate incorporated in one sign. Further research is required to identify all possible forms of complex predicate construction that can be correlated with NNC in ASL. For this reason, we focus the discussion here on resultative complex predicates.

Wood (2004), looking at the correlation of noun-noun compounding and resultative constructions in the acquisition of ASL, tested seventeen Deaf children, ages 3:0-6;11 (average age 5;0), from two different states (Indiana and New York) in the United States who are native signers of ASL. The results were not clear-cut, since not all of the children were able to fulfill the
stringent criterion set by Wood for passing the NNC part of the experiment, namely, that the child must produce a NNC on five out of six trials. All of the children also produced resultatives. Using a looser criterion of producing at least one NNC to pass the NNC task, the children who passed the NNC task also passed the Resultative task, which supports Snyder (2001, 2012). That is, all of the children who were able to comprehend the resultatives also produced at least one NNC, when given the opportunity.

Wood suggests that there is a possible delay in setting the compounding parameter for [+TCP], since the production of recursive NNCs were low for even the older children. In a pilot test, she administered the same tasks with an older Deaf child, age 7:9, and Deaf adults who easily and readily produced a large number of recursive NNCs and resultatives. That is, they were able to not only comprehend resultative constructions and NNCs but also produce them with ease. Based on this, Wood surmises that ASL is [+TCP] but may have some other rule blocking the association between the acquisition of compounds and resultatives, which causes a delay in the positive setting of the Compound Parameter43.

Another possibility is that the input is scarce with respect to recursive nominal compounds for the children acquiring ASL, much like Japanese as shown in the Sugisaki and Isobe (2000) study. Wood (2004) surveyed transcripts of 33 sessions (~1 hour long each) from four Deaf children interacting with their parents and experimenters, in order to investigate spontaneous production of NNC and resultatives44. The transcripts were from videotaped sessions of spontaneous production of ASL from the ages of eighteen months to three years old

43 We will discuss this idea a bit more in detail in section 3.8 in conjunction with the results for the experiment with the homesigners, late learners and native signers of Libras.
44 Transcripts were obtained through the University of Connecticut CLESS project. Our thanks to them for allowing us to use their transcripts for this study. See Lillo-Martin and Pichler (2008) for a detailed description of the CLESS project.
for each child. In the transcripts, only a total of four NNC were found in the input. Three of these compounds were produced by the hearing experimenter present and only one was produced by any of the Deaf adults in the family present in the video. Recursive NNCs were not found in any of the sessions. Only three resultative constructions were found. In this case, ASL appears to be somewhat like Japanese. More experimental research is required for ASL and other sign languages to ascertain the precise nature of the relationship between noun-noun compounding and resultatives plus other complex predicate constructions since it is clear that spontaneous production is not readily accessible for determining the ages of acquisition for NNCs and resultatives and thus the setting of [+TCP].

For the time being, I will assume that if a sign language allows novel, recursive compounds, i.e. three-sign nominal compounds, it is tentatively [+compounding], since based on Synder (2000, 2012), if a language allows resultatives, it will also allow NNCs, which is how we classify ASL as a [+TCP] language. However, if we do not have access to data regarding resultatives, but do have access to data for NNCs, we can tentatively conclude it is [+TCP], if and only if there are recursive, novel NNCs produced, since languages that are [-TCP], as in French, do not allow recursive, novel NNCs. In this chapter, we will not investigate the association between noun-noun compounding and resultatives, but we look for evidence of recursion, which is readily observable in the production of recursive nominal compounding, in homesigned systems and Libras (late and native acquisition).

Using some of the observable processes outlined in (4) above as a baseline for identifying compounds in Libras and homesigned systems, we can proceed with the experimental task investigating production of novel, recursive (three-sign) compounds. To date, there is no published work on compounding in Libras, but consultations with linguists who work with
Libras and native signers of Libras attest that novel, productive compounding is prevalent in Libras, and that the processes outlined in (4) are also found in these compounds. Later in this chapter, we will see that native signers of Libras produce novel, recursive compounds and they are readily identifiable by the processes we have just discussed.

With regards to homesigned systems, our first goal is to establish whether homesigners produce compounds. If so, we should not expect their processes of creating compounds to be as ‘fluid’ as in mature, established signed languages, because the participants may have difficulty with the task and processing the linguistic demands for producing compounds. However, we should use some ‘criteria’ as a means of determining whether the signs produced in the compounding task (discussed later in this chapter) are signed as a compound, or as a sequence of separate words. The criteria in this chapter are based loosely on the five processes discussed above, but less stringent. This way, we can determine whether there is a structural relationship between the signs in a single utterance rather than a paratactic string of words being used.

For instance, we will look at the prosody of the putative compound signs, the timing, and the transitions between the signs. A homesigner, faced with this new task never done before and being asked to produce a compound sign, may have some processing delays. So, one criterion would be that the homesigner’s hands are in the air the whole time the compound is being produced, but may have some delay between the signs. However, if the homesigner drops their hands between each sign, that is a clear instance of the words being signed separately and not as a compound. When signed as separate words, the prosody, timing, and transitions between the signs are readily observed.
4.5 Structure-dependence

In chapter 2, we looked at structure-dependence and also at the ordering of the Noun + Adjective phrases in the spontaneous utterances of the homesigners and late learners of Libras\textsuperscript{45}. Structure-dependence is a linguistic universal that should be seen in all linguistic systems. One way to observe structure-dependence in recursive nominal compounds is to look at their head and modifier ordering. That is, if the string of nouns is produced, presumably, as a compound, there should be a structural basis for the position of the head and modifier inside the deeper compound. In other words, the constituents of the inner endocentric compound should be composed of a head and its modifier, most likely following a particular order, and then that compound merges with another nominal, which may be the head or the modifier of the full recursive compound.

Wood (2004) discusses how recursive noun-noun compounds in ASL such as PAPER FLOWER BOOK (‘a book with/about flowers made of paper’) exhibit this structural dependency. In ASL, a required fixed word order for the embedded elements (PAPER FLOWER) appears along with reversible word order for this constituent and the head BOOK. It is possible to have either PAPER FLOWER + BOOK or BOOK + PAPER FLOWER with the same meaning in both cases. However, PAPER FLOWER is a constituent and it is ungrammatical to change the ordering for these two nouns as shown in (7 a, b) below. Furthermore, it is also ungrammatical to interrupt the constituent PAPER FLOWER with the noun BOOK, as in (8 c,d).

\begin{enumerate}
\item \textbf{a.} *FLOWER PAPER BOOK
\item \textbf{b.} *BOOK FLOWER PAPER
\end{enumerate}

\textsuperscript{45} The ordering alone does not entail structure dependence. It’s the relationship between the two syntactic items that illustrates structure dependence.
c. *PAPER BOOK FLOWER

d. *FLOWER BOOK PAPER

Thus, there is a clear structural dependency (hierarchy) in the formation of recursive compounds. One can see this from the structures given in (9) below. The N-N compound that is the modifier of the head noun in the recursive compound may be ordered either prenominally or postnominally. However, one cannot vary the order inside the deeper compound or insert a noun inside it.

\[
\begin{array}{ccc}
(9) \text{a.} & \text{N} & \text{b.} & \text{N} & \text{c.} & \text{N} \\
\text{N} & \text{N} & \text{N} & \text{N} & \text{N} & \text{N} \\
\text{book} & \text{paper} & \text{flower} & \text{paper} & \text{flower} & \text{book} \\
\text{paper} & \text{flower} & \text{paper} & \text{flower} & \text{paper} & \text{flower}
\end{array}
\]

In this study, we attempt to elicit novel recursive noun-noun compounds with homesigners, late learners of Libras, and native signers of Libras. Libras allows NNC, with what we assume has more strict (than ASL) ordering, since Libras requires the Noun + Adjective ordering in noun phrases. We predict that the ordering for NNC will be head + modifier, following along the same lines of ordering for the noun and adjective in Libras\(^{46}\). For homesigners, we expect the ordering to vary either way for the head and modifier since the ordering, as we saw in chapter 2, for adjectives was either prenominal or postnominal (or both). Crucially, we look at the ordering with respect to the head and modifier in that the structural relationship between the two is not “interrupted” with another constituent inserted between the

\[^{46}\text{According to Beard’s (1996) cross-linguistic survey of languages, the ordering of the head and modifier should be the same as its ordering for noun and adjectives. We discuss this further in section 3.8.}\]
two, keeping in mind that the absence of consistent ordering does not constitute evidence for absence of structure.

4.6 Why look for NNC in homesigned systems and late learners?

As mentioned earlier in this chapter, languages tend to behave like French or like English with respect to novel, productive compounding. So, not all languages have a positive setting for the Compounding Parameter. Moreover, some languages may have a positive setting but evince a considerable delay in setting the value for the Compounding Parameter, as we saw with Japanese and ASL. This indicates that NNC is not strongly rooted, i.e. it might be considered ‘somewhat rooted’. The Compounding Parameter is based in UG and provides choices for the language, which can take some time to set, thus providing the impetus for more variability in its acquisition with late learners and native signers/speakers of a given language (with a positive setting for the Compound Parameter). Given this generalization, why would we use NNC as a diagnostic for recursion in homesigners? Typically, properties of language that are ‘somewhat rooted’ are not expected to occur in homesigners and should evince variability in their acquisition by late learners, as we saw in chapter 3 when discussing acquisition of ‘topic’.

A preliminary study with Nicaraguan homesigners by Richie et al. (in press) show use of compounding in reference to items in a naming study, such as ‘cow’, ‘orange’, and ‘potato’. The homesigners in this study frequently produce compounds such as ‘ANIMAL-HORNS-MILKING to refer to ‘cow’. Another study by Meir et al. (2010) reveals prolific use of compounding in a young sign language, Al Sayyid Bedouin Sign Language (ABSL). ABSL is a relatively young, emerging sign language that has been created in the Al Sayyid Bedouin community, which both Deaf and hearing people use to communicate with each other.
Meir et al. studied compounds used by second and third generation signers of ABSL, and found that compounding is one of the most productive uses of morphology in the language. They looked at responses that were signed fluidly and without hesitation, showing phonological reduction between signs in the compound. The most common forms of compounds are Verb + Noun as in COOK^WIDE-OBJECT for ‘stove’ or SQUEEZE^ROUND-OBJECT for ‘lemon’. There are some nominal compounds such as MOVIE^WIDE-OBJECT for ‘tv’ and COFFEE^POT for ‘coffee pot’.

Meir et al. (2010) suggest that endocentric compounds are frequently signed in Modifier + Head order, which does not follow ABSL’s ordering for Noun + Adjective, but a deeper look at their data shows that the ordering for endocentric compounds is quite variable with respect to the head and modifier order\(^\text{47}\). ABSL signers also produced exocentric compounds such as SWEAT^SUN for ‘summer’. A large percentage of the signers’ responses in the picture-naming task were multiple word responses, but not all of them were counted as compounds. Meir et al. (2010) do not discuss any instances of three-sign compounds, so it is not clear if the ABSL signers make use of recursive compounding.

Given the instances of compounding found in homesigned systems (Nicaragua), ABSL, and many other signed languages, it seems plausible that NNC can be a useful diagnostic for looking at recursion in homesigners and late learners of Libras. Of course, since NNC itself is ‘somewhat rooted’ due to its variability in acquisition and the fact that not all languages employ novel, productive NNC, we cannot assume that homesigners will have NNC. If they do produce novel, productive three-sign compounds, this can be taken as positive evidence for recursion in their system. That is, such productions will provide evidence that the mechanism for recursion is

\(^{47}\) Later we will see how this is relevant for the data with respect to the ordering of the head-modifier in compounds signed by the Libras signers. They also have strict N + A ordering, but show variability in the head-modifier ordering for compounds.
available to the homesigners and they readily capitalize upon this for creating new words extemporaneously.

On the other hand, if novel, productive compounds are not produced by the homesigners, we cannot assume that indicates an absence of recursion in their system. It just means we have to look elsewhere. However, we do predict that late learners of Libras should be able to produce NNC because novel, productive NNC is allowed in Libras. There may be some variability in how well it is acquired, but we expect all late learners to be able to produce at least one recursive NNC.

Recursion is ‘strongly rooted’, being a linguistic principle, which means that the language learner or creator (homesigner) has access to this principle from UG so it should show up in their system one way or another, even if it does not show up in their production of NNC. In the next section, we will look at the experimental task for eliciting NNC from late learners and native signers of Libras and homesigners.

4.7 Noun-Noun Compound Task

In this study, we hypothesize that, in homesigners, late learners, and native signers, structure-dependence and recursion will be evident in their production of recursive NNC.

4.7.1 Experiment

The goal of this experiment is to test whether each participant produces at least one novel three-sign Noun-Noun compound to describe/identify an item, thus showing evidence of recursive nominal compounding.\(^{48}\)

\(^{48}\) Two-sign compounds are expected, but in this experiment, the goal is to find evidence of recursive noun-noun compounds in the use of three-sign compounds.
4.7.2 Participants

As discussed in Chapter 1, fourteen Deaf Brazilian adults were recruited (23-53 years old), through a Deaf Brazilian local who also assisted in the experiment. Five were native signers of Libras, six were late learners of Libras, and three were homesigners.

4.7.3 Procedure and Materials

Each participant was shown twelve actual items, all of which have been selected to elicit a recursive Noun-Noun compound (NNC). During the “training” portion, we showed the participant three items with two characteristics (for example, a sofa blanket or a computer table), and asked him/her for their signs for each item\textsuperscript{49}. For example, we would point to a blanket (that is on top of a sofa) and ask them to produce the sign for the blanket and then we would point to the sofa and again ask them to produce the sign for the sofa. Often, the signers would spontaneously produce a two-sign NNC at this point. We would affirm the compound production by nodding our head or signing ‘okay’. Then we would give a scenario in which they had to look for the item and ask someone if they had seen “it”. They would then produce a short narrative and produce a noun-noun compound\textsuperscript{50}, as shown below in (10). Sometimes, the homesigners and late learners of Libras needed additional prompting, but we did not sign the compound for them. We would try to come up with another scenario in which they would produce one themselves and affirm their production. If they produced a compound on their own, we would repeat it back to them. If they did not produce a compound or signed a different way to describe the item after a little prompting, we moved on to the next item and did not pursue the question further.

\textsuperscript{49} With native signers, we used Libras signs for the objects in the test items. However, with homesigners and late learners of Libras, we asked them for their own gesture/sign for the item.

\textsuperscript{50} Recall from the earlier discussion that the ordering for NNC in Libras is head + modifier.
(10) Practice Items:

(a.) A blanket for the sofa BLANKET-SOFA
(b.) A table for the computer TABLE-COMPUTER

Then, we commenced with elicited production of recursive noun-noun compounds, using the same method that we used for the training items. A total of 12 test items were given to each subject. Examples of test items are shown below in (11), presented in the head + modifier order expected in Libras. A list of the test items is presented in Appendix B for this chapter\(^5\).

(11)

(a.) A picture frame with a pig on front FRAME-PICTURE-PIG

(b.) A necklace with a pen with a frog on its cap NECKLACE-PEN-FROG

4.7.4 Results

All of the participants produced at least one 3-sign NNC. Figure 1 shows the totals produced by each participant for 2-sign and 3-sign NNCs. Some of the participants produced more than one NNC construction for the same item, which are included in the total number of NNCs produced by each signer. All head + modifier NNCs were included, both 2-sign and 3-sign, for the Libras signers (late and native). A total of thirty-five 3-sign NNCs and a total of sixty-one 2-sign NNCs were produced by the late learners and native signers of Libras. For the

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\(^5\) These are pictures of actual items that were presented to the participants. We did not use any pictures or photos of items in the task.
homesigners, we included all H+M and M+H nominal compounds, which resulted in a total of 21 NNC produced.

Some examples of 3-sign NNC by homesigners are shown below. Note the variation in the order of head and modifier within each of the homesigners, which was expected, given their variability in Noun + Adjective ordering (as discussed in chapter 2):

(12) a. [[PICTURE FACE] FRAME]- ‘photo picture frame’

    b. [BEAR [FRAME PHOTO]]- ‘bear photo/picture frame’

Other examples of 3-sign NNC by late learners can be seen in (13). Note that in (c), the order of the constituents in the embedded compound could be either H + M or M+ H since it could be interpreted as ‘farm animal book’ or ‘animal farm book’:

(13) a. [BAG [FOOD CAT]]- ‘cat food bag’

    b. [BOX [BRACELET SILVER]]- ‘silver bracelet box’

    c. [BOOK [FARM ANIMAL]]- ‘animal farm book’
Finally, we present examples of 3-sign (or 4-sign) NNC produced by native signers in (14).

(14) a. [PUPPET [TOY [CAT DOG]]]- ‘dog cat toy puppet’

b. [FRAME PICTURE PHOTO]- ‘photo picture frame’

c. [ZIPPER-CASE CD-SLEEVE] BEAR]- ‘bear cd case’

The results from the experiment show that all of the signers can produce a 3-sign NNC, which supports the hypothesis that recursion is strongly rooted. Note especially that all of the homesigners were able to produce two or more 3-sign NNCs.

4.8 Discussion

The purpose of this study was to determine whether homesigners, very late learners of Libras and native signers of Libras were able to produce at least one novel, recursive NNC. As predicted, each signer was able to produce at least one recursive NNC, which indicates evidence of recursion is apparent in their system. At the very least, we can say that recursion as a mechanism is available to the homesigners and each homesigner capitalized on this mechanism for creating recursive NNC. Late learners of Libras apparently understood that Libras allows novel, productive compounding and utilized the mechanism for recursion, as did the native signers.

What is interesting is the overall nature of the production of the NNC. Previously in this chapter, we discussed Klima and Bellugi’s (1979) characteristics of compounding in ASL. One important characteristic is the ‘smoothness’, the fluidity between the constituents signed in the compound. Homesigners were not expected to be as fluid as the other signers due to their inexperience with the task and online processing. However, it was noted that both the homesigners and late learners of Libras frequently had to develop a story in their responses to
these items; that is, a narrative in which they could then arrive at the production of the NNC. The native signers had no such requirement. They were able to instantly produce the NNC off the top of their heads, so to speak. This suggests that when the language is [+TCP] as with the native signers, the operation is readily accessible to them and leads to greater ease in online processing. However, when there is delayed acquisition of the [+TCP] setting, the homesigners and late learners have to consciously think about what the operation calls for in composing a NNC, which affects their processing. That is, delayed acquisition of the [+compounding] setting leads to more variability in accessing the operation and greater difficulty in online processing.

Snyder (1995, 2001) shows that noun-noun compounding illustrates properties of structural dependency and recursion, which Chomsky (1976) claims to be a central component of Universal Grammar (see also Hauser, Chomsky, and Fitch 2002 for a deeper discussion of recursion in UG). Importantly, the present experiment shows that homesigners, late learners, and native signers of Libras were able to produce a novel, recursive noun-noun compound with at least three signs, thus providing evidence that even these participants have access to Universal Grammar regardless of the presence or absence of ordinary linguistic input (that is, regular exposure to natural human language). If this is correct, then recursion can only be assumed to be provided via UG, since there is no other spoken or signed input providing them with the means for recursion. The evidence from the NNC task supports my hypothesis that recursion is ‘strongly rooted’.

Recently, there has been some heated discussion in the linguistic community regarding recursion as part of UG (Chomsky, Fitch, and Hauser 2009; Jackendoff and Pinker 2005; Nevins et al. 2009, among others) in response to Everett’s (2005, 2007) claim that there is a language, Pirahã, that shows no evidence of recursive structures in its grammar. Others quickly took sides
between these two camps, with one claiming that recursion is a linguistic universal and the other that recursion is not. One thing to consider from the results of the present experiment is that if recursion is indeed not a linguistic universal, it might not be expected to show up in the linguistic system of homesigners. Since it is evident in their systems, my hypothesis that recursion is ‘strongly rooted’ is supported even further.

However, a question could be raised with respect to the lesser degree of rootedness for NNC. That is, NNC is ‘somewhat rooted’, since this operation is not allowed in all languages. This brings up an issue regarding the surprising finding that homesigners apparently have no difficulty with setting the TCP positively, despite the lack of input regarding the setting of the TCP. The type of input that a homesigner receives from his/her environment is not necessarily rich enough to indicate the setting for the TCP. Carrigan and Coppola’s (2012) study of the comprehension of homesigners’ description of events by their respective mothers shows that the mothers do not understand their own (adult) child’s homesigned systems. Goldin-Meadow’s study (2003) also revealed that the gestures produced in young homesigners are not based on the gestures used by their mothers. Thus, the gestural system developed by the homesigner is not (typically) created through complicit cooperation with the mother/caregiver in developing a communication system for both52.

Recall from our earlier discussion that Snyder (2001, 2012) argues that languages show parametric variation as either [+/-TCP]. Children require input from the target language in setting these values. If the default setting is [-TCP], they will assume their language does not

52 This is not necessarily the case for every homesigner. One of my consultants who now uses ASL was a homesigner until the age of nine. His mother actively created a linguistically rich gestural system for the whole family in order to communicate with him and his younger sister who was also Deaf. The family continues to use this homesigned system with this consultant and his sister to this day. Also, the brother and sister use both their own homesigned system and ASL with each other. This is an unusual situation, however, and merits further study in determining the similarities and/or differences between his homesigned system and others.
allow productive, novel compounds until they receive input showing them otherwise, upon which they set the value for compounding positively. This is one aspect of what Snyder (2007, 2011) calls ‘grammatical conservatism’ (GC).

If this is the case, then homesigners would be waiting indefinitely for the input to be provided and should assume, on the basis of no evidence for compounding, that they should set the parameter as [-TCP]. The question is why do they go ahead and set the TCP on a positive setting? This question is especially relevant in consideration of their tendency to be conservative in other aspects of their syntax.

Recall that in chapter 2, I suggest that the syntax of homesigners is based primarily on small clauses and simple applications of Merge. We also saw in chapter 3 that they do not apply the syntactic operation Move in their grammar. This suggests that they may have a simpler syntax by virtue of setting (almost) every parameter for the default setting. However, we assume they have Merge in their linguistic system and they also clearly have creativity, which impels them to create a lexicon. So, why do they appear to limit themselves to only recursive NNC, but possibly deferring the option of having (other) fully developed syntactic constructions?

One answer might involve the type of recursion that is accessible to the homesigners. Roeper and Snyder (2005) suggest that recursion can be understood as either direct or indirect. Direct recursion is evident with lexical categories, i.e. N → N N. When phrase structure rules cannot directly generate recursion, as in embedding or possessives, this is indirect recursion. Roeper and Snyder suggest that children may have difficulty with indirect recursion and this is tentatively shown by the fact that children do not produce recursive possessives as in ‘Mary’s brother’s name’ and have difficulty understanding them as well.
I suggest that this applies to homesigners, and expect that they will have difficulty with indirect recursion since they do not receive spoken or signed input indicating that indirect recursion is allowed. Direct recursion is simpler and generated directly in the phrase structure for lexical categories, and we have observed prevalent examples of compounding with nouns and verbs with homesigners.

So, possibly, we should consider amending the generalization that ‘recursion is strongly rooted’ to ‘direct recursion is strongly rooted’. If one wanted to support the idea that Pirahã does not show evidence of recursion, it may be the case instead that indirect recursion is not evident in Pirahã, but direct recursion might be. Nevins et al. (2009) show that Pirahã has evidence of N-N compounding, which would possibly be an instance of ‘direct recursion’, but Pirahã also shares a similar linguistic property with German in that prenominal possessives are not allowed to embed other possessives as in “Mary’s brother’s house”. As noted earlier, this would be an instance of indirect recursion. At this time, it is beyond the scope of this dissertation to delve further into the issues regarding Pirahã and I will leave this for future research, but this is one possible approach with respect to recursion being ‘strongly rooted’, i.e. direct recursion is ‘strongly rooted’.

Another possibility with regards to why the TCP is set on a positive setting rather than continuing to be grammatically conservative (as discussed above) or assuming [-TCP] due to the lack of input is actually related to the nature of the input itself. In a sense, the homesigners do not follow GC. Why is this the case?

Let’s consider the situation for French for the moment. Snyder (2007, 2011) argues that French children are GC and will not set the TCP either positively or negatively at an early age since there is a lack of input with regards to the use of NNC. So, why are homesigners different than French children?
Recall from our earlier discussion in section 4.2 that French is a language that does not allow NNC and is a [-TCP] language. It has been suggested by Beard (1996) that there is something in the input that blocks the use of NNC with languages that do not allow NNC. Following Giorgi and Longobardi (1991), Beard suggests that productive compounding is blocked in languages that have head + modifier ordering and obligatory inflectional suffixation on the head noun. Consider (15) in which we see the adjective following the noun. Beard (1996) claims that the plural inflection must appear on the rightmost edge of the morphological head of the noun phrase.

(15) les chaussures athlétiques  
    the-PL shoe-PL athletic-PL  
    'the athletic shoes' (i.e. 'shoes for athletes')

In this example, we have the plural morphology on the determiner, the head noun, and the adjective. Note that French adjectives do not form a phonological word with the nouns that they modify. However, consider (16) below in which Beard suggests there is a conflict with the stipulation that the inflection must be on the rightmost edge of the phonological word (which is the morphological head as well).

(16) *les chaussures athlètes  
    the-PL shoe-PL athlete-PL  
    'the athlete shoes' (i.e. 'shoes for athletes')

In (16), the head of the compound is "chassure(s)", but the right edge of the phonological word is at the end of "-athlète(s)" (if we assume that an NNC constitutes a phonological word). Thus, Beard suggests this conflict blocks productive compounding in French.

As soon as the child acquiring French knows that French has head + modifier order and suffixal plural-marking on the head nouns, she should know that endocentric nominal compounding isn't a creative process. So, the child initially may be GC but will eventually set
the value for the compounding parameter at [-TCP] based on the evidence that compounding is blocked in the input.

We already know that English has no such inhibition on creating NNC. The English-speaking child has plenty of evidence from the input that indicates novel, productive compounding is allowed. Thus, there is no grammatical process in the input that would conflict with the setting of [+TCP] and the child is free to set the marked value accordingly.

Regarding the homesigners, there is clearly an absence of any grammatical process in the input, (since the input is markedly limited) that would conflict with the setting of [+TCP] for the homesigners. However, there are plenty of ‘nouns’ in the environment (that is, their own creations) from which to create a NNC. Homesigners typically have a fairly rich lexicon of nouns and verbs (Goldin-Meadow, et al. 1994; Richie et al. in press). Therefore, the homesigner can use the nouns and verbs in their lexicon based on the availability from his environment at ‘minimal cost’ for setting the marked value.

I propose a generalization that can account for the differences between the French children, English children, and homesigners in their setting of the TCP. My proposal, the Input Inhibition Constraint (IIC), is as follows:

(17) ‘A parameter is blocked from setting its marked value if that value conflicts with a grammatical process available in the input.’

So, the IIC determines whether a parameter can be set on its marked value or not, depending on what is happening in the input. The French children cannot go ahead and set the compounding parameter as [+TCP] because the IIC is in effect. However, the homesigners and English children can because the IIC is not violated, since there is no grammatical process available in the input to block the [+TCP] setting.
Homesigners have no evidence for NNC or "of" insertion (like French), but have 'creativity' (for inventing new words for the lexicon), Merge, and Recursion at their disposal. So, nothing inhibits them from creating a NNC. English children receive positive evidence for creating NNC so, like the HS, they have 'creativity', Merge, and recursion.

Back to the idea of GC, I suggest that the homesigners, French children, and English-speaking children all go through a stage in which they may be GC as Snyder (2007, 2011) suggests. After some time, the child emerges from the GC period and decides whether to set a certain parameter with the marked or unmarked value. The IIC determines whether this parameter can be set on the basis of any possible grammatical process that may conflict with the setting of the marked value.

As Snyder notes (2007, 2011), children can be forced to ‘violate’ GC in experiments and they will produce options that are available from UG even though they will not produce this construction on their own. For instance, a well-known study by Crain and Thornton (1998) shows that some children will insert a medial wh-phrase in a long-distance wh-question as in (18):

(18) What do you think what Cookie Monster eats?

Constructions like (18) are attested in German (as discussed in Crain and Thornton 1998) so the child is violating GC in creating a medial wh-question since they are being ‘forced’ to set the parameter as [+medial] without having any input in the target language (English) that indicates this is allowed. However, the IIC is not violated since there is no grammatical process that would block this parameter from being set so the children are free to ‘violate’ GC and create a medial wh-question. My proposal is that the situation of the homesigner is similar to that of a

53 Snyder and Chen (1997) show that French children can create novel, productive phrases using ‘of’ inserted between the nouns, i.e. N-de-N constructions but they cannot and do not create NNC.
child in an elicitation task: The homesigner may deviate from GC – up to the limits of IIC - when the situation calls on them to express a meaning that they would not be able to otherwise.

From this discussion, we can now create a testable prediction- French children, even in elicited production tasks, will not ‘violate’ GC and create a NNC because the IIC is in effect. There is already a grammatical process, i.e. suffixal inflection for plurals, that will block them from setting the TCP on a marked value and creating NNC. This is clearly set aside for future research since this is beyond the scope of the dissertation. However, this proves to be an exciting avenue for future research with French and other languages to test for the evidence of the IIC.

4.8.1 Some issues to consider

Earlier in this chapter, we assumed that NNCs of native and late learners should follow the same ordering as noun + adjective in Libras, i.e., head+modifier. Looking over the spontaneous data with the NNC production task, each NNC that was signed by the participants was analyzed with respect to its ordering. While there was a marked preference for head + modifier order in NNC with the native signers, they did produce some NNC with modifier + head order. Native signers never switched orders on the same item, whereas the late learners often did. The late learners were pretty much evenly divided between both orders (HM vs. MH). The table in (19) below summarizes the data with respect to the production of NNCs signed in HM and MH order:54

54 In the case of 3-NNC, the data includes ordering for both the inner and the outer compounds. Sometimes, both the inner and outer compounds have the same ordering and a few times, they will be different. We see no clear pattern with the ordering of the compounds in Libras. They do show a preference for HM but the inner compound can be either HM or MH. Also, they show [[HM] M] ordering in some of their compounds.
(19) Number and Percent of NNC signed in HM or MH order

<table>
<thead>
<tr>
<th>Part.</th>
<th>2-NNC HM</th>
<th>% HM</th>
<th>2-NNC MH</th>
<th>% MH</th>
<th>3-NNC HM</th>
<th>% HM</th>
<th>3-NNC MH</th>
<th>% MH</th>
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<tr>
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<td>50</td>
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<td>50</td>
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<td>33.3</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>H3</td>
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<td>50</td>
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<td>50</td>
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<td>50</td>
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<td></td>
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<td>44.4%</td>
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<td>100</td>
<td>3</td>
<td>50</td>
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<td>50</td>
</tr>
<tr>
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<td>50</td>
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</tbody>
</table>

The data with the late learners is not so surprising as we have already predicted variability in the late learners due to NNC being ‘somewhat rooted’. However, the data from the native signers make it clear that Libras does not robustly follow the head + modifier order for NNC. Beard’s (1996) cross-linguistic survey of 60-70 languages supports the generalization that noun-noun compounds follow the same order as noun + adjectives in the respective languages. Therefore, we expected compounds to follow the head+modifier order, since, as also mentioned briefly earlier in this chapter, we saw in chapter 2, the native signers robustly followed noun + adjective ordering and the late learners did as well.
There are a couple of possible analyses to account for the dichotomy between the ordering for NNC and adjectival noun phrases. One would be to assume that all of the putative NNC are not actually compounds, but some other construction(s) that superficially appear to be nominal compounding. NNCs are not the only way to describe an object and there are many possible different constructions that can describe the same item.

Another is to amend Beard’s generalization or to assume that his generalization does not hold true across all languages. Recall that ABSL also shows variable ordering for NNC in their grammar (Meir et al 2010) and ABSL has robust ordering for noun + adjective phrases. This doesn’t quite apply to ASL as APs can be either N+ A or A + N, so we can expect the NNC ordering to be variable as well. As discussed earlier in section 3.5, Wood (2004) shows there is variable ordering for NNC in ASL, especially with respect to distinguishing between lexical and novel, productive compounds. That is, novel, productive compounds in ASL allow variable ordering of the head and modifier, but lexical compounds do not. The problem is really that of Libras since Libras strictly follows N + A, but allows variable ordering for the NNC compound. Recall that ABSL, a young language, also follows this pattern and other spoken languages (discussed in Beard 1996), so it is obviously not ‘unusual’ for a language to have variable ordering for the NNC.

Perhaps the variable ordering in NNC is related to novel, productive compound phrases being structurally different than other compounds. At this point, it’s not clear what the solution is. For the time being, it does appear that many or most languages consistently follow Beard’s generalization, but there are some exceptions, which may or may not fall under another putative generalization that explains them. It is beyond the scope of this dissertation to engage in a full
analysis or discussion of these constructions, but possible ideas would be pseudopartitives, construct-state expressions, or paratactic constructions. This is clearly an area of future research.

4.9 Conclusion

We have seen that recursion, i.e. direct recursion, is a ‘strongly rooted’ property of language that is evident in homesigned systems and the grammar of late learners and native signers of Libras. NNC is attested in all three groups as novel, productive compounding. However, NNC is a ‘somewhat rooted’ property of language due to the fact that not all languages allow NNC. Structural dependency is evident in the production of NNC, in that for novel and recursive compounds the inner constituents form a constituent in the deeper compound, but the head + modifier ordering for the inner or outer compounds show variability in Libras and ASL (albeit of a different kind in each), which indicate that structural dependency is not entailed by the ordering but whether there is a structural relationship between the constituents with no linguistic material inserted between the two.
Chapter 5
Degrees of Rootedness- Concluding Remarks

5.1 Summary and Discussion

The primary goal of this dissertation is to investigate the relationship between Universal Grammar and the properties that Universal Grammar constrains, by investigating how language is created/acquired, following the constraints of Universal Grammar. We do this by examining the strength of ‘rootedness’ with respect to universal properties and parameters, i.e. the relationship between the degrees of external input provided to the child and the degrees of guidance provided to the child innately through UG. The framework proposed in this dissertation provides us with tools for predicting what will and will not appear in linguistic systems of homesigners, late learners and native signers of Libras. New data presented from the spontaneous production of homesigners and from experimental studies of these homesigners, late learners and native signers of Libras supports the proposal presented in this dissertation with regards to the strength of rootedness of recursion, merge, hierarchical structural dependency, word order, and topic. The proposed framework in this thesis sets the stage for future hypothesis-driven research on language development and language creation.

In Chapter 2, I hypothesized that Merge would be evident in homesigned systems and in the acquisition of Libras by late learners and native signers as Merge is assumed to be linguistically universal, i.e. ‘strongly rooted’. The results from the Noun + Adjective experiment and spontaneous narrative analysis presented evidence of constituency (hierarchical structure) in homesigned systems, indicating the presence of Merge. Word order was hypothesized to be
‘somewhat rooted’, due to the many possible variations in word order. Acquisition of ‘somewhat rooted’ properties is expected to present variability in homesigners and late learners of a given language. Each homesigner showed a preference for ordering with respect to one-argument clauses, SV and OV, but exhibited variability with respect to the subject, object, and verb, and for the noun + adjective phrases. With regards to the noun + adjective experiment, the results for the late learners of Libras paralleled that of the native signers, due to the input being ‘clear’ and provided with ease. However, as shown in Chapter 3, derived word orders in the late learners exhibited greater variability, as predicted. The analysis of spontaneous utterances in homesigners revealed some surprising constructions, indicating possibly there is a greater degree of complexity available to homesigners than previously noted in research.

In Chapter 3, we considered the evidence for ‘topic’ as a ‘somewhat rooted’ property of language, despite its appearance in most languages, if not all, in one form or another. The fact that there are so many possible variations for the realization of ‘topic’ in a given structure lends further support for its classification as a ‘somewhat rooted’ property. As such, it is expected that acquisition of ‘topic’ will be variable among late learners, i.e. first and second language learners. Furthermore, homesigners are not expected to manifest ‘topic’ in their linguistic systems, but if it does, it shows that the mechanism for ‘topic’ is operational in their systems. Results from the experiment involving comprehension of SVO and OSV items reveal that late learners of Libras, as a group, perform significantly above chance, but on an individual basis, the late learners exhibit the expected variability in their comprehension of OSV, i.e. topicalization- a derived word order. Homesigners, as expected, did not perform significantly above chance, but neither did they consistently follow any other possible pattern of ordering. It is surmised that the test design or the unfamiliarity with ‘testing’ could have contributed to the completely random
results exhibited by the homesigners. However, two homesigners did produce ‘topic-like’
constructions in their spontaneous utterances, leading us to consider the possibility that ‘topic’
may be operational in their linguistic systems as well, but with the expected variability that
comes with the characteristics of a ‘somewhat rooted’ property of language.

We looked at another ‘strongly rooted’ property of language, recursion, in Chapter 4.
Recursion, as a ‘strongly rooted’ property, is expected to manifest in all linguistic systems, even
in homesigned systems. We tested for recursion in an experiment involving production of
productive noun-noun compounds, i.e. compounds with more than two nominals as in ‘frog pen
necklace’. If a participant was able to produce at least one recursive noun-noun compound, it is
assumed that the mechanism for recursion is operational in their linguistic systems. However,
Noun-Noun compounding, as a property of language, is ‘somewhat rooted’ due to the fact that
not all languages allow productive compounding. As such, some variability is expected with
respect to its development with homesigners and late learners. In particular, variability with the
late learners of Libras was seen with respect to the head-modifier ordering in contrast with the
native signers. Even with this, all of the homesigners and late learners and native signers of
Libras exhibited evidence of productive compounding, indicating that they all have access to
recursion in their linguistic systems, providing further support for recursion as a ‘strongly rooted’
property.

5.2 Considerations for future research
5.2.1 Small clauses in homesigned systems

Recall from Chapter 2 regarding SV clauses produced by homesigners, a small mention
was made of the fact that most of them were in the form Noun + Adjectival Predicate, as in
BABY FAT or IX-ear BAD.
The question arises to how to analyze these constructions with respect to their structure. The homesigners do produce verbs, but overwhelmingly prefer to have some type of predicate clauses with one argument. One possibility would be to look at the ‘small clause hypothesis’, a two-word stage with no functional projections (Radford 1990). Radford (1990) argues that children pass through a stage in which all of their constructions, i.e. phrases and clauses, are lexical-thematic structures. That is, the syntactic structure consists only of lexical categories (Noun, Verb, Preposition, and Adjective) and do not have functional categories (Determiner, Complementizer, and Inflection). All of the constituents in the clauses are assigned thematic roles such as agent, patient, role, and theme. This stage is short, typically between the ages 1;5 and 2;0. Examples of such utterances are shown in (1a-d, examples taken from Radford 1990):

(1) a. Girl hungry. (Kathryn 1;10, from Bloom 1970)
   b. Car gone. (Angharad 1;10)
   c. Mommy help. (Alison 1;10, from Bloom 1973)
   d. Mess on legs. (Daniel 2;0)

Such constructions are reminiscent of what we see with the homesigners. They typically have one argument with a predicate, either verbal or adjectival. Some parallel examples are shown in (2):

(2) a. BABY FAT
    ‘That baby is fat!’
    (H2)

b. MAN BIG HUG
   ‘The big man hugged (the bear).’
   (H3)

c. IX-(other person) DIE, IX-(upward)
   ‘She is dead, in heaven.’
   (H2)

d. THIS-EAR GOOD
   ‘This ear (hears) good.’
   (H1, H2)
It is tempting to suggest that homesigners may be extending the ‘small-clause’ stage, well past the age that most children pass through, since they do not have input that leads to the projection of functional categories\textsuperscript{55}. However, one problem with this possible analysis is evidence of functional projections does appear in their constructions, with embedding and topic, which suggests that they have CP in their syntax.

Another perspective may come from Progovac’s (2007, 2010) argument about linguistic fossils in our syntax in the form of ‘Root Small Clauses’ (RSC). She argues that in modern languages, there is an “co-existing layer of grammar” that does not have functional projections and embedding/recursion that is reflected in the use of RSC still in use today. These RSCs are considered to be ‘linguistic fossils’, manifesting back to an evolutionary point of morpho-syntax.

This idea is also echoed by Jackendoff (1999), in which he elaborates on Bickerton’s (1990) claim that language has evolved into two stages, i.e. protolanguage and modern language. Protolanguage is the stage before syntax developed in human language, so inflection and hierarchy of phrase structure are assumed not to be present in this stage. There are different ideas about what was not present in the protolanguage stage, but most agree that these two were not present at this level. We are, of course, in the modern language evolutionary stage. However, it is possible that our structures still have linguistic fossils expressing clauses without inflection or structural hierarchy, i.e. RSC as proposed by Progovac (2007, 2010).

Progovac (2007, 2010) argues that RSC are clauses in which the subject of the clause does not have a structural relationship with any other constituent. They do not have tense, do not require a DP, i.e. determiners, and cannot embed within another RSC. Some examples from Progovac (2007) are given in (3), with their fully realized sentential counterpart:

\textsuperscript{55} See Guasti (2002) for an extensive discussion of Radford’s small-clause hypothesis and other alternative analyses for this stage in child language.
(3) a. Him retire?! vs. He’s going to retire.
   b. John a doctor?! vs. John is a doctor.
   c. Problem solved vs. The problem is solved.

Progovac argues that these clauses, while used widely, are reflective of an earlier stage in our linguistic development, when merge (and recursion) are not yet available for syntactic operations. RSC are paratactic strings with a loose relationship between the linguistic elements. One aspect of this argument is reflected by the inability of RSC to embed within each other, i.e. recursion is not operational, as shown in (4, examples from Progovac 2007).

(4) a. *Him worry [(that) me first]?! 
   b. *If problem solved, (then) me first!
   c. *I consider [problem solved].

Following Progovac (2007, 2010), if the one-argument clauses exhibited in homesigned systems are indeed RSC, then we would expect their syntax to be paratactic with only a loose relationship between the linguistic elements. We have seen that this is not the case in Chapter 2, with evidence of merge and recursion. It would appear, rightly so, that homesigners do have access to a fully articulated CP/IP since they have the modern human brain. However, due to the nature of the impoverished input, they may have a more visible manifestation of these linguistic fossils, exhibited in their clauses with a primitive form of Merge/recursion and a limited articulation of functional categories. I have argued earlier in this thesis that homesigners have a simpler version of Merge since they typically do not go beyond one or two levels of merge and they do not seem to have the operation Move in their systems. Progovac (2007, 2010) argues that RSC, as linguistic fossils, do not employ merge in their structure. However, it is possible to have a simpler version of Merge, which does allow for combinatorial syntax. It remains to be
seen how far we can go with this idea, but if linguistic fossils are evident in modern language, then it is certainly possible that homesigners may capitalize on the accessibility of a simpler syntactic level in order to self-generate their linguistic systems.

5.2.2. Mental-state verbs

One homesigner produced utterances with embedded clauses and clauses with mental-state verbs such as REMEMBER, DON’T-REMEMBER, and UNDERSTAND. This is of particular interest to research into ‘theory of mind’. Using mental-state verbs such as “want”, “need”, “think”, “know”, and “remember” are linguistic expressions of beliefs and states of mind. Acquisition of these verbs is crucial before being able to express these beliefs. Hence, there is a connection between TOM and acquisition of these concepts and linguistic expressions. (Tager-Flusberg 1993; Bartsch & Wellman 1995, among others. Between the ages of 3 and 4 years, children master sentence forms involving mental state verbs and their complements. The timing of this linguistic achievement roughly coincides with children’s successful performance on standard false-belief tasks. Also, knowledge of complementation is crucial for mastery of ‘false-belief’ tasks (See Peterson and Siegal 2000 for a review of the literature on ‘theory of mind’).

Interestingly, Deaf children of hearing parents pattern with autistic children on false-belief tasks, with decreased mastery, in comparison to hearing children and to Deaf children of Deaf parents. They lag several years behind hearing children in their mastery of false-belief tasks with the average age 7-10 years old and some do not even pass until 14-16 years old. However, it was found that if oral Deaf children had significant mastery over spoken English, they did better on the false-belief tasks, on par with native Deaf and hearing children. Courtin (2000) argues that DoD develop ‘theory of mind’ on par with Deaf and hearing children because
of early exposure to language and due to the mental perspective of the signer prevalent in the modality of signed languages. That is, when complementation is learned by the Deaf child early, either via spoken languages or signed languages, the Deaf child will develop ‘theory of mind’ as a typically developing child would.

Courtin (2011) raises the question as to whether homesigners evince development of ‘theory of mind’ since they inarguably pass the critical period for acquisition of language, with minimal or no access to spoken/signed input. One study involving adult homesigners by Morgan and Kegl (2006) showed that if the adult homesigners were exposed to ISN before the age of 10, they tend to pass the false-belief task. However, they tend to fail the false-belief task if they learn ISN after the age of 10, even if they have been using the language for quite some time. Even though as a group, the ones who learned after the age of 10 did not do well with the false-belief task, four out of eleven did pass the false-belief task.

Another study by Pyers and Senghas (2009) looks at the relationship between production of mental-state verbs and performance on false-belief tasks in signers of early Nicaraguan sign language. As discussed previously in this thesis, NSL/ISN developed through a series of successive cohorts of language learners. The first cohort were much older than the second cohort and had more prolonged experience as homesigners before learning the early form of NSL, approximately ten years. Eight first-cohort and ten second-cohort signers were tested with respect to their production of mental-state verbs and their understanding of what happened in a false-belief task. The first-cohort signers produced significantly less tokens of mental-state verbs, with four producing none at all, than the second-cohort. Likewise, the second cohort was significantly better at the false-belief tasks than the first cohort. Interestingly enough, when the two cohorts were tested again two years later, there were no significant differences between the
groups with respect to the production of mental-state verbs and the false-belief tasks, although there was still a “gap” between the first and second cohorts. It is surmised that at that point, the first cohort had begun interacting with the second cohort at a newly-formed association for the Deaf, increasing their exposure to a richer form of NLS, thus introducing them further to situations requiring linguistic use of mental-state verbs. In the study, it was clearly the case that development of mental-state verbs was a requisite for above-chance performance on the false-belief task. That is, development of language is a requirement for development of ‘theory of mind’.

So, it is possible that ‘theory of mind’ can develop beyond a rudimentary understanding of social perception. If the homesigner has evidence of complementation (‘I think that…’ or ‘I remember he..’) in their homesigned systems, one would expect them to show evidence of a more developed ‘theory of mind’. With respect to the homesigner studied in this thesis who showed evidence of mental verbs and embedded clauses, the prediction would be that he would pass the false-belief tasks, showing some evidence of ‘theory of mind’ development. This is clearly an avenue for future research, examining further implications for the critical period of acquisition for theory of mind and language.

5.3 Conclusion

The goal of this dissertation was to investigate which properties of language will be evident in all linguistic systems, due to its association with Universal Grammar, and those that will not. That is, if a particular property of language is ‘strongly rooted’, this indicates a very high degree of innately specified guidance specifically for language development. We have seen evidence with respect to ‘merge’ and ‘recursion’. Also, there are some properties that are
constrained by UG, but with possible options, which would be considered ‘somewhat rooted’ in my framework. These are expected to evince variability in their acquisition with input from a mature, established language or in their creation with self-generated input.

One question that arises with respect to the critical period hypothesis (Lenneberg 1964, 1967; Newport 1990; 1991) and AoA for grammatical constructions. What are the expected effects on the homesigners and late learners? That is, the homesigners do not receive the requisite input for most, if not all, grammatical constructions, and yet, they do produce evidence of complexity in their systems: recursion, merge, embedded clauses, topic, and structural dependency, i.e. constituency. It is apparent that their linguistic systems are not simply paratactic with no structural/syntactic hierarchy, but have systematic, complex grammatical phenomena.

It is likely that there are some properties of language that will never emerge in a homesigned system and research is ongoing to discover which will and which will not. If a homesigner learns a signed language later, as a late learner of a first language, there will always be some deficiencies in their acquisition of certain grammatical phenomena. However, it is not impossible for a late learner of L1 to acquire language well after the critical period for language. My framework with ‘degrees of rootedness’ helps predict what should happen after the critical period for acquisition, providing avenues for hypothesis-driven research into language development and creation.
Appendix A - Chapter 2

Test items for the Noun + Adjective experiment

1.) A NN  FAT MAN WOMAN EAT
picture of fat man and fat woman eating/picture of fat man and regular woman eating

2.) A NN  BIG MAN BEAR HUG
picture of big man hugging a little bear/picture of a big man and big bear hugging

3.) NN A  CAT DOG FAT EAT
picture of fat dog and regular cat eating/picture of fat cat and fat dog eating

4.) N A N  CAT FAT DOG EAT
picture of fat dog and regular cat eating/picture of fat cat and regular dog eating

5.) NN A  COW HORSE FAT EAT-HAY
picture of fat horse and regular cow eating/picture of fat horse and fat cow eating

6.) N A N  COW FAT HORSE EAT-HAY
picture of fat horse and regular cow eating/picture of fat cow and regular horse eating

7.) NN A  MAN BEAR BIG HUG
picture of both big bear and man hugging/picture of big bear and small man hugging

8.) A NN  BIG BABY DOG HUG
picture of big baby and big dog hugging/picture of big baby and small dog hugging (test with Ana again because should be the second one)

9.) A NN  LITTLE MOUSE BIRD HUG
picture of little mouse and a big bird hugging/picture of little bird and little mouse hugging

10.) N A N  MAN FAT WOMAN EAT
picture of fat man and regular woman eating/picture of fat woman and regular man eating

11.) NN A  MAN WOMAN FAT EAT
picture of fat man and fat woman eating/picture of fat woman and regular man eating

12.) N A N  BEAR BIG MAN HUG
picture of big bear and regular man hugging/picture of big man and little bear hugging
## Appendix B- Chapter 4

### Test Items for Noun-Noun Compounding Task

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Libras translated into English gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) a picture frame with a pig at the top</td>
<td>PICTURE FRAME PIG</td>
</tr>
<tr>
<td>“pig picture frame”</td>
<td></td>
</tr>
<tr>
<td>2.) a keyholder in shape of a fish</td>
<td>KEY HOOK FISH</td>
</tr>
<tr>
<td>“fish keyholder”</td>
<td></td>
</tr>
<tr>
<td>3.) socks with butterflies</td>
<td>SOCK BUTTERFLY</td>
</tr>
<tr>
<td>“butterfly socks”</td>
<td></td>
</tr>
<tr>
<td>4.) box for toy trucks</td>
<td>BOX TRUCK TOY</td>
</tr>
<tr>
<td>“toy truck box”</td>
<td></td>
</tr>
<tr>
<td>5.) CD case in shape of a bear</td>
<td>CASE CD BEAR</td>
</tr>
<tr>
<td>“bear CD case”</td>
<td></td>
</tr>
<tr>
<td>6.) bag of cat food</td>
<td>CAN/BOX FOOD CAT</td>
</tr>
<tr>
<td>“cat food bag”</td>
<td></td>
</tr>
<tr>
<td>7.) keychain with a small stuffed dog</td>
<td>CHAIN KEY DOG</td>
</tr>
<tr>
<td>“dog keychain”</td>
<td></td>
</tr>
<tr>
<td>8.) box that holds silver bracelets</td>
<td>BOX BRACELET SILVER</td>
</tr>
<tr>
<td>“silver bracelet box”</td>
<td></td>
</tr>
<tr>
<td>9.) puppet with cat at one end and dog at other end</td>
<td>PUPPET DOG CAT</td>
</tr>
<tr>
<td>“cat dog puppet”</td>
<td></td>
</tr>
<tr>
<td>10.) book about farm animals</td>
<td>BOOK ANIMAL FARM</td>
</tr>
<tr>
<td>“farm animals book”</td>
<td></td>
</tr>
<tr>
<td>11.) book with pictures of dogs</td>
<td>BOOK PICTURE/PHOTO DOG</td>
</tr>
<tr>
<td>“dog picture/photo book”</td>
<td></td>
</tr>
<tr>
<td>12.) a necklace with a pen with a frog on cap</td>
<td>NECKLACE PEN FROG</td>
</tr>
<tr>
<td>“frog pen necklace”</td>
<td></td>
</tr>
</tbody>
</table>
References


