THE EMERGENCE OF COMPLEXITY

IN PROSODY AND SYNTAX

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Abstract. Our research on a new sign language that arose in a small, insular community shows that complex grammatical functions, such as dependency relations between clauses, arise early but gradually, and that they are marked by the timing cues and intonation of prosody alone. By comparing two older and two younger signers of Al Sayyid Bedouin Sign Language (ABSL), we find that the prosodic marking of the younger signers is more systematic due to alignment of timing and intonation cues at constituent boundaries, and that dependency between clauses is marked more often and more consistently in the younger than in the older signers. These relations between clauses are not accompanied by overt syntactic markers. However, as prosodic structure becomes complex, so too does the structure within the clause. By tracing the emergence of prosodic and syntactic organization, we find that complexity in the two systems arises gradually and in tandem, but that their grammatical domains do not overlap.

Syntax and prosody are both central ingredients in human language, and they are clearly closely related. By imposing rhythmic structure on the language stream, prosody signals the division of our utterances into interpretable pieces or constituents. Intonation is superimposed on these rhythmic constituents, in part to convey semantic or pragmatic information, such as whether we are asserting or questioning. Together, rhythmic and intonational structure also signals relations between constituents, as in the two clauses of the complex conditional sentence, *If it rains, the fireworks are off*, in which there is typically a rise in intonation at the end of the first clause followed by a pause before the second clause. Of prosody and syntax, some researchers attribute to prosody the more basic role, providing the bootstraps to syntax for infants (Jusczyk et al., 1992; Nespor et al., 1996) and signaling relations between constituents in new languages like pidgins, before syntactic structuring arises (Givón, 1979).

How are syntax and prosody related in the organization of language? One way to investigate this question might be to observe a new language as it emerges. But this is not an easy testing ground to find, as truly new languages are hard to come by. Even pidgin

speakers are not *tabulae rasae* – they are also speakers of full-fledged native languages, making it difficult to determine the source of the structures they contribute to pidgins.

Nevertheless, new languages do exist, in communities of deaf people, and empirical data that bear on the emergence of language in modern humans is found through the study of nascent sign languages. Investigating such languages allows us to ask the question, What is the nature of the earliest kinds of structuring to arise in a human language? Here we report on the early stages of prosody and syntax in such a language, Al Sayyid Bedouin Sign Language. We trace the emergence of prosodic and syntactic organization, and find that complexity in the two systems arises gradually and in tandem, although their grammatical domains do not overlap.

Sign languages, the natural languages that develop spontaneously in deaf communities, have grammatical organization, and many of their structural properties overlap with those of spoken languages (Sandler and Lillo-Martin, 2006). Once that has been established, it should not be surprising that the utterances of sign language have prosodic organization, devices for marking rhythm, stress, and the visual equivalent of intonation. The prosody of sign language – transmitted not only by the hands, but by the face, head, and body as well -- is of general interest for two reasons. First, it holds out the promise of arriving at a core of universal prosodic properties: if some property is shared by spoken and signed languages, that implies that human language cannot do without it. Second, sign languages are the only languages that allow us to observe the way such a system emerges and more generally how complexity arises in human language. Not only are all known sign languages relatively young (under 300 years old), but some have arisen quite recently, and their development can be observed in real time.

In this study, we report on the development of prosody and syntax in a new sign language that arose over the past 75 years in a Bedouin village with a high incidence of

deafness. We find that neither complex syntactic structure nor systematic prosody arise overnight. Nor do we find that prosody develops entirely without syntax. Instead, they each develop gradually, and, in some respects, they develop hand in hand. As syntactic structure **within** clauses increases, we see that prosody marks complex relations **between** clauses before there are any overt syntactic markers of such relations.

We begin with a brief overview of prosody in more established sign languages, focusing particularly on Israeli Sign Language, which is the sign language used by most deaf people in Israel, but which has a very different social history from that of Al-Sayyid Bedouin Sign Language. After demonstrating in Section 1 that sign languages have such properties as prosodic constituents, domain convergence, and intonation, we move on in Section 2 to describe the new sign language, Al-Sayyid Bedouin Sign Language (ABSL), as context for the present study.

Excerpts from narratives of four second generation Al-Sayyid signers are the object of this study. Two signers are older, in their 40s, and two are 12-17 years younger. Through detailed analysis of their narratives, the gradual appearance of prosodic and syntactic complexity in the language is revealed. Our methodology is described in Section 3.

In the younger signers, relations among constituents are marked through prosody. The study indicates that signals such as manual rhythm, head position, and facial expression are recruited to cue types of constituents and the relations between them in a way that becomes more systematic as the language matures. The differences between the older and younger signers in their use of prosody are described in Section 4. There are no overt markers of syntactic complexity, and we cannot see interaction between syntax and prosody on the surface. Nevertheless, as complex interclausal relations are signaled by prosody in the younger signers, syntactic complexity at the clause level is also emerging, particularly in the content and distribution of noun phrases. These results and analyses come together in §6,

where the gradual evolution of grammatical structuring in this new language is illustrated through 'snapshots' of data from three different time periods: a short segment of narrative from a rare videotape of a first generation signer, compared with segments from an older and a younger signer of the next generation. A brief conclusion is offered in §7.

1. Prosody in sign language

The sign language literature reflects just how closely prosody and syntax are interrelated, since there are still differences of opinion about whether certain signals are elements of the syntactic or the prosodic components in sign language grammar. Early work on such structures as interrogatives, topics, and relative clauses attributed a set of nonmanual markers accompanying them to the syntactic level of analysis. Differences in head position and facial expression were shown to systematically mark such structures in American Sign Language (ASL) (Liddell, 1978, 1980; Baker and Padden, 1978). This perspective was exploited to the fullest in a treatment of wh- movement and other syntactic phenomena in which the authors assumed that the distribution of such nonmanual markers directly reveals the underlying syntactic structure of ASL sentences (Neidle et al., 2000).

Other researchers have pursued the position that the suprasegmental system of facial expressions and head and body postures interacts with syntax but bears the earmarks of prosody rather than syntax.[1] This line of research claims in particular that facial expression is comparable to intonation (Reilly et al., 1990a; Nespor and Sandler, 1999; Wilbur, 2000). By studying the distribution of these markers together with that of rhythmic patterning, Nespor and Sandler (1999) developed a theory of sign language prosody according to which rhythmic constituency is demarcated by the hands, while the functions of intonation are

[1] The term *suprasegmental* applied to sign language is intended to mean above the level of the word.

manifested on the face. This means that the articulators do not divide themselves up neatly according to function (Pfau and Quer in press, Sandler in press). Many prosodic cues are conveyed nonmanually, but critical rhythmic cues are conveyed by the hands. Conversely, nonmanual markers may be lexical or morphological, and are not always prosodic. Contributing to the prosodic analysis of the relevant cues (to be described below) is evidence such as temporal alignment of facial expression with manual rhythmic breaks and nonisomorphism between intonational and syntactic constituents (Sandler and Lillo-Martin, 2006, Sandler 2009a provide detailed discussion of the two views).

Here we adopt arguments based on nonisomorphism between syntactic structure on the one hand and both the rhythmic and intonational structure of prosody on the other (Sandler 2009a), and assume that syntactic and prosodic structure in sign languages are distinct. We provide a brief description of how the overall prosodic system works in an established sign language, Israeli Sign Language (ISL).

Israeli Sign Language is the language of the majority of deaf people in Israel, numbering about 10,000. It arose under creolization conditions, when immigrants from many parts of the world joined a small earlier population in Israel in the 1930s-1960s. Although Israeli Sign Language is of a similar chronological age to Al-Sayyid Bedouin Sign Language, its social history has been quite different. (See Meir and Sandler, 2008, for an introduction to the language and community.) Perhaps as a result, the structure of the language, including its prosody, has much in common with that of other established sign languages, such as ASL and sign languages of Europe.

ISL is selected for comparison for other practical and conceptual reasons. On the practical side, the prosodic system of ISL has been described in some detail, giving us a detailed descriptive framework within which to work. On the conceptual level, we adopt the overall analysis of ISL prosody, according to which the alignment of rhythmic structure

manifested by the hands with intonational structure conveyed by the face create a coherent system (Nespor and Sandler, 1999; Sandler, 1999b,c; Sandler, 2006).

While the discussion here focuses on ISL, there are certain similarities in prosodic marking across sign languages, as some of the references here reflect. Let us take conditionals as an example. Published reports of other sign languages in which conditionals have been studied have attributed signals to these structures that are similar to those of ISL (ASL:Baker and Padden, 1978; Liddell, 1986; Reilly et al., 1990b; Swedish SL: Bergman, 1984; BSL: Sutton-Spence and Woll, 1992; Danish SL: Engberg-Pedersen, 1990). Conditional clauses in these languages are uniformly characterized by brow raise. While there are some descriptive differences with respect to head position, all sources indicate a non-neutral head position on the 'if'- clause that is changed at the boundary. Not all sources describe head position, but whenever pictures are provided in the published studies, the signer's head is seen to be forward/down at the end of the first constituent, the 'if' clause, returning to a more neutral position after it. Brow raise and forward head position clause finally, then, are apparently typical signals for conditionals in sign languages. While prosodic systems across sign languages are not identical, then, many of the characteristics described here are found in other established sign languages, so that we may take them as typical of a sign language prosodic system. The prosodic structure of ISL has been amply documented in other work, and only a sketch will be presented here, to lend context to the study at hand.

1.1 Prosodic constituents

We focus here particularly on prosodic constituency and intonation.[2] ISL is organized prosodically at the level of the syllable (which we do not discuss here), the prosodic word, the phonological phrase, and the intonational phrase, and is characterized by a system of facial intonation.

Prosodic organization, from the syllable to the intonational phrase, is marked by a number of rhythmic cues. In response to the propensity for monosyllabic prosodic words in sign languages generally (Sandler, 1993; Brentari, 1998), pronouns are sometimes cliticized to ISL content words in such a way as to reduce the combined form to a single monosyllable (Sandler, 1999a). This occurs when the two words, each lexically a monosyllable, occur together at the end of what Nespor and Vogel (1986) call a phonological phrase, corresponding loosely to syntactic phrases such as NPs or VPs.

At this level of the phonological phrase (similar to what Beckman and Pierrehumbert, 1986 call the intermediate phrase), the final phrase boundary in ISL is marked by rhythmic cues (hold, pause, or reiteration of the final sign). Important support for each level of the prosodic hierarchy, including that of the phonological phrase, comes from phonological rules that have specific prosodic constituents as their domain (Nespor and Vogel, 1986). Such rules, often external sandhi rules, give added prominence to the rhythmic units in utterances. An example of this phenomenon (what Selkirk (2002) calls 'domain convergence') is found in ISL, in the form of a process of external sandhi whose domain is the phonological phrase.

The process, Nondominant Hand Spread (NHS), is triggered by two-handed signs (a robust minority of signs in the ISL lexicon). Under NHS, the nondominant hand either appears in the signing space before the sign it belongs to, persists after it, or both – but only

[2] We omit the prosodic property of stress from the present discussion. See Wilbur (1991) for stress and focus in ASL and van der Kooij et al. (2003) for a discussion of focus in SLN.

as far as the phonological phrase boundary (Nespor and Sandler, 1999; Sandler 2005). This convergence of a set of phonetic cues at the boundary of a syntactically coherent constituent with a phonological process applying in the same domain provides evidence for the phonological phrase constituent in ISL, much as the process of liaison does, applying within the same constituent in French (Selkirk, 1986, 2002; Nespor and Vogel, 1986).

The next constituent up in the hierarchy is the intonational phrase (IP), the constituent that figures most prominently in the analysis of ABSL to follow. The IP boundary is typically salient, and it is the one people think of impressionistically as an intonation break. In studying ISL, we assume following Nespor and Vogel (1986) that syntactic constituents such as topics, nonrestrictive relative clauses, and parentheticals often constitute separate intonational phrases. In ISL (a strongly topic-comment structured language, Rosenstein, 2001), Nespor and Sandler found that IP boundaries were marked by the same rhythmic cues as those marking the phonological phrase, but that two additional salient cues were present: change of head or body position, and across-the-board change in facial expression. The juxtapositon of manual rhythmic cues with face and body articulations and changes is what makes this boundary so salient. Figure (1) shows the juncture of two IPs in a counterfactual conditional sentence meaning, ‘If the goalie had caught the ball, they would have won the game’ (Dachkovsky, 2005; Dachkovsky and Sandler, 2009). The change in head posture and facial expression between the last sign of the first clause and the first sign of the second clause is clear. Partial coding of prosodic cues is included in the figure.

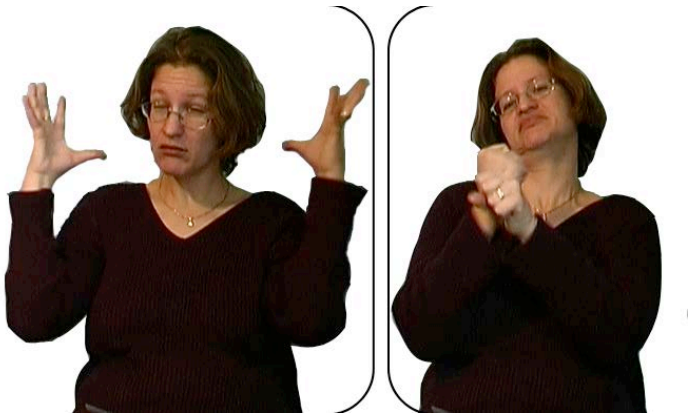

Figure 1. The juncture of two Intonational Phrases in the ISL counterfactual conditional sentence, 'If the goalie had caught the ball, they would have won the game.' Pictured here are CATCH-BALL] and [WIN.

1.2 Intonation

The alignment of facial expression with intonational phrases (seen clearly in Figure 1 above) is the first piece of evidence in favor of the claim that facial expression in sign language is comparable to intonation in spoken language. Beyond distribution, the function of linguistic facial expression in established sign languages is also comparable to that of linguistic intonation in spoken languages: it signals the illocutionary force of an utterance, such as assertions vs. questions, continuation and dependency across clauses, and the status of information in a discourse.

Individual grammatical facial articulations can combine with one another to create complex intonational arrays whose meaning is compositionally interpreted (Nespor and Sandler, 1999), a property that has been argued to characterize spoken language intonation as well (Pierrehumbert and Hirschberg, 1990; Hayes and Lahiri, 1991). Figure (2a-c) shows intonational arrays including (a) raised brows, (b) squint, and (c) raised brows together with squint. Raised brows convey continuation and dependency and characterize yes/no questions, conditionals, topics, and other structures (much like High tones in spoken

languages, Bartels,1999)[4]; squint is associated with an instruction to retrieve information not readily accessible, commonly found with relative clauses and topics in ISL; and the two together combine the two functions and are found on counterfactual conditionals (as in Figure (1) above) as well as utterances such as yes/no questions about information that is retrievable but not readily accessible. The information status of the concept to be retrieved is determined at the discourse level, and not at the level of the sentence (see Dachkovsky, 2005; Dachkovsky and Sandler, 2009).

Figure 2. Compositional Intonation in ISL: (a) Raised Brows, (b) Squint, and (c) Raised Brows and Squint together.

Linguistic facial intonation is distinguished from affective or emotional expression in a number of ways. Functionally, emotional or affective expressions reflect the feelings and attitudes of the speaker, while linguistic facial expressions signal discourse functions and relations, such as questions, topics, and shared information. Both the number of facial articulations (measured in Action Units) and the part of the face involved differ for the two types. Linguistic facial intonation tends to involve the upper face (inner and outer brows, upper and lower eyelids), while emotional expressions involve more actions and both the upper and lower face (Corina et al., 1999; Dachkovsky, 2005, 2009). In addition, specific linguistic facial expressions occur predictably with particular types of discourse (yes/no

[4] See Wilbur (1999) for a syntactic account of the distribution of brow raise and Sandler and Lillo Martin (2006) and Sandler (to appear) for arguments in favor of an intonational analysis.

questions, wh-questions, topics, shared information, etc., Dachkovsky and Sandler, 2009), while affective or emotional expressions are idiosyncratic. Finally, as we elaborate below, linguistic facial intonation is closely aligned with prosodic constituents. Affective expressions are not closely aligned with the text, and can even anticipate the linguistic signal and persist after signing stops (Baker-Shenk, 1983; Dachkovsky, 2005, 2009).

One of the arguments in favor of a prosodic component in the grammar (rather than subsuming prosody in the syntactic component) is the fact that prosody is not fully isomorphic with syntax (Nespor and Sandler, 1999; Sandler and Lillo-Martin, 2006; Sandler 2009a). Some examples of non-isomorphism in sign language have been shown in the sources cited with respect to constituent boundaries. But there is also non-isomorphism with respect to intonation. While certain facial expressions are typically associated with syntactic structures such as yes/no or wh-questions, these can be replaced by different expressions if the pragmatics require exclamatory, rhetorical, or other intonation, even though the syntactic structure remains the same. The content of the particular intonational array selected for a given string is determined pragmatically rather than syntactically.

To sum up, pragmatic function, cooccurrence with intonational phrases, and lack of strict isomorphism with syntactic structures are all compatible with the claim that facial expression is the intonation of sign languages, both functionally and distributionally.

1.3. Alignment

One of the features of the phonetic cues of prosody sketched above that gives weight to the view that they form a prosodic system is the fact that they are temporally aligned at prosodic boundaries -- the most salient of which is the intonational phrase boundary – as can be seen in Figure 1.

Alignment of intonation, manual rhythm, and head and body position within prosodic constituents not only lends salience through redundancy to the signal, it also suggests a linguistic system that is discrete. In established sign languages like ISL and ASL, linguistic facial expressions align with the text (i.e., with manual rhythmic cues), while affective or paralinguistic facial expressions do not, as explained above.

1.4. Interim summary and generality of the analysis across sign languages

A prosodic system, then, is realized by different cues by different parts of the body co-occurring with each other in particular ways. As pointed out above, linguistic facial expressions tend to span a prosodic constituent, unlike emotional facial expressions, which do not coincide neatly with constituents. Head tilts (right or left) also typically characterize a whole constituent. In contrast, where head movements up and down occur, they are associated with boundaries: up with the initial prosodic boundary, and down with the final boundary. Head/ torso leans forward and backward are also associated with boundaries. In sum, up and down or back and forth movements of the head or torso tend to occur at the beginning or end of a prosodic unit, while upper face articulations and head tilts to one side typically span the whole prosodic constituent. As we shall see, in a new sign language formed in an insulated community, coordination and alignment of these features is one of the properties of prosody that has not yet self-organized in the early stages of a language.

2. Al-Sayyid Bedouin Sign Language

Our team has been studying Al Sayyid Bedouin Sign Language (ABSL) for the past several years. The language is found in a Bedouin village in the south of Israel, where the presence of a gene for deafness and marriage patterns within the community have resulted in the birth of a proportionately large population of deaf people over the past 75 years -- ~ 150 out of 3,500, about fifty times the proportion in the United States, for example.

The sign language developed in relative isolation in this village, and today all deaf people and a large number of hearing people use it. Signers converse on topics as diverse as hospitality, national insurance, marriage, childbirth, and jobs, and as remote as folk medicine no longer in use or the clan structure of the village, originating with the five sons of the patriarch, who migrated from Egypt with their father and set up tents in the Negev 200 years ago. Conversations are vibrant and rapid, and give every impression of being fully intelligible and effortlessly interpreted by the interlocutors.

The language of the second generation of deaf people (now from early 30s to over 50 in age) has robust word order patterns: SOV and Noun-Modifier (Sandler et al., 2005).[7] There is a productive type of compounding or affixation in Al-Sayyid Bedouin Sign Language (ABSL), which sequentially adds a size and shape specifier to a nominal sign to describe objects (Meir et al., in press). Other kinds of morphology common to sign languages, such as verb agreement, rich aspectual morphology, and complex classifier predicates, have not been found in the language (Aronoff et al., 2004; Padden et al., in press).

The first generation of deaf people in the village was made up of four children born into a single family. Their signing must have been a form of home sign, but one that benefited from the fact that there were four deaf children (instead of the single deaf child

[7] Identification of constituents for the purposes of determining word order was achieved partly on the basis of prosody (see Padden et al, in press for details).

usually documented in home sign situations, Goldin-Meadow, 2003), and from the fact that the parents did not have a negative attitude toward signs and, according to a report from a grandson, were willing to communicate gesturally. Because of consanguineous marriage patterns and the large number of children born in each household, the number of deaf people has grown quickly in the village. The second generation of ABSL signers numbers about twenty, and the third and now appearing fourth together are estimated at over a hundred.

The present study is based on videotaped narratives of two pairs of signers, 12-17 years apart in age. By the time the two younger signers were born, more and more deaf children had been born in the community, so that the younger signers benefited from a larger community of signing peers; and one of the two in our study had older deaf siblings.[8] The linguistic differences between the pairs point clearly to the development of complexity in the language, both in the organization of a prosodic system and in the syntactic structure, although, as we will explain, no overt relation can be seen between the two. In the next section we describe the methodology of the study, and then move on to the results, both prosodic and syntactic.

3. Methodology

In an effort to trace the development of the prosodic and syntactic systems in ABSL, we report here on a study in which we analyzed one minute of narrative for each of four signers, two aged 40-50, and two about twenty years younger. Even in this small sample, the changes in the prosody and the syntax of the language over the course of twenty years are clearly revealed. In attributing the differences to differences in the development of the language, we rely on Labov's Apparent Time hypothesis (Labov, 1963, 1966), supported by

[8] Social, educational, and other differences across signers and across age groups are currently being investigated. Social, educational, and other differences across signers and across age groups are currently being investigated.

his study of New York English. In that research, Labov showed a difference between features of the speech of older and younger people. After twenty years, he found that the features found in young peoples' speech had become more widespread among speakers of all ages. In other words, the language of young people presages broader diachronic change in a language. We start this section by reporting on the data collection, go through the coding procedure, and, finally, describe prosodic and syntactic analyses.

3.1. Subjects and corpora

The study is based on detailed coding and analysis of one minute of narrative from each of four subjects. The two older subjects are O_S and O_T , and the younger subjects are Y_N and Y_A. The letters 'O' and 'Y' stand for 'older' and 'younger', and the subscripts are the first initials of the subjects' names. O_S is a man about 40 years old at the time of recording, and O_T is a woman then aged 42. Y_N and Y_A are both women, aged about 28 and 25, respectively, when videotaped. O_T is an older sister of Y_N (they were two of five deaf siblings in the household). All narratives were addressed to another deaf ABSL signer. The narratives of the two older signers were stories about past events, while those of the younger signers were excerpted from conversations. In all cases, the minute coded was part of a coherent narration and was uninterrupted. The narratives were translated with the help of bilingual (and trilingual) consultants in the village, either ABSL-ISL or ABSL-Hebrew, one through a voiceover in Hebrew, and followed up by sign by sign glossing (via Hebrew and/or ISL signs).

Our report is in the nature of a case study, as there are few participants and certain variables that are difficult to control. For example, the younger second generation signers spent some years at school. This variable and its possible effect on linguistic development in ABSL is difficult to assess, as any assessment must take into account the nature of the

language used by the teachers and other pupils. However, since the ABSL signing of these signers is fully intelligible to the older signers and unintelligible either to signers of ISL or to speakers of Hebrew, and since the structure is different from that of those other languages according to our previous work and present analysis, we are confident that the language of the ABSL signers cannot be attributed directly to influence from these languages.

3.2. Coding procedure -- Rhythm

The first step is parsing the signing stream into prosodic constituents. Since the hands are the basic channel of transmission of lexical items (signs), it is the manual component that encodes most directly the effects of rhythmic patterning and temporal organization. For this reason, and because manual rhythm was best coordinated with the meaning units in the utterances, we used manual cues as the primary indicators of prosodic boundaries in this study. Signals for IP boundaries include pauses and holds, reiteration of the final sign, as well as slowing down or increase in size of a sign, all at the end of prosodic constituents. A pause is defined as a relaxation of the hands, while a hold is holding the hands in place without movement. In addition to coding the manual markers, we coded head/ torso movements and blinks.

3.3. Coding procedure -- Intonation

Coding of facial configurations and head movements is based on Ekman and Friesen's Facial Coding System (FACS) (1978). Each coding category is entered on a separate line under the text, and the temporal alignment of each element with the text is indicated. Since the cues and their alignment were not always clear, we often call the constituents we found ‘prosodic constituents’, without distinguishing intonational from phonological phrases. Although distinctions between intonational and phonological phrases

were not always clear in the older signers, we attempted to focus on major prosodic constituents, Intonational Phrases, in coding both rhythm and intonation in the present study.[9]

3.4. Prosodic Analysis.

The boundaries of an intonational phrase can be demarcated by an array of prosodic cues. The more prosodic cues aligned with a rhythmic boundary, the more salient the boundary is. If these prosodic cues are of different types, i.e., hand rhythm with facial expression and/or head/torso movement, the effect is even stronger. We were therefore interested both in whether or not cues were aligned with the rhythm of the hands and in the number of cues that were so aligned, and we interpret these measures as an indication of systematicity and complexity of the prosodic system.

In tracing the emergence of a linguistic system in a new language, we took rate of transmission into account. It is conceivable that a language gains efficiency and therefore speed over time (in fact this has been documented in the development of Nicaraguan Sign Language, Kegl et al., 1999), and it is possible that increased speed may influence the prosody and its relation to the text. For this reason, we counted the number of IPs found in one minute of narrative.

A key question was whether dependence/connectedness between constituents is prosodically marked. Certain cues are associated with particular types of constituents and relations, such as continuation and dependency, as explained in §1. When such markings are compatible with the translation offered by consultants, we are able to attribute to these signals dependency marking across constituents.

To address these issues, then, we tallied the following characteristics of the signal:

[9] Since ABSL strings tend to be short, we did not focus on lower prosodic levels in the present study.

1. The number of intonational phrases (determined by manual rhythmic cues) per one minute of signed narrative

2. The percentage of prosodic constituents marked by linguistic facial expressions

3. The mean number of prosodic cues aligned with prosodic boundaries

4. The percentage of prosodic constituents marked as connected to each other by prosodic means. In this category, constituents may be connected either by coordination or by dependency.

3.5. Syntactic analysis

The syntactic analysis takes the prosodically and semantically determined constituents as a starting point, and proceeds to identify the content and structure of phrases, clauses, and interrelated constituents. Grammatical categories such as *noun, verb, subject, object*, or syntactic entities and relations such as *clause* or *embedded, subordinate*, assume a whole package of grammatical features that typically go with them, features that cannot be taken for granted in a new language. In order to avoid misunderstandings, we clarify here what we mean by these terms with respect to ABSL.

Clauses in a stretch of discourse are identified by signs for actions, events or states-of-affairs, each of which is classified as the predicate nucleus of a clause, and is termed a 'verb'. We classify other signs as noun arguments, adjectives, numerals, and negative markers, based on their meanings. Subjects (S) and objects (O) are identified depending on their semantic roles in a clause and the standard mapping of these roles onto syntactic positions; that is, when a predicate takes two arguments, the argument bearing the higher-ranking thematic role according to the thematic hierarchy (e.g., Jackendoff, 1990; Grimshaw, 1990) is regarded as Subject. The thematic role of agent, for example, is highly ranked and, if present in a string, is assumed to be the subject, while theme or experience in the same

string is relegated to object status. The rest of the syntactic analysis adopts standard terminology straightforwardly.

4. Prosody results: comparison of older and younger signers

By analyzing the narratives according to the prosodic criteria described above, we were able to see a pattern, summarized in Table 1.

Signer & age	# prosodic constituents	% IPs with linguistic Facial Expressions	Avg. # aligned cues	% connected constituents
S (40)	31	3%	2.4	6%
T (42)	42	0%	2.7	14%
N (28)	43	30%	3.7	70%
A (25)	31	18%	4	45%

Table 1. Prosodic characteristics in one minute of narrative signed by two older and two younger ABSL signers.

In order to understand the differences between the two age groups, we first illustrate with two short segments, one produced by older second-generation signer O_S (Figure 3), and the other by younger signer Y_A (Figure 5). We then proceed to each of the categories in Table 1.

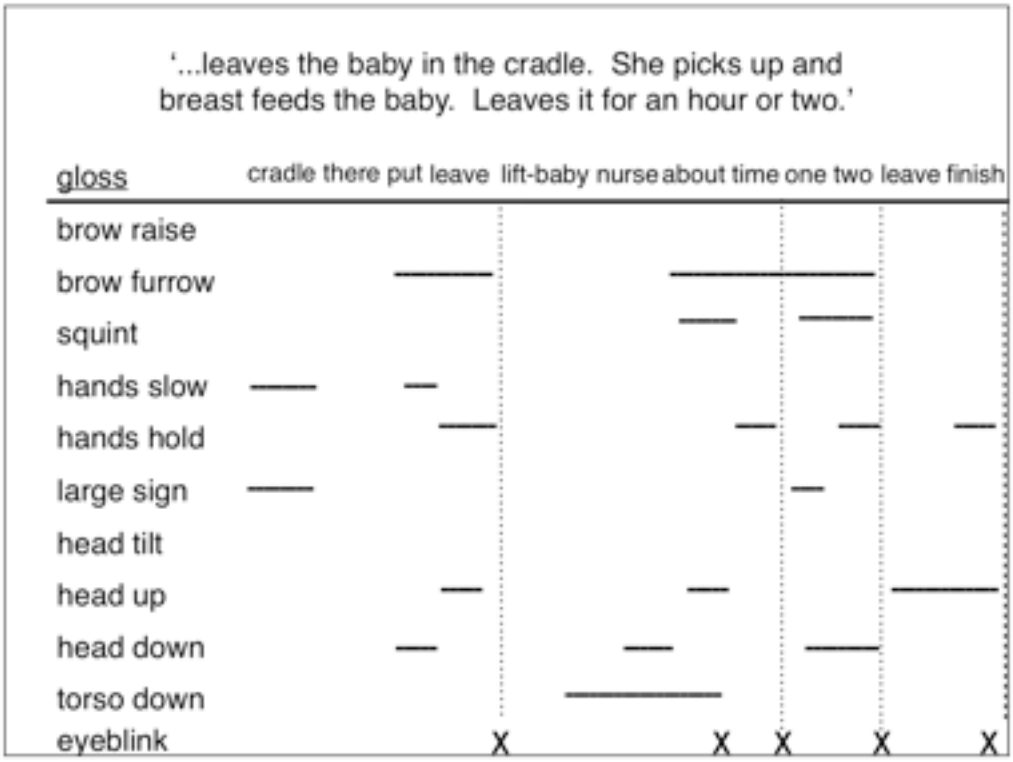

Figure 3. Sample of coding in stretch of signing of an older second generation signer.

This segment of O_S's narrative shown in Figure 3 consists of four prosodic constituents, marked by holding the hands in place. All the final prosodic boundaries are marked by blinks. The final boundary of the first prosodic constituent is also marked by a slight upward head movement, preceded by a downward movement. The end of the utterance is characterized by an upward head movement. The number of prosodic cues at each constituent boundary in this stretch is 3, 1, 4, and 2, with a mean of 2.5 per intonational phrase in this segment. No facial expression spans a whole IP (except brow furrow which crosses a boundary between the third and fourth IPs), and, as is typical for the older signers, no IPs are marked prosodically as dependent. In addition to aligned cues, there are a number of facial and head/body cues that are not aligned with manual rhythmic cues, a point to which we return below.

The example in Figure (4), coded in Figure (5), presents a short stretch of discourse signed by a younger person, Y_A. The rhythmic boundary markings and the alignment of prosodic cues, look very different from that in the previous example.

Figure 4. The juncture of two Intonational Phrases in the ABSL conditional sentence, 'If he says no, then nothing can be done.' Pictured are NOT-AT-ALL] and [NOTHING-CAN-BE-DONE.

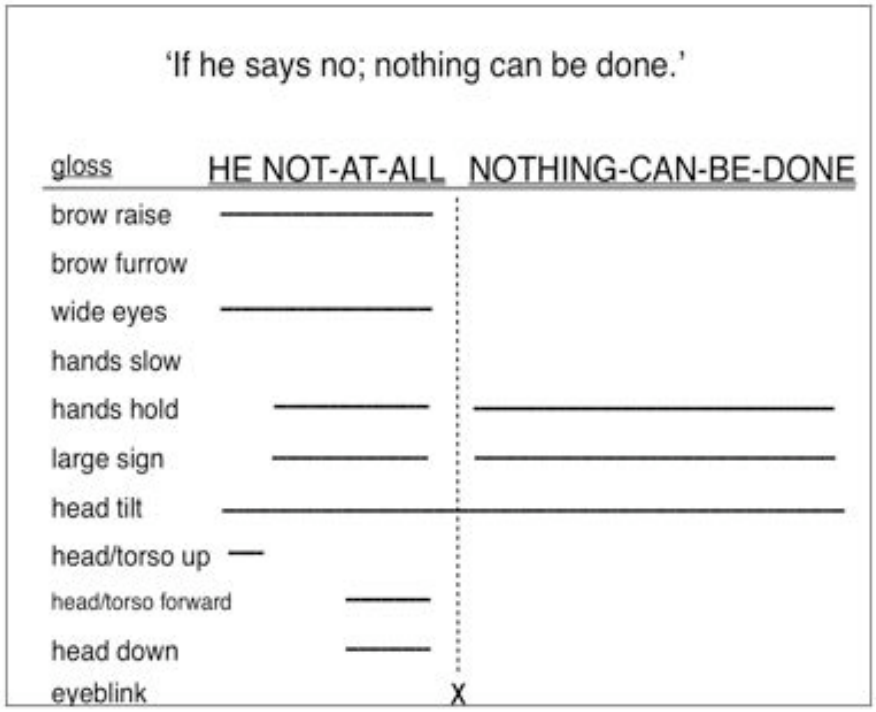

Figure 5. Sample of coding in stretch of signing of a younger second generation signer.

In contrast with the previous example, in Figure (5) the boundary between constituents can be easily detected. The utterance is divided into two intonational phrases [HE NOT-AT-ALL] and [NOTHING-CAN-BE-DONE]. The right edge boundary of each intonational phrase is signaled by perceptually clear manual rhythmic cues. The final sign in each prosodic unit is lengthened by holds, and, in addition, is judged to be larger than a citation form of the sign.

The number of prosodic cues and their alignment in this utterance are similarly indicative of the signing of the younger pair, in contrast with that of the older signers. The final boundary of the first intonational phrase is associated with seven prosodic cues – raised brows, widely open eyes, large sign with hold, head down, head and torso forward, prolonged gaze at the addressee, and eyeblink.[3] The final boundary of the second phrase is marked by four prosodic signals – hold and large size on the last sign, head and torso tilted back, and blink, yielding a mean number of 6 cues per intonational phrase in this utterance. The facial articulations that co-occur with the first constituent are clearly linguistic, determined by comparing associated meanings (in this case, a conditional relationship between the two constituents) with the particular Action Units articulated and their temporal scope in relation to the text.

The two clauses are connected by dependency marking, which consists of raised brows across the first constituent and prolonged gaze at the addressee with forward head/torso at the end, followed by head/torso retraction on the second constituent, as seen in Figure (5). Brow raise here, as in Israeli Sign Language, signals that the information of the constituent so marked is to be completed by the unfolding discourse. The prolonged gaze at the addressee at the end of the first intonational unit captures the addressee's attention and

[3] Gaze is not interpreted as a prosodic cue per se in other studies (Sandler to appear), and it is not marked in Figure 5. As it is a reliable indicator of dependency in the ABSL data, we included it in the analysis, leaving its status to future research.

directs it to the coming IP. These signals, together with the forward/ backward head movements, create a strong overt cue to the contingency implicature between the clauses, and yield a conditional interpretation of the whole utterance (Dachkovsky, 2008; Dachkovsky and Sandler, 2009). We now turn to the results summarized in Table 1.

4.1. Rate of transmission.

There was an interesting disparity between the rate of transmission of intonational phrases and the content of those phrases, prosodically and, as we show in Section 5, syntactically. Unexpectedly, the number of intonational phrases per minute is approximately the same for both age groups. We found this interesting, as it suggests a fairly constant rate for transmitting propositions, regardless of the nature of the propositions themselves, pointing to a more general cognitive explanation.[10] The other measures show that the language of the two age groups differs both in systematicity and in complexity.

4.2. Linguistic facial expression

Among the prosodic cues aligned with rhythmic boundaries, linguistic facial expressions play an important role in the interpretation of the whole utterance, including the conveying of dependency relations. Although emotional facial expressions abound, there was only one case of a clearly linguistic facial expression in the narratives of the older signers. It is glossed in example (1), produced by signer O_S, where brow raise is coterminal with the first intonational phrase, giving an adverbial interpretation to the first constituent. Note, however, that there is no prosodic marking of the 'if' clause (SCORPION-BITE) here.

[10] This finding in a new language is consistent with a comparison between an older sign language, ASL, and a very old spoken language, English. An early study by Fischer and Bellugi (1972) compared the rate of transmission of a story told in ASL with that of the same story told in English, both by hearing native bilinguals. The authors found that, while it took less time to produce a word in English than a sign in ASL, the production rate for a proposition was the same in the two languages.

1) Lone example of linguistic facial expression in older signer O_S

_____ Brow raise

LATER GROW-UP SCORPION-BITE NO NOTHING

'Later, [when he] grows up, [if] a scorpion bites [him]– nothing [will happen]'

This lone marking contrasts sharply with the younger signers' narratives, in which 18% and 30% , resp., of the IPs are characterized by linguistic facial expressions, primarily, brow raise, as shown in the first IP of Figures 5 and 6, and/or squint. It seems then, that linguistic use of facial expression becomes part of the prosodic system later than manual rhythmic cues, with and head and body position somewhere in between.

4.3. Alignment of linguistic cues, mimesis, and gradience.

The older signers average 2.3 and 2.5 aligned prosodic cues, whereas for the younger ones the number is much higher – 3.7 and 4. There are two reasons for this difference. One is the fact that younger signers are more likely to use linguistic facial expression, as described in 4.2, increasing the number of prosodic cues overall. The other is a general disruption of prosodic organization with non-prosodic movement in the older signers, as a result of mimesis or pantomime.

We distinguish pantomime from signing by invoking a distinction between a mimetic replica and a symbol (Sandler, 2009b). Mimetic replicas are mimes in the sense that the hands are the hands and the body is the body; the hands are not used independently to symbolize a referent or action, as they are in symbolic signs.[11] The rhythm of a pantomimic

[11] Since some lexical signs evolved from mimetic forms, an additional criterion for distinguishing mime from sign is conventionalization. In a new language with an unstable lexicon, this criterion is more difficult to substantiate.

expression is governed by extra-linguistic factors, which interfere with the rhythmic flow of signing. It is certainly not the case that the older signers are restricted to pantomime; the majority of their communication consists of strings of signs. However, pantomime does occur in their language, and when it does, movements of the hands, head, or body disrupt the flow of prosody.

In Figure (3) above, the slower tempo of the sign PUT (baby), which mimics the motherly manner of placing a baby in a crib, disrupts the general rhythm of the intonational phrase. As a result, the following sign, LEAVE, semantically closer to PUT than to the following sign, PICK-UP-BABY, is prosodically stranded. There is a very slight hold after LEAVE, which, together with the meaning, groups it with PUT and separates it from PICK-UP-BABY. But the demarcation line is unclear, both because the signals are not salient and because manual rhythm and facial intonation are not coordinated. In this figure, we place a boundary line after LEAVE because the slight disfluency, though less salient than the slowed motion on PUT, is not prompted by pantomime, and because it is more compatible with the semantic interpretation (and voiceover translation) of the string: 'She puts the baby in the cradle and leaves it there; she breastfeeds the baby…..' Another example is the production of the sign CRADLE, larger and slower than the surrounding signs because it portrays the real size of the object, tracing its actual shape in space, rather than a constituent boundary. In addition to creating rhythmic "noise", pantomime can create intonational "noise" as well, since the accompanying face and body movements are governed by mimetic or emotional rather than linguistic factors. In these ways, pantomimic signs interrupt the general prosodic pattern of the utterance. Prosodically, one might compare it to the use of expressives in speech that mimic sounds, like a description of a motorcycle tearing around a corner and slamming into a tree (imagine the changes in rhythm, voice quality, volume): **Vroooom! Bam! Splat…** The signing of the two older signers includes several pantomimic signs in the

minute coded, while these are completely absent from the narratives of the two younger signers in this corpus. This difference reflects the emergence of grammar, from a more mimetic system in which pantomime is interspersed with words and prosody is interrupted, to a grammatical system in which words are sequenced and divided into prosodic constituents.

Another difference between the age groups, one that is partly due to the mimetic elements in the older signers' language, is the type and distribution of rhythmic cues marking prosodic boundaries. Some cues are clearer than others, and the younger signers favor the clearer cues in combination with those that are more gradient. For example, holds and pauses are clear signals of prosodic phrasing, whereas slowing down of the signing tempo or increasing the size of a sign is more gradient and harder to perceive. As we have shown, the latter two cues are also used extra-linguistically to mimic the slow speed of an action or its extended size in reality. While the majority of the younger signers' rhythmic cues are holds, sometimes combined with the more gradient kind, more than half of the rhythmic cues present in the older signers' narratives exclusively either slow down or enlarge the size of a sign. Along with the scarcity of aligned manual and nonmanual cues, such size and rhythm indeterminacies create ambiguity and opacity in the signal, contributing to a general lack of grammatical systematicity for the older two signers.

4.4. Dependency

A major difference between older and younger signers is seen in the hierarchical relations between constituents implied by prosodically marked dependency between intonational phrases. In the prosodic system of the younger ABSL signers, intonational means of signaling dependency between clauses are abundant: 45% and 70 %, respectively, of all intonational phrases are connected by specific cues of dependency marking, most notably head forward and raised brows and gaze to the addressee in the first intonational

phrase alternating with head back in the next intonational phrase (see Figures (4) and (5) above). Older signers signal discourse relations between prosodic groupings much more rarely; each intonational phrase is typically a unit by itself. The older signers' utterances may be linked by a kind of chaining or listing prosody, however, consisting of manual holds and repeated forward movements of the upper body. An utterance of this type will be described in Section 5 on syntax. Of the connected utterances of the older signers, only one was prosodically marked for dependency, shown in Example 1 above.

4.5. Prosody results: Interim summary

Through careful analysis of prosodic cues and their organization, we are able to see clear differences in the language of the older and younger pairs of signers. While the older signers do separate prosodic constituents rhythmically, they tend to use much less linguistic intonation (facial expression); their boundary cues are fuzzier, partly because the various cues are often not temporally aligned; they use more mimetic elements; and they tend to concatenate constituents, very rarely expressing dependency between constituents. Only about fifteen years their junior, the younger signers present a different picture. Both linguistic intonation and the alignment of all prosodic signals are used systematically to cue constituent boundaries; pantomime is not prominent; and dependencies such as conditionals and temporal and other adverbial clauses are marked prosodically. We now turn to the syntactic content of the narratives.

5. Syntactic differences between signers of the two age groups

In earlier work, we have shown that there is syntactic structure at the clause level in the language of the second ABSL generation (Sandler et al., 2005). Specifically, verbs are final in this language, and, where both subject and object are expressed, the order is SOV. The study also found that if there is a noun and modifier in a phrase, the order is noun-modifier. In neither case are these orders found in the local dialect of Arabic or in other surrounding languages, spoken or signed. Prosody has helped us to distinguish the word order within a clause from discourse determined ordering of external topics and other sentence fragments (Padden et al., 2009b), confirming the SOV pattern within the clause. In comparing older and younger signers in the present study, we go on to analyze the syntax within clauses and to consider prosodically cued dependency between clauses.

Differences in the use of prosodic dependency between discourse units may signal the inception of – or may be a precursor to -- syntactic complexity in the younger signers. The texts of both pairs include units concatenated one after the other, without any lexical means for indicating dependency relations between them – no complementizers or other function words or morphemes, no sequence of tenses, or any other overt syntactic markers. But when dependency is explicitly marked by prosody, as it is for the younger signers, the structure of constituents in the utterance is no longer mere concatenation. Instead, a hierarchical structure emerges, in which units are dependent on one another as part of a larger constituent. In the absence of overt markers of syntactic dependencies between clauses, connectivity and dependency between clause-like constituents is emerging in the prosody of younger signers.

We find that there are syntactic differences between the two age groups indicating that prosodic complexity and syntactic complexity are both emerging in this language, though they are not necessarily interacting. The differences we see at the syntactic level are both intra- and inter-clausal. Within the domain of the clause, signers of the two age groups differ in their use of NPs in three ways: the ratio of nouns to predicates in the texts, the

positions of the NPs with respect to their predicates, and the type of nominals expressed (nouns vs. pronouns), dealt with in §5.1. The signers also differ in relating clauses to one another, as we have explained in the preceding section. The relations expressed by the younger signers are clearly complex in meaning and prosody, relations that are typically conveyed by syntactically complex sentences in many familiar languages, and it is in this respect that a connection between syntax and prosody is evoked. We will deal with clausal dependencies in §5.2.

5.1. Noun phrases

Noun phrases may consist only of the head noun, but they may also include various types of modifiers such as adjectives (WOMAN FAT 'fat woman'), numerals (DAY THREE 'three days'), (possessive) pronouns (MAN $INDEX_1$ 'my father') and modifying nouns (BROTHER LEG 'the brother with the [broken] leg'). Noun phrases may also consist of pronominal signs. Pronouns in sign languages are pointing signs directed at the signer (first person), the addressee (second person), or at another point in space that is interpreted as identifying a third person referent. Unlike ASL and ISL, which have separate forms for personal and possessive pronouns (Sandler and Lillo Martin, 2006:174), ABSL uses the same form for both. Pointing signs may also have a locative meaning: when the finger points downwards, the interpretation is ‘here’ and pointing to other locations in space is interpreted as ‘there’. Locative pointing signs often have an arced or rotated movement, which differentiates them from personal pronouns referring to third person. The form of possessive pronouns is identical to that of personal pronouns in this language. We gloss all pronouns as INDEX. The subscript following the gloss indicates the interpretation of the pronouns as indicating first, second, third person referents, or as LOC(ative) markers.

The three factors related to NPs described in Subsections 5.1.1-5.1.3 are summarized in Table 2. They are (1) the NP:predicate ratio; (2) whether or not NPs occupy a clear position with respect to their predicates; and (3) the use of personal pronouns. A text with overt NPs that are clearly associated with their predicates, and with pronouns signaling co-referentiality with NPs, has a much clearer structure and interpretation than one that lacks these syntactic characteristics. The narratives of the two older signers have more discourse units lacking these characteristics than those of the two younger signers, and indeed require more access to shared knowledge and context to be interpreted. Dependency across constituents is discussed in Subsection 5.2.

		Older signers		Younger signers	
		S	T	A	N
No. of IPs		31	41	31	43
No. of predicate signs		27	30	24	40
No. of nouns	Subject	7	1	2	9
	Object	5	1	1	5
	Unclear	5	5	∅	∅
	Other (Adverbial)	2	5	2	2
1P pronouns	Subject	∅	7	12	∅
	Object	∅	∅	1	1
2P pronouns	Subject	∅	∅	1	∅
	Object	∅	∅	∅	1
3P pronouns	Subject	∅	∅	9	17
	Object	∅	∅	2	1
Argument:predicate sign ratio		12:27~1:2.25	9:30~1:3	28:24~1:0.9	34:40~1:1.2

Table 2. Types of Noun Phrases and their uses in four ABSL narratives.

5.1.1. Number of noun phrases

The first difference to notice between the signing of the older vs. younger signers in the study is in the number of noun phrases (which include nouns, nouns plus modifiers, and pronouns) in argument positions with respect to the number of predicate signs (signs denoting events and properties) in the texts. In the two older signers, the ratio is 1:2.25 and 1:3 (one NP to every 2.25 or 3 predicates, see Table 1 below). In the two younger signers, the ratio is about 1:1. This difference implies that in the narratives of the older signers, there are many predicates that are not associated with arguments. Such texts are often vague, since the arguments (the doer and the undergoer of an event) are not explicitly mentioned, and need to be inferred from shared knowledge between the interlocutors. In a sequence of predicate signs, each may be associated with a different argument, but this information must be inferred if the different arguments (subjects and objects) are not explicitly mentioned. In the strings analyzed in the present study, this information can usually be easily inferred.

For example, in O_S's story, there are two human participants, a woman and her baby. There is also a non-human participant, a scorpion. World knowledge suffices to interpret which predicates are associated with which referents and what the role of the referent is with respect to the verbal sign. But in some discourse segments and stories, especially those of signers in the older age group, we sometimes encounter difficulties in interpreting the message, because of the paucity of explicit NPs. In the narratives of the two younger signers, we find that arguments are usually explicitly mentioned, and we generally do not find vagueness in terms of 'who is doing' and 'to whom'.[12]

[12] In the signing of A, a young signer, ambiguity sometimes does arise because it is not always clear who the referent of a third person pronoun is. A. reports on conversations involving herself, her mother and her brother. In some cases of reported speech, it is not clear which of the three is the speaker. Quick changes in third person referents with no overt nouns result in some cases of ambiguity.

5.1.2. Associating NPs with predicates

Still, it is not enough to have more NPs in a text. For a text to be clear, the various NPs have to be associated with predicates, so that their roles in the event are clearly indicated. In the narratives of the younger signers, we find that the various NPs serve subject, object or adverbial functions. An example of a noun with an adverbial function is NIGHT, meaning 'at night'. In the older signers' stories, we find at least five NPs in each narrative whose function is unclear, since they are not associated with any predicate.

Let us start with an example from the narrative of, O_S, an older signer. He begins his story with the following sequence of signs: WOMAN, HOUSE, HOUSE NO, CLOTH, TENT. O_S introduces the main character (the woman) and the location (a tent) in which the event will take place. But this introduction has no clear syntactic structure, since the nouns are not associated with overt predicates. A reasonable interpretation is as a series of existential sentences with modification, such as *There was a woman; there was a house, not a house, a cloth thing, a tent.* However, none of this syntactic structure is there.

O_T, the other older signer in this study, produces a stretch of no fewer than16 IPs, in which she lists her household chores. The list consists of signs denoting actions (MILK, GRIND, CHURN), and signs denoting objects (CHICKEN, COW, SHEEP) interspersed with modifiers such as MORE, GOOD, WELL. Lists usually contain semantically related elements, unified by a listing prosody characterized by holds and repeated forward-backward motion of the head and torso on each word in the list, as mentioned in 4.4. In O_T's list, all the elements are related to different chores. But they are not necessarily of the same syntactic type: some are nouns, some are verbs, and some, like BREAD which can also have a verbal

MAKE-BREAD interpretation, are indeterminate.[13] It is not clear whether the nouns are arguments of the verbs in the list or not. The syntactic structure is also unclear. For example, the following four signs each constitute an independent IP in a list: COW, SHEEP, CHURN, MILK. The general sense is that the chores had to do with the cows and the sheep, and that there was butter churning and milking going on. But the nouns COW and SHEEP are not syntactically related to the verbal signs CHURN and MILK. If COW were the object of MILK, we would have expected the two words to occur in a sequence within the same IP (COW MILK). But this is not the case here. Rather, each sign is a separate item on the list, forming its own proposition, which we interpret as 'There were cows (to be tended to), there were sheep (to be cared for), there was milking, there was churning' etc.

Typically, the younger signers eliminated indeterminacy by producing nouns or pronouns with verbs in a way that clarified the message. The following example (2) from Y_N's narrative also lists several items, but it is constructed as a list of propositions, and has linguistic structure.

(2)

HE LOVE, TEA, THAT'S-IT. COFFEE, NO. CIGARETTE, NO. ALL, NO. TEA ONLY. STAY-THERE, MIND-AT-EASE, THERE DRINK, THAT'S-IT.

'He loves tea, that's it. Coffee – no. Smoking – no. Anything else – no. [When there's] tea, he stays, relaxes and drinks [it], that's all.

5.1.3. Use of pronouns

A third noticeable difference between the older and the younger signers is in the use of pronouns. Of the two older signers, one (O_S) does not use pronouns at all in his narrative.

[13] In ASL, a large number of noun-verb pairs exist with similar but not identical form (Supalla and Newport, 1978). Since these differences can be neutralized in different prosodic contexts (Sandler, 1999b), identifying them can be tricky, and we assume for now that BREAD and MAKE-BREAD, are essentially the same sign in ABSL. Nothing central to the present study hinges on this assumption.

The other (O_T) uses a first person pronoun in six clauses, all in subject position, and a locative or deictic form in two clauses. The deictics are complements of the verb SEE, and they refer to a place or situation mentioned in the previous clause, rather than to a particular referent, interpreted as THERE or THAT (situation). In contrast, both younger signers use pronouns referring to first, second, and third person throughout their discourse.[14]

Pronouns are linguistic entities with no fixed denotation, performing the abstract grammatical function of co-referring to a previously mentioned participant. The interpretation of first and second person pronouns is dependent on those present in the discourse situation, specifically on the identity of the addressor and addressee. Pronouns referring to third person may be interpreted that way too, if they refer to a present participant other than the addressor and addressee. But more often than not, third person pronouns are interpreted by establishing co-reference with referents mentioned previously in the discourse. As such, they signal syntactic dependency, by virtue of being dependent on another element in the discourse for their interpretation. Third person pronouns are therefore syntactic elements (as opposed to lexical elements) par excellence.

Of the two older signers, one (O_S) does not use pronouns at all in his narrative, as pointed out above. The other, O_T, uses mainly the first person pronoun, 'I'. Since first and second person pronouns are situation- and not context-dependent, it is only third person pronouns that mark co-referentiality with referents introduced earlier in the text, and, crucially, these pronouns are almost entirely absent from the narratives of both of the older signers. They either use explicit nouns, or no overt nouns at all. Referential dependency is either marked by using the same noun again, or must be inferred. This results in many one-word constituents where either the subject or the predicate is not overtly stated. Y_A's and

[14] In the one minute segment reported, Y_N doesn't use the first person pronoun, only second and third person, as the story is about two third person referents. In other parts of the discourse, when she talks about herself, she uses a first person pronoun. Notice that O_S 's story is also about two third person human referents, but he doesn't use a single pronoun in the segment.

Y_N's narratives, in contrast, explicitly mark such referential dependency by using third person pronouns throughout their discourse (see Table 3 above). A good example is found in the beginning of Y_N's story.

(3)

WOMAN TWO $INDEX_3$ SHORT $INDEX_{LOC}$, SLEEP. $INDEX_3$NIGHT SLEEP, DREAM. $INDEX_3$ DREAM FATHER $INDEX_2$ $INDEX_3$ LOOK-AT- $INDEX_3$.

'The second wife, the short one from over there, was sleeping. She was sleeping at night, dreaming. She dreamed that your father looked at her…').

Y_A uses an explicit noun to introduce new participants (MOTHER, ABDULLAH), third person pronouns to maintain reference to them and other participants in the discourse (the mother; Abdullah; and the brother;), a second person pronoun and a deictic for the school at Segev Shalom. This intricate use of nouns and pronouns makes the text clear and cohesive. Without pronouns, referent identity can be established and maintained only by using explicit nouns. However, O_S and O_T not only use very few pronouns, they also use very few nouns, resulting in texts which are vaguer and rely heavily on shared knowledge for interpretation. Some pronominal pointing signs in Y_A's narrative are shown in Figure 6.

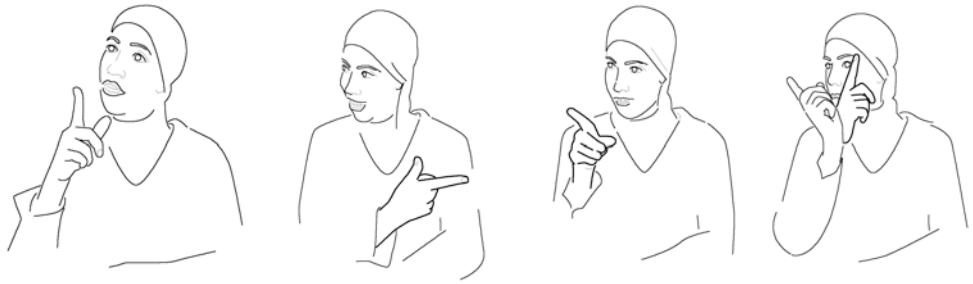

Figure 6. Pronominal signs in younger ABSL signer's narrative, referring to Abdullah, the signer's brother, the addressee, and Segev-Shalom (a place).

5.4. Clause dependency

While information can be conveyed by using only simple clauses, the ability to indicate dependency between clauses contributes to a richer discourse in which the structure and interrelation of events is more precise. A text comprised of only simple sentences seems heavy and monotonous: *Tessa is my best friend. We were having a heated discussion. Tessa was offended. She walked out of my house*. This very short text contains a sequence of four sub-parts, each representing one state of affairs. Neither the semantic relationships between the four sub-parts nor their status in information structure is specified, and they must be completely inferred from the text. For example, it is very plausible that Tessa left because she was offended, but a causal relation is not explicit.

The same occurrence can be expressed differently: *Tessa, my best friend, walked out of my house because we were having a heated discussion and she was offended*. This text, in addition to marking explicitly the causal relations between the events, also marks some state of affairs as background information (Tessa being my best friend, having a heated discussion and Tessa's offense-taking), and singling out one occurrence as the foreground information (Tessa leaving my house). This sentence, then, is both more explicit and more complex than

the single clause concatenation above. Subordinators such as *because* mark both dependency between clauses and the specific semantic nature of such dependency, one of causation.

In ABSL we do not find lexical subordinators, as we've explained. Therefore the specific semantic relationship between clauses must be inferred from the context. Yet dependency itself is marked. Prosodic cues such as head forward and eye gaze directed toward the addressee indicate that one clause is dependent upon another (see Section 4, introduction, and §4.1).

Here too, there is a marked difference between the two age groups. In O_S's story, there is only one case in which dependency is partially marked, in the example, analyzed in Section 4.2 above: LATER GROW-UP, SCORPION-BITE NO NOTHING, 'Later, [when he] grows up, [if] a scorpion bites [him]– nothing (will happen)'. As explained, the first clause, LATER GROW-UP, is marked by brow raise and head tilt sideways. But brow raise is not accompanied by other signals of dependency marking, such as gaze directed towards the addressee and forward head and torso positions. The following sign, SCORPION-BITE, can be interpreted as a conditional clause, but this interpretation is based only on semantic and contextual clues. There is no clear prosodic marking of constituency, and no signal of dependency relations. In the narrative of O_T, the other older signer, there are only two cases of dependency marking, and what is marked as dependent is not a clause but rather a temporal expression: DAY 3, TIME 3, VERY DARK, I GO-AWAY, meaning, '(After) 3 days, (at) 3 o'clock in the wee hours, I ran away'.

The narratives of the younger signers are strikingly different in this regard. In Y_A's narrative 14 and in Y_N's narrative 30 IPs are prosodically marked as dependent (about 45% and 70% of the IPs in their narratives, respectively). In other words, most of the units in their narratives consist of more than one clause. Some units consist of up to 6 IPs, as in example 4, in which each IP is contained in square brackets.

(4)

[SHE FATMA] [FATMA THERE] [FATMA THERE] [CALL COME COME], [HE NO] [AGAIN AGAIN AGAIN]

'[When] Fatma, Fatma [from] over there, calls me [saying] "come, come", he [always says] "no", again and again.'

Fatma is one of the signer's sisters, living across the village, and the intent is that whenever she calls the signer (by text message) to invite her over, the signer's husband says no again and again. Dependency here is marked by changes in head position, accompanied by raised brows and prolonged gaze at the addressee. Though the exact semantic relations of dependency (conditional, temporal, question-response) are not expressed, the dependency marking indicates that the events are not separate, but rather constitute sub-parts of one discourse unit. Such units, then, have a clear hierarchical structure.

Even in venerable spoken languages, a good deal of structural information is manifested in prosody, and certain structures typically accompanied by overt syntactic markers can do without them, if the prosody is right. *You overcook that steak, you're out of here* said to an applicant for a job as chef is clearly a conditional, though the standard structure is, *If you overcook that steak, you will not get the job*, marked both by the conditional *if* and by a sequence of tenses. We typically attribute hierarchical syntactic structure to such strings, sentences embedded within sentences, and we have good evidence from many domains to attribute complex syntax to English and many other languages. But in a new language that only has sentences of the simpler variety without syntactic markers, this structure cannot be assumed, at least not in the absence of other syntactic tests, still to be

conducted. Nevertheless, we see that complex relations can certainly be marked by other means: prosody.

The differences between the older and younger signs, then, are found both in the number of units marked for dependency and in the clarity of the marking, since more prosodic cues are aligned with each other to mark such dependencies, as pointed out in section 4 above. The prosodic and the syntactic systems here work hand in hand: both increase in structure and complexity, resulting in a clearer and more multi-layered text.

6. Snapshots of ABSL at three points in time

In Al-Sayyid Bedouin Sign Language, we see the gradual emergence of prosodic and syntactic structure. Restricting ourselves to overt markers of structure, since more abstract structure is difficult to see in a nascent language of this kind, we find a situation in which prosodic constituents are filling up with more syntactic structure as the language matures, and in which a higher level of hierarchical structure is emerging to link constituents with one another.

To get a feel for the development of this language, let us compare a stretch of narrative from an older and a younger second generation signer from this study with that of a first-generation signer, the latter not included in the study reported above.

A single amateur videotape exists of one of the first four deaf children born in the village (now deceased), taped when he was in his late 60s. In it, he tells a story to a group of younger men (all hearing), a tale from the history of the Al-Sayyid tribe. It is a story that is said to have been conveyed to him gesturally by his hearing father and, though it is probably rehearsed, it is clearly not a rote performance, but rather one that is fully internalized, interpreted, and re-imparted by the teller. A stretch of narrative is shown in Figure 7. Each

line in the gloss is an intonational phrase in this figure. These phrases are separated by clear pauses -- typically, full relaxation of the hands. The story was translated by the man's son.

GLOSS	TRANSLATION
RUN-AWAY RUN RUN SWORD GUN HIT GUN BLOCK HIT SHOOT SHOOT HORSE FALL EYE FALL-OUT KAFFIYEH TWIRL	'(They each) took off (on horseback) and galloped. (The man with) the sword hit (the Al-Sayyid man). (He) blocked it with his gun. (He) shot back (at his attacker). The horse fell. (The rider's) eye fell out. (The Al-Sayyid man) waved (his) kaffiyeh (to summon people.)'

Figure 7. Excerpt from narrative of a first-generation ABSL signer.

Most constituents, which for the purposes of this discussion we conceive of as thought units, consist of a single word only, with either a nominal or a verbal meaning. Those with two have the structure Object Verb (KAFFIYEH TWIRL) or Subject Object, consonant with our findings for the somewhat more elaborated utterances of the second generation (Sandler et al., 2005). There is no linguistic facial expression and very little affective facial expression in this segment. There is prosody, in the most basic sense that each constituent is clearly delineated by pauses, with no other observable signals. None of the constituents here are connected. Without the pauses between thought units, the narrative would be completely unintelligible. Even with the pause prosody, the narrative is only intelligible to someone who knows the story, as we can see by the crucial information provided in the son's translation, enclosed in parentheses above.

A segment of the scorpion story from O_S, an older second generation signer, is shown in Figure 8, slightly expanded from the segment coded in Figure 3. The narrative is about a folk immunization treatment against scorpion bites that was once administered to babies. IPs in this figure are separated by double space.

GLOSS	TRANSLATION
WOMAN BABY THERE TENT CRADLE THERE WOOD SIDES CRADLE THERE PUT LEAVE PICK-UP BABY NURSE ABOUT TIME ONE TWO LEAVE-THERE FINISH	'The woman puts the baby down. In the tent there is a wooden cradle. She puts the baby there and leaves it. She breast-feeds the baby and leaves it for an hour or two.'

Figure 8. Excerpt from narrative of an older second-generation ABSL signer.

By the second generation, a good deal more information is packed into a thought unit, an intonational phrase: The setting in the tent, the baby's cradle made of wood, a time frame. But this abundance of lexical concepts is not yet organized syntactically or prosodically. The prosodic cues to constituency are ambiguous, absent, or obscured by mimesis, as explained in Section 4. Syntactically, there are no constituents with a both a lexical subject and predicate, and no pronouns. While more than one predicate can occur within an intonational constituent, they are not linked, neither by prosody nor by any overt syntactic means. Still, in comparison with the signing of generation 1, a good deal more information is transmitted linguistically here, in an original and intelligible narrative.

By the time this signer is twelve years old, many younger signers have been born into the same generation in other families, and some families have many deaf children. The

language of a younger signer, Y_N, born when he was 12, in a family with four older deaf siblings, makes a leap at least as large as his, shown in Figure 9. Here, each line is a separate intonational phrase. IPs marked for dependency are followed by >>. For clarity, pronominal indices are glossed with English inflected personal pronouns.

GLOSS	TRANSLATION
SHE DREAM FATHER YOU(R) HE LOOK AT-HER >> FATHER SAY WH- YOU LONG-TIME SEE NONE WHY MORNING REMEMBER SHE MORNING GET-UP SIT THINK (PREGNANT SHE >> SHORT WIFE PREGNANT >> SHE CAME-TO-YOU PREGNANT?) >> GIVE-BIRTH SHE RECKON...	'She dreamed. (In the dream) Your father, he looked at her. Your father said, 'Why haven't we seen you for such a long time -- Why?' 'In the morning she remembered. She woke up in the morning, and sat, thinking. 'She was pregnant. The short wife was pregnant. She came to you when she was pregnant. 'She'd give birth (soon), she reckoned….'

Figure 9. Excerpt from narrative of a younger second-generation ABSL signer.

The language of this younger second generation signer is enriched lexically, syntactically, and prosodically. Constituents are typically characterized syntactically by both a subject and a predicate. Pronouns abound to mark this argument structure. There is reported speech, interrogatives marked both by a general wh- sign and by facial intonation. And perhaps the most striking structural leap is in the presence of dependency in the constituent structure. Linking prosody is indicated in the figure with >> -- e.g., a temporal clause, 'in the morning', prosodically linked to 'she sat thinking', reported speech ('Where have you been', etc.) prosodically linked to the report of who spoke ('Your father said'). In these examples, we see a dependency relation between the constituents, both in the meaning, and in the prosody (as described in Section 4).

The segment in parentheses in the gloss box is a parenthetical, set off prosodically in the following way. The signer turns her upper body slightly to the side, her head down and gaze toward the signer, brows raised and head forward to gain confirmation from the addressee that she remembers that the second wife was pregnant when she came to visit the addressee's family. At the end of the parenthetical segment, she resumes her earlier posture and continues with the story. This shows not only embedding at the level of propositions, but embedding of one discourse segment within another.

7. Conclusion

By closely observing a new language as it emerges, we are able to see the stages of evolution of a linguistic system. Capturing slices of this process and analyzing them in detail, as we have done here, reveals properties of our language capacity that are usually inaccessible. A fundamental result of this study is the finding that language breaks up thought units rhythmically before there is any other structure to speak of, even in the first signers of Al-Sayyid (see Figure 8). About 15 years later, as soon as a larger lexicon and more communicative experience (with more interlocutors) has accrued, for the older second generation signers of this study, we see more words in the thought units, and we see the addition of other cues, such as occasional facial expressions and body movements (Figures 4 and 9). However, we also see that a system has not yet emerged. For those signers, these elements are not yet coordinated in such a way as to clearly cue prosodic constituents or their pragmatic functions.

What's more, in older second generation signers of ABSL, relations across clauses of a kind that corresponds to complex sentences are almost nonexistent. Jumping forward in time about another 15 years and capturing another slice of language, we can see important differences. The various signals of hands, face, and body are coordinated now, pronouns are

used in abundance, nominals are associated with predicates, and many constituents show prosodic dependencies, cuing complex structuring of linguistic information.

Research on the acquisition of prosodic signals in children acquiring American Sign Language shows that the mastery of this system is not a trivial matter. In their detailed investigation of the acquisition of conditionals in ASL, Reilly et al. (1990b) found that children do not use nonmanual signals before the age of 5, don't combine them systematically before age 6, and fully master them only at around age 8. Before that time, the children use some but not all of the signals, and have problems producing them cotemporally with the antecedent clause, i.e., problems with what we call alignment here. Prosodic marking of wh- questions is similarly delayed (Lillo-Martin 2000). Our study shows that the development of the system in the life of a language takes a similarly gradual course.

There are two messages to be learned from this. First, we understand from this study that complex structure in language does not appear at the moment of the inception of language, even at the point where the language functions effectively within a community. The second message is that different types of linguistic structure develop complexity in parallel as a language matures -- here, prosodic organization and prosodic marking of semantic dependency relations on the one hand, and syntactic organization and complexity within clauses on the other. The grammatical structure of language in a community takes time to self-organize and emerge. But emerge it will.

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