Sign languages and compounding

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Compounding is one of the few sequential word formation processes found
across sign languages. We explore familiar properties of compounds in
established sign languages like American Sign Language, as well as a modality-
specific type of simultaneous compounding, in which each hand contributes
a separate morpheme. Sign languages also offer the opportunity to observe
the way in which compounds first arise in a language, since as a group they
are quite young, and some sign languages have emerged very recently. Our
study of compounds in a language that came into being only about 75 years
ago (Al-Sayyid Bedouin Sign Language) provides insight into the way in which
compounds arise and acquire structure. We find in our data a relationship
between conventionalization and grammaticalization of compounds:
as particular forms become conventionalized in the community, both
morphological and phonological structural begin to emerge.

1. Introduction

What could be special about compounds in sign languages? What might they tell us
about language in general? Sign languages share two important properties. The first is
modality; the second is their age. Each plays a role in the structure of sign languages
and each has an impact on the formation of complex words.

Sign languages are produced by the hands, accompanied by the face and body, and
are perceived by the eyes. The hands move in a three-dimensional space. The motion
of hands in space is a basic building block of signs in any sign language. Because they
can make use of space, sign languages show quite distinct types of morphology, which
make them typologically distinct from spoken languages (Aronoff, Meir, and Sandler

2005, Meir, Padden, Aronoff, and Sandler 2007).[1] In addition, sign languages but not spoken languages have two independent but identical articulators, the two hands. What are the effects of these physical characteristics on the structure of compounds in sign languages? Do sign languages have compounds? Are they different in structure from spoken language compounds? Are there compound types found in signed but not in spoken languages? The questions raised by modality differences are discussed in Section 2 of this chapter.

The second property shared by sign languages is age. Sign languages can be young, since they come into being when there is a group of deaf people interacting regularly with each other in a particular location. Typically, there are two major types of circumstances that lead to the emergence of a sign language (Meir et al. in press). One type, Deaf community sign languages, arises from bringing together unrelated deaf people of different backgrounds in locations such as cities or schools. The second type, village sign languages, develop within small communities or villages where genetic deafness is transmitted within and between families, resulting in a community with a relatively high percentage of individuals with congenital deafness.[2] In both cases, a sign language emerges at a specific point in time, the point at which deaf people are born to a community or form a community. The conditions leading to the emergence of a sign language recur to the present day, and offer linguists the rare opportunity of watching a language develop almost from its inception. Focusing on compounds, the study of new languages may shed light on the emergence and development of complex words of this type in language generally. Studies of new spoken languages, pidgins and creoles, show that compounding is the type of productive word formation process that develops earliest in the life of a language (Plag, 2006). Yet what are the properties of these early compounds? Do compounds in early stages of a language show different characteristics than compounds in later stages? How are they formed? Are they built up, by combining a sign to another, or are they compacted down from larger strings of words? How do they acquire structure? Which comes first, the sequencing of individual signs, or the structure itself into which signs are inserted?

We have been privileged to study a very young sign language. Al-Sayyid Bedouin Sign Language (ABSL) emerged with the birth of a few deaf children into the Al-Sayyid Bedouin community about 75 years ago. By studying the compounds found in the language productions of second and third generations of signers in this language community, to which we turn in Section 3, we can start to answer some of the questions raised above.

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1.   The issue of modality and its impact of language structure in signed vs. spoken languages have been dealt with in numerous works. See Meier et al. (2002) and Sandler and Lillo-Martin (2006) for in-depth discussions about the role of modality in the various linguistic domains, and Emmorey (2003) and Vermeerbergen et al. (2007) on more language specific structures.

2.   For a somewhat different typology, see Fusseiller-Souza (2006).

2. Modality

A survey of sign languages reveals that the one highly productive word-formation device that they share is compounding. Most compounds combine words sequentially and are similar to the sorts of compounds found in spoken languages. Yet the signed modality offers a possibility for compounding which is impossible in spoken languages: simultaneous compounding. Since the manual modality has two articulators, the two hands, compounds might in principle be created by simultaneously articulating two different signs, one by each hand. However straightforward simultaneous combinations of this type are very rare (Section 2.2).

a. Sequential compounding

Properties of sign language compounds: As mentioned above, compounding is widespread in sign languages. It appears in every sign language studied to date. Some illustrative examples of lexicalized compounds from different sign languages are given in Table 1. As in spoken languages, sign language compounds also display word-like characteristics. In their seminal study of compounds in American Sign language (ASL), Klima and Bellugi (1979: 207–10) describe several properties which are characteristic of compounds and which distinguish them from phrases. First, a quick glance at the examples in Table 1 shows that the meaning of compounds in many cases is not transparent.[3] The ASL compound BLUE^SPOT does not mean 'a blue spot', but rather 'bruise'. HEART^OFFER (in Israeli Sign Language, ISL) does not literally mean offering one's heart but rather volunteering, and NOSE^FAULT ('ugly' in Australian Sign Language) has nothing to do with the nose. Since the original meaning of the compound members may be lost in the compound, the following sentences are not contradictory (Klima and Bellugi 1979: 210):

(1) BLUE^SPOT GREEN, VAGUE YELLOW
    'That bruise is green and yellowish'.

(2) BED^SOFT HARD
    'My pillow is hard'.

Compounds are lexicalized in form as well, in the sense that they tend to have the phonological appearance of a single sign rather than of two signs. For one, they are much shorter than equivalent phrases (Klima and Bellugi 1979: 213), because of reduction and deletion of phonological segments, usually the movement segment of the first member of the compound (Liddell & Johnson 1986, Sandler 1993a). The transitional movement between the two signs is more fluid. In some cases, the movement of the second member is also deleted, and the transitional movement becomes the sole

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3. As is conventional in sign language linguistics, signs are represented by English glosses in capital letters.

Table 1. Examples of compounds in sign languages

American Sign Language	BED^SOFT	'pillow'
(Klima and Bellugi 1979)	FACE^STRONG	'resemble'
	BLUE^SPOT	'bruise'
	SLEEP^SUNRISE	'oversleep'
British Sign Language	THINK^KEEP	'remember'
(Brennan 1990)	SEE^NEVER	'strange'
	WORK^SUPPORT	'service'
	FACE^BAD	'ugly'
Israeli Sign Language	FEVER^TEA	'sick'
(Meir and Sandler 2008)	HEART^OFFER	'volunteer'
	RESPECT^MUTUALITY	'tolerance'
Australian Sign Language	CAN'T^BE-DIFFERENT	'impossible'
(Johnston and Schembri 1999)	RED^BALL	'tomato'
	NOSE^FAULT	'ugly'
Al-Sayyid Bedouin Sign Language	CAR^LIGHT	'ambulance'
(Aronoff et al 2008)	PRAY^HOUSE	'mosque'
	SWEAT^SUN	'summer'
Indo-Pakistani Sign Language	FATHER^MOTHER	'parents'
(Zeshan 2000)	UNDERSTAND^MUCH	'intelligent'
	POTATO^VARIOUS	'vegetable
New-Zealand Sign Language	NO^GERMS	'antiseptic'
(Kennedy 2002)	MAKE^DEAD	'fatal'
	READY^EAT	'ripe'

movement of the compound, resulting in a monosyllabic sign with only one move-
ment, like canonical simplex signs (Sandler 1999).

Changes contributing to the single-sign appearance of compounds are found not
only in the movement component, but also in hand configuration and location. If the
place of articulation of the second sign is the non-dominant hand, that hand may take
its position at the start of the whole compound. In many cases, the handshape and
orientation of the second member spread to the first member as well by a kind of an-
ticipatory assimilation (Liddell & Johnson 1986; Sandler 1989, 1993b).[4]

Morphological structure: Compounding takes advantage of linear structure, but it
also involves reorganization and restructuring. The members of a compound may ex-
hibit different types of relationships. In endocentric compounds, compounds that have
a head, the head represents the core meaning of the compound and determines its

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4.   Similar phenomena have been attested in Australian Sign Language (Auslan). Johnston
and Schembri (1999: 174) point out that in lexicalized compounds phonological segments of the
components are often deleted, and suggest that they might be better characterized as blends.

lexical category. A compound such as *scarecrow* is exocentric (see Bauer, this volume). Neither of its internal components is the head: a scarecrow is neither a type of a crow nor a "scare" but rather originally something that scared crows. The meaning of exocentric compounds is often opaque, and the word class of the compound is determined lexically for each compound, disregarding the word class of the constituents. Endocentric compounds are further classified according to the position of the head in the compound: right-headed and left-headed. It is commonly assumed that the position of the head in compounds is systematic in a language (Fabb 1998). English, for example, is characterized as right-headed, while Hebrew is left-headed. However, there are languages in which both orders are possible. For example, in Japanese and Vietnamese, both of which historically borrowed words heavily from Chinese (in the same way that English borrowed a large portion of its vocabulary from Latin and French), native compounds are left-headed, while compounds containing words that were originally borrowed from Chinese are right-headed (Goddard 2005. See also Booij, and Scalise and Fabregas, this volume).[5]

Not much has been written on headedness in sign language compounds. Of the ASL examples presented in Klima and Bellugi, many are exocentric, e.g., SURE^WORK 'seriously', WILL^SORRY 'regret', WRONG^HAPPEN 'accidentally'/ 'as it turns out', FACE^STRONG 'resemble'. In other cases, it is difficult to determine whether a compound is exocentric or endocentric. EAT(FOOD)^NOON 'lunch', THINK^ALIKE 'agree', FLOWER^GROW 'plant', are such cases. In more straightforward endocentric constructions, headedness is not fixed. SLEEP^SUNRISE 'oversleep' is left-headed, but BLUE^SPOT 'bruise' is right-headed. In ISL, compounds that have Hebrew counterparts are usually left-headed (PARTY^SURPRISE 'surprise party'), though for some signers they may be right-headed. Native compounds in that language, compounds that do not have Hebrew counterparts, are often exocentric, e.g., FEVER^TEA 'sick', SWING^PLAY 'playground'. Verbal compounds are often right-headed, as in HEART^OFFER 'volunteer', and BREAD^FEED 'provide for'.

A third type of compound structure is coordinate compounds (or co-compounds, see Bauer, this volume), where the members are of equal rank, as in *hunter-gatherer*, someone who is both a hunter and a gatherer. In a special type of coordinate compounds, the members are basic category-level terms of a superordinate term. The meaning of the compound is the superordinate term. This class of compounds, called also *dvandva* compounds,[6] is not productive in most modern European languages, but occurs in languages of other families. Such compounds exist in ASL (Klima and Bellugi 1979: 234–5): CAR^PLANE^TRAIN 'vehicle', CLARINET^PIANO^GUITAR

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5. Both types of compounding are quite productive in both Japanese and Vietnamese. Native speakers are not confused, because the vocabulary is quite strictly segregated in much the way that English is.

6. The etymology of the term is from Sanskrit *dvamdva*, literally, a pair, couple, reduplication of *dva* two -- more at TWO.

'musical instrument', RING^BRACELET^NECKLACE 'jewelry', KILL^STAB^RAPE 'crime', MOTHER^FATHER^BROTHER^SISTER 'family'.[7] Like other compounds, they denote one concept, the movement of each component sign is reduced, and transitions between signs are minimal. However, ASL consultants report that there is a lot of individual variation in form and in the degree of productivity of this type of compounding. Younger signers use them very little, and consider them to be old fashioned or even socially stigmatized.

b.   Simultaneous compounding

Compounding is traditionally defined as combining two (or more) words to create a new word. We have described sign language compounds of this type in the previous section. However, we have also pointed out that the presence of two potentially independent articulators opens up possibilities not present in spoken languages, and that, while each articulator typically contributes a meaningless phonological unit to the word, it may also represent a meaningful morpheme. Sign languages do exploit these opportunities in word formation processes that some researchers have described as simultaneous compounds, although they are not compounds in the traditional sense, as the morphemes are bound. We use the term 'simultaneous compound' as used in the literature we are citing, but in so doing we take no position as to whether or not these are compounds in the usual sense.

Examples of one mechanism for simultaneously combining signs are exceedingly rare. Two BSL example are mentioned in the literature: MINICOM (a machine which allows typed messages to be transmitted along a telephone line, Brennan 1990: 151), and SPACE^SHUTTLE (Sutton-Spence and Woll 1999: 103). The compound MINICOM is composed of the sign TYPE and the sign TELEPHONE produced simultaneously: the right hand assumes the ✍ handshape of the sign TELEPHONE, but is positioned over the left hand, that produces the sign TYPE.

However, according to some analyses, a different kind of simultaneous compounding is very widespread in sign languages. Signs in any sign language may be produced by one hand or by both hands. Two handed signs are symmetrical or asymmetrical. In symmetrical signs, the two hands have the same handshape and they articulate the same kind of movement at the same location (or at mirror locations on or near each side of the body). In asymmetrical signs, one hand (the preferred or dominant hand) articulates the sign, while the other hand (the nonpreferred or nondominant hand) is static and functions as the location of that sign. In these signs, the handshape of each hand may be a transparent representation of some meaning aspect of the sign. In a sign such as WRITE (in ISL and many other sign languages), the dominant hand has a ✍ handshape depicting the handling of a long thin object (a pen or pencil), and the nondominant hand in a ✋ handshape represents a flat surface, a sheet of paper in this case.

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7.   One unusual feature of the coordinate compounds of ASL is the fact that they often have three members. The classic coordinate compounds of spoken languages have two members only; hence the term *dvandva* of ancient Sanskrit grammar (from the Sanskrit work *dva* 'two').

Since each hand carries its own meaning, in a sense, such signs can be regarded as compounds of two meaning-bearing units. Such an analysis is presented in Brennan (1990), who uses the term 'classifier compounds' for signs in which the non-dominant hand assumes a handshape of a classifier morpheme that occurs elsewhere in the language.[8] It should be pointed out, though, that these signs, however they originated, are lexical signs in every respect, and under most analyses, they are not regarded as compounds synchronically.

The simultaneous structures described in this section are necessarily unique to the signed modality. The spoken modality, with one articulator, cannot produce forms that call for simultaneous use of two articulators, each conveying a different word or morpheme. But the sequential compounds, described in Section 2.1, are very much like spoken language compounds. They show word-like rather than phrasal properties on all levels: phonology, morphology, syntax and semantics. We turn now to the second property characterizing sign languages, their youth. This property will allow us to examine compounds from another angle – how they come into being.

2. Language age: Compounding in a new language

The newness of sign languages may also shed light on the nature of compounds. We will therefore focus on compounding in a sign language that is less than 75 years old and used in a fairly small, closed community: Al-Sayyid Bedouin Sign Language (ABSL). Compounding is the type of productive word formation process that develops earliest in the life of a language, and it is abundant in pidgins and creoles (Plag, 2006). It has been suggested that compounds are a manifestation of very early stages in the evolution of syntax in human language (Jackendoff 2002). Yet little thought has been given to the way in which compounds might arise. What are the stages in the emergence and development of compounding? ABSL, as a young language, offers us the possibility of studying such questions by observing actual language use in a community. We will address three questions here: (a) How do compounds arise? (b) How do they get conventionalized? (c) What kind of structure do they get, and how? As we shall see, compounds may arise in more than one way: not only by combining (as suggested by the very term) but also by reduction of longer strings of words (Section 3.3).

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8. Classifier morphemes are handshapes that stand for a class of referents, representing some salient visual or semantic properties of these referents. For a survey and analysis of classifier constructions in different sign languages, see Emmorey (2003). Classifier constructions are constructions that combine classifier morphemes (handshapes) with a movement morpheme. The main function of such constructions is to depict the motion of an entity in space. Although these constructions resemble compounds at first glance, they are much more complex, and their linguistic status has been a matter of discussion and controversy for a few decades now. We will not discuss them here. The reader is referred to Sandler and Lillo-Martin (2006) for an overview and an analysis.

In addition, we find remarkable variation, both in terms of the lexical items used in a compound and their structure – variation that must be eliminated in the lexicalization process (Section 3.4). Our data suggest that there is a correlation between conventionalization in choice of compound members and grammaticalization of form: those compounds that are more conventionalized are also characterized by more clear-cut structural and other compound-like properties (Section 3.5).

a.   The Al-Sayyid linguistic community

The Al-Sayyid Bedouin group was founded about two hundred years ago in the Negev region of present-day Israel. The group is now in its seventh generation and numbers about 3,500 members, all of whom reside together in a single closed community.

As a result of consanguineous marriage, within the past three generations, approximately 150 individuals with congenital deafness have been born into the community, all of them descendants of two of the founder's sons. Thus, the time at which the language originated, and the number of generations through which it has passed, can be pinpointed. Members of the first generation of deafness are deceased. We have worked with second and third generation signers, people in their late forties, down to children as young as five and six years old.

Many of the signers in this community are hearing (Kisch 2004). This is quite typical of sign languages that arise as a consequence of recessive deafness in a closed community (Lane, Pillard and French 2000). One result of the recessiveness is that there is a proportionately large number of deaf individuals distributed throughout the community. This means that hearing members of the community have more daily contact with deaf members, and consequently signing is not restricted to deaf people.[9]

In previous works we have shown that ABSL developed a consistent SOV word order in clauses and Head-Modifier order within phrases by its second generation (Sandler et al. 2005). It also developed a lexicon with open-ended categories of content words, the equivalent of prototypical nouns, verbs, adjectives and adverbs, as well as a few function words (Aronoff et al. 2008). However, we have not found inflectional morphology in the language (Aronoff et al. 2004). It appears that the most productive and prevalent morphological device in the language is compounding.

b.   Compound elicitation

In order to elicit vocabulary items in ABSL, we used two tasks: picture-naming and translation from Hebrew. In these tasks, signers quite often responded in multi-word strings. In such cases, we had to deal with two questions: first, whether a response was a phrasal description of the target concept or a compound, that is a conventionalized

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9.   The linguistic situation in the Al-Sayyid community is rich and complex. Deaf members in their 40s and 50s are monolingual in ABSL, but all other members typically have access to more than one language, and master it to varying degrees of proficiency. Hearing members' mother tongue is the local Arabic dialect, and they may know Hebrew and ABSL. Younger deaf members may know ISL, and written Hebrew or Arabic. See Kisch (2008) for a description of communicative interactions in the community.

multi-word lexical item; and second, whether the compound was lexicalized or a nonce form created on the spur of the moment. Neither distinction is easy to draw, even in languages which have been studied in detail over a long time, such as English. For example, an English string of the form A N can be either a phrase (*red shoe*) or a compound (*redwing*). Conveniently, some (but not all!) English compounds have a different stress pattern from phrases, which usually allows us to decide which is which, but some strings, like *french fries* can be stressed on either the first or the last element, so we need to resort to further tests before we decide that *french fries* is a compound (because we cannot insert another element in between the two). Furthermore, whether a particular compound is new is an even harder determination to make, because it depends on the individual, although in the case of written languages, one can use listing in a dictionary as a substitute for knowing the mind of the speaker. In a new language, the difficulties are greater. We do not have diagnostic criteria for distinguishing a compound from a phrase and we have no dictionaries to fall back on for determining what is new from what is lexical. Notice that ABSL is new in two senses: it is a young language, and it is also newly studied. Therefore, we can't make any assumptions about whether compounds exist in the first place, and what structure they may take. Where do we start, then?

One possible point of entry into the system is uniformity. As lexical items, we might expect that compounds should be conventionalized and uniform across signers, as we expect with simplex signs. However, this criterion is problematic for two reasons. First, uniformity is expected only in lexicalized compounds. If compounding is a productive process in a language, then novel compounds should occur, and these are, by definition, not uniform across the community, as they are invented 'on the spot', so to speak. Second, in principle it is possible that different members of the community use different compounds, but all compounds share some structural property, for example a specific word order. But in order to be able to identify the structure of compounds, we need to identify string of words as compounds in the first place, which takes us back to point zero. In order to avoid this inherent circularity and to get a point of entry into the system, we decided to look first at clear-cut cases of compounding, that is, compounds that are conventionalized and lexicalized. If these are identified, they may give us a clue to the structure of compounds in the language.

Conventionalization in form, then, is our first criterion. Yet even this seemingly straightforward criterion is not easy to apply. The degree of variability found in the ABSL community, described below, is such that there are hardly any cases where all or even most signers use precisely the same compound form. We therefore had to make do with partial uniformity across signers. Another possible criterion is whether signers retrieve these multi-word responses quickly and effortlessly, as they do with single word responses, or whether they construct the response while signing. Such a measure is, of course, subjective. However, when looking at a few dozen responses for each signer, such a distinction can be drawn in many cases. The criteria that we ended up using to identify compounds in our data are these: (a) they denote one concept; (b) they

are uniform across at least some signers, (c) they share at least two components with some other signers; and (d) they are produced with ease and with a fluid movement, that is, without the hesitation which tends to characterize novel constructions in our tasks. Responses we were not sure about were not included in the study.

A picture naming task was administered on three different occasions, to three groups of participants (see Table 2 below). The pictures were of everyday objects found in the village, as well as fruits, vegetables and animals, all of which were familiar to the participants. The elicitation materials were different for each group. Group 1 had five participants: two sisters (in their late 40s) and three of their daughters (ages 20 and younger). They were shown 60 pictures. For 29 of the pictures we received compounds as responses. Group 2 consists of four second generation signers (in their 40s) and four third generation signers (in their teens and early twenties), three of whom are brothers. They were shown 66 pictures. We analyzed responses for 14 pictures as compounds. Group 3 consists of ten participants: three second generation signers, all siblings, and seven third generation signers. Of these, five are the children of one of the second generation signers, and two others are not related to that family. Responses to 8 of the 40 pictures they were asked to name were classified as compounds.[10] Three of group 1 signers and two of group 2 signers are included in group 3 as well. Since these tasks were administered in different occasions, we can check the individual consistency of these participants. Full details about the participants are found in the appendix.

Picture naming has the advantage of having no interference from another language, and no need to rely on knowledge of another language, and is therefore a good stimulus for monolingual ABSL signers. But it is restricted mainly to concrete objects. In order to get other types of lexical items, we asked a trilingual deaf signer

Table 2. the three groups participating in the picture naming task

Group 1	Group 2	Group 3
5 participants:	8 participants:	10 participants:
2 second generation signers	4 second generation signers	3 second generation signers
3 third generation signers	4 third generation signers	7 third generation signers
29 compounds	14 compounds	8 compounds

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10.   The number of multiple-word responses was much higher than the actual number of compounds analyzed. For example, in group 2 forty-five responses had more than one word in them, but only fourteen were identified as compounds according to our criteria. This high percentage of compounds in the vocabulary is characteristic of other sign languages developing in small insular communities. Washabaugh (1986;55) reports that in a study of 307 vocabulary items in Providence Island Sign Language, 40% of the signs were compounds. In ASL, in contrast, only 11% of the same vocabulary items were compounds.

(trilingual in ABSL, ISL and Hebrew) to translate a set of 218 Hebrew words into ABSL.[11] As in the picture naming task, quite a few of the signer's responses were multi-word forms. We regarded as compounds those responses that were signed with ease and fluidity, and were not preceded by hesitation. As in the previous task, responses that were unclear as to their compound status were excluded from the study.

c.   How do compounds arise?

The criteria outlined in the previous section helped us establish that there are compounds in ABSL. After identifying as compounds some of the multiple-word constructions in the signers' responses, we were able to turn to investigate the three questions posed above. We start here with the question of how compounds arise in a language. Compounding expands vocabulary in the language by drawing from the existing lexicon, using combinations of two or three words to create distinctive new meaning. According to this view, compounding is a building process. When lacking a lexical item, a language user draws on two existing words which together convey the desired meaning. Under this scenario, three-word compounds seem to be more complex, since they are based on more building blocks.

However, there is another possible interpretation of the process by which compounds emerge, not by building but rather by carving. It is possible that signers start out with long unstructured strings of words, and, as these are used more often, they get reduced, finally ending as two- or three-word units. And indeed, this interpretation best fits what we find in ABSL. When signers are presented with a concept or an object that they do not have a word for, they produce many words that are semantically related to that concept.[12] For example, ABSL does not have a conventionalized lexical item for 'calendar', though calendars are used in the community, and the picture was of a calendar found in one of the participants' houses. In the picture naming task, when presented with a picture of a calendar, signers produced the following responses:[13]

(3)   TIME+SEE+COUNT-ROWS+WRITE+TIME+CONTINUE+FLIP+SEE +COUNT-ROWS

(4)   WRITE+ROW+MONTH+ROW+WRITE

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11.   The words in the list are not compounds in Hebrew, except for four words: cemetery (*beit- kvarot* 'house [of] graves'), factory (*beit-xaroshet* 'house [of] industry'), hospital (*beit-xolim* 'house [of the] sick') and school (*beit-sefer* 'house [of] books'). These are highly lexicalized compounds in Hebrew. Three of them were translated into ABSL as compounds, but different from the Hebrew compounds. One (*factory*) does not have an ABSL equivalent.

12.   In a way, this is quite similar to the dvandva compounds described in Section 2.1, where a string of several basic category-level terms represents the superordinate term. In the case described here, properties of a term represent the term. In both cases, a term is expressed by using several subordinate terms. We thank Susan Goldin-Meadow for this point.

13.   In these responses, we use the symbol + instead of ^, since we do not analyze them as compounds, as they are clearly non-uniform across signers.

(5)   NUMBERS+ROW+MONTH+FLAT-ON-WALL+FLIP
(6)   FLIP+WRITE+FLIP

The words in these responses relate to the function of a calendar (telling the time), its arrangement (rows), its internal form (written), its shape (rectangle), how it is being handled (by flipping pages). Responses vary greatly among signers, and they can also vary within a signer. The example in (6) is produced by the younger signer in that group (about 20 years old), and it consists only of two words, referring to its form and how it is being handled.

'Calendar' is an extreme example: there seems to be no conventionalization at all across these examples. Each signer recruits whatever lexical resources s/he can find in order to refer to this concept. Strings of words for other concepts are somewhat more conventionalized. In these cases, it seems that the signers have already narrowed down the number of words related to a concept. In 'stove/range top', there are four lexical items that signers draw on: COOK, TURN, WIDE-OBJECT, INSERT. However, signers vary as to how many and which items they select from this list, as the following examples show:

(7)   TURN^COOK^WIDE-OBJECT
(8)   TURN^FIRE^4^BURNER^ FIRE
(9)   TURN^WIDE-OBJECT
(10) COOK^INSERT
(11) COOK^WIDE-OBJECT

At the other end of this continuum is a case where all signers use the same components in the same order. In our data we do not have any one compound that is signed uniformly by all signers in the study. But some signs are conventionalized within a family, like the sign KETTLE. There are different sign combinations meaning KETTLE, but two combinations (shown in Figure 1) are each consistently used by members of two different families (Sandler et al. 2009).

We have described only three degrees of conventionalization here, but there are many intermediate cases. For example, in some cases all signers share one component, but differ on the others. Signers may share components but differ in the order of these components. The fact that so many of the responses in our data consist of more than two words may indicate that, at least in a new language, compounding may not be the result of putting two words together, but rather the result of narrowing down, of eliminating members of a long string of words until only two are left. Structure emerges when the types of words for describing an object are of similar function, and come in a particular order (e.g., a word describing the function, and a word describing the shape). We will describe these structural tendencies in Section 3.5.

(a)   (b)

Figure 1. Two different compounds meaning 'kettle':
a. CUP^POUR-from-handle as signed uniformly by all three members taped from one family. b. CUP^ROUND-OBJECT as signed uniformly by all five members taped from a different family

d.   How do compounds get conventionalized?

The process described above demonstrates that we find a lot of variation along the long way towards conventionalization.[14] And indeed the variation we find in ABSL is quite overwhelming. In order to measure the degree of variation we found in the three picture naming tasks, we use two measures, developed in Israel (forthcoming). One measure is the *mode*, the most common value (or the most common form) in a set.[15] In our case, the compound form used most frequently in a set of forms expressing the same notion is the mode. Since the three sets in our study are of different sizes, the mode is calculated as a proportion of the set size, rather than as an absolute value. So, for example, in group 1, four out of the five signers signed 'lemon' as SQUEEZE^ROUND-OBJECT. The mode for that item is therefore 80%. In group 2, four signers signed 'light bulb' as SCREW-IN^LIGHT. However, in this group there are eight signers, and therefore the mode value of that sign is only 50%. The higher the value of the mode, the more uniform the compound across that group of signers. The mean of the modes of all items per set represents the mode score of that set.

The mean mode values for the three sets are: groups 1 and 3 – 51.2%, group 2 – 28.5%. This means that on the average, in groups 1 and 3 about half of the signers produced the same compound form. In group 2 the number is even lower, less than a third of the signers in the group produced the same form. Groups 1 and 3 have more signers from the same family (or extended family) than group 2, which may explain

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14.   The variation in the ABSL community is not restricted to compounds. See Israel (2009) and Sandler et al. (2009) about variation in sign formation in ABSL.

15.   Note that the mode does not have to constitute a majority in order to be the most common. If there are more than two choices, the mode can be less then half, so long as no other choice constitutes a greater fraction of the total.

their higher score. But nevertheless it is striking that even within the same family, compound productions are very variable. In some cases, the same person produced two different forms. One signer signed TURN^COOK in set 1 and COOK^INSERT in set 3 as a response for 'stove/range top'. Her sister signed COOK^TURN and TURN^WIDE-OBJECT for the same concept. Only two signs in group 1 responses got a score of 100%. In group 3 the highest score was 90%, and in group 2 only 50%.

The second measure used for measuring variation is the *number of variants* for each compound. This measure is independent of the mode. Take, for example, a hypothetical situation where, in a set of 10, the mode is 6. That is, six signers used the same form. The remaining four signers may also all use the same compound form, though different from that of the majority, resulting in two variants for that item. However, they may also use two, three or four different forms, resulting in three, four or five variants for that item. The higher the number of variants, the lower the uniformity of the form. As with the mode, the mean number of variants for each group was calculated as a proportion of the set size, because the sets are of different sizes. The mean value for number of variants in group 1 is 65% (3.26 out of a set of 5), of group 2 – 76% (6.1 out of a set of 8), and of group 3- 34% (3.4 out of 10). Combining the two measures together, we see that group 3 is the most uniform; next is group 1; and group 2 is the least uniform. But even in group 3, on average each sign has more than three variants, and only half of the signers use the same form.[16] The results are presented in Figure 2:

An interesting generational difference emerges in a few compounds: older signers use compounds, while younger signers produce a single word response. For describing a TV set, the four older signers in group 3 produced the compound MOVIE^WIDE-OBJECT whereas the four children signed only the first member, MOVIE. Similarly, in set 1, the two older signers produced a compound for 'closet' (CLOTHES^DOORS) and for 'dove' (PECK^WINGS). Their three daughters' responses were DOORS and WINGS.

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16. It should be pointed out that some of the variants are more similar to each other than others. In some cases, two variants differ only in the order of elements (e.g. SCREW-IN^LIGHT vs. LIGHT^SCREW-IN 'light bulb'), whereas in others both the order and the lexical items themselves may be different (e.g., BRIDLE^RUN, RIDE^BRIDLE, MOUNT^BRIDLE^RIDE for 'horse'). The number-of-variant measure does not reflect these differences. Any two forms that are not identical were regarded as different variants.
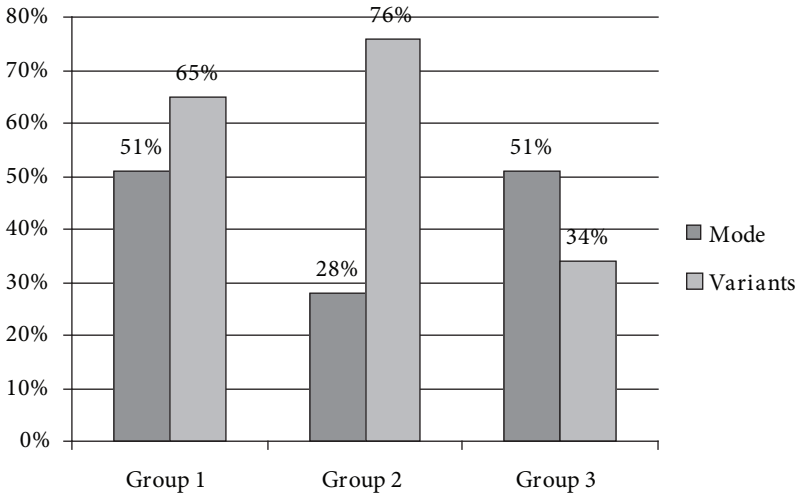
Figure 2. Degrees of conventionalization in ABSL compounds according to two measures: mean values for mode and number of variants in three ABSL groups

e.   Conventionalization and the emergence of structure

As we have seen, the degree of variability in compound production in ABSL is very high, yet some compounds are more uniform than others. It is in these more conventionalized compounds that we find the emergence of properties that characterize compounds in more established sign language. We find evidence for two processes within these compounds: phonological reduction and increased structure.

Phonological reduction: Phonological reduction is at work in the three most uniform signs: TOMATO, EGG, and LEMON. It is manifested in three ways. First, some signers produce a smoother transitional movement between the two parts of both TOMATO and LEMON, as if the transitional movement – rotation of the hand – has become part of the form of the compound. This smoother movement usually goes together with a reduction of the movement of the first sign. The first member of TOMATO (a sign meaning 'squeeze') has a double movement, in which the fingers of the hand close to a fist. Five group 3 signers (one second generation and four third generation signers) reduce it to a single movement, which blends neatly with the transitional movement. The first member of LEMON has a different kind of movement, rubbing of the fingers against the thumb. In LEMON too, in the productions of four signers (all third generation signers), this movement is shorter and blends into the transitional movement. In these forms, then, the movements of the components are blended, and give the impression of a single movement in the entire compound.

Another type of phonological reduction appears in EGG – handshape assimilation (Sandler et al 2009). The compound is made up of CHICKEN^ SMALL-OVAL-OBJECT. CHICKEN is produced with the index finger in a curved shape and the hand

<div align="center">(a)   (b)</div>

Figure 3. a. The standard form of the compound EGG: CHICKEN^ SMALL-OVAL-OBJECT. b. Handshape assimilation in EGG.

bending at the wrist twice, apparently motivated by the beak of a chicken pecking for food. The sign for SMALL-OVAL-OBJECT is produced with three spread, curved fingers, the palm oriented up. The basic compound is shown in Figure 3a. In one family, assimilation occurs. The first sign takes on the finger selection of the second, losing the 'curved beak' icon, so that the only difference between the first and second sign is the orientation of the hand: downwards for the first sign and upwards for the second (Figure 3b). Notice that both types of phonological process render the compound less iconic.

Increased structural regularity: The structure of compounds is usually expressed in terms of the linear order of the head and the modifier. In case of exocentric or coordinate compounds, structure can be defined only in linear terms (the order of the particular members of each compound), since there is no hierarchical relationship between the compound members (neither one is a head). We saw that in less conventionalized compounds in ABSL, signers often use multiple signs to describe an object. In case of more conventionalized compounds, these strings are reduced to two- or three-member units. Yet each compound can be conventionalized in a different way, resulting in different structures for different items. Is there any evidence for increase in structural regularity in any class of compounds? Can we talk about the structure of compounds in the language rather than the structure of **a** compound?

We found two structural tendencies emerging in the language. The first, which is stronger, has to do with compounds containing a Size and Shape Specifier (SASS). There is a tendency for the SASS member to be last. The other tendency is towards a modifier-head order in compounds containing a head and a modifier.

a.   SASS compounds: In many cases, one of the signs used to refer to an object describes the size and shape of the object.[17]   Some examples are: COLD^BIG-RECTANGLE   'refrigerator',DRINK-TEA^ROUNDED-OBJECT   'kettle', WATER^ROUNDED-OBJECT   'pitcher',CUCUMBER^LONG-THIN-OBJECT 'cucumber',PHOTO^FLAT-OBJECT 'photograph', CHICKEN^ SMALL-OVAL-OBJECT 'egg', WRITE^LONG-THIN-OBJECT 'pencil', TV^RECTANGULAR-OBJECT 'remote control' (the last two are illustrated in Figure 4). We note that the

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SASSes do not tend to occur as independent words in the language, so that it is possible that we are looking at an early form of affixation in the language. However, we cannot construct criteria for distinguishing the two in this new language, and we refer to the complex forms with SASSes as compounds here. Compounds containing SASSes are very widespread in the language: they constitute 37% of the compounds in our data set. These compounds are the most uniform ones, and they also show a very strong structural tendency for the SASS to be the final member in the compound. This holds both within each signer (Figure 5) and across signers (Figure 6).
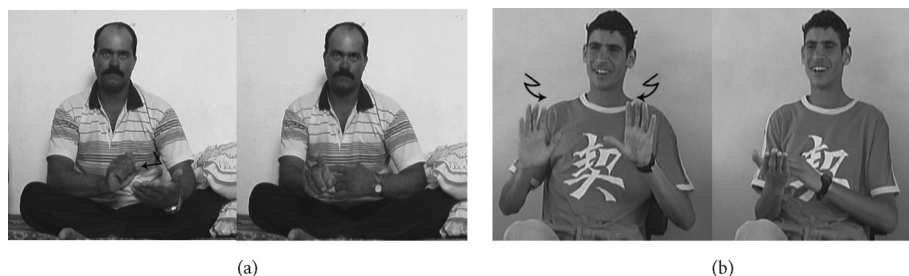

(a)   (b)

Figure 4. Two SASS compounds: a.WRITE^LONG-THIN-OBJECT 'pencil'.
b. TV^RECTANGULAR-OBJECT 'remote control'.
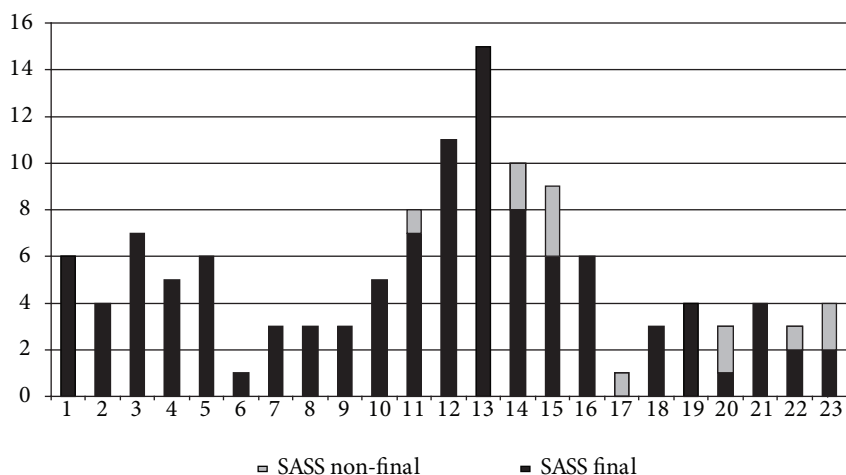

⊡ SASS non-final   ■ SASS final

Figure 5. Structural tendency in SASS compounds: Number of SASS-final and SASS-non-final compounds in the production of each signer
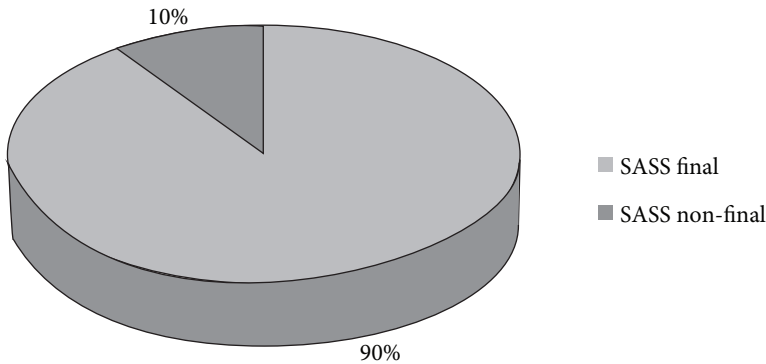
Figure 6. Percentage of SASS- final vs. SASS non-final compounds in our data

b.   Head-modifier order: The other structural tendency is for a modifier-head order in endocentric compounds, as in PRAY^HOUSE 'mosque', SCREW-IN^LIGHT 'light-bulb',BABY^CLOTHES 'baby clothes', COFFEE^POT 'coffee pot'. These are less widespread in our data set (22%) than the SASS-type compounds, and the tendency is much less pronounced, for each individual (Figure 7) and in the entire set of data (Figure 8).

As Figures 7 and 8 show, the mod-head order occurs more often that head-modifier order, but the difference is not as striking as in the case of the SASS compounds. However, there is an interesting generalization even in this rather messy picture: the most uniform endocentric compounds, that is, those that received a high mode score, tend
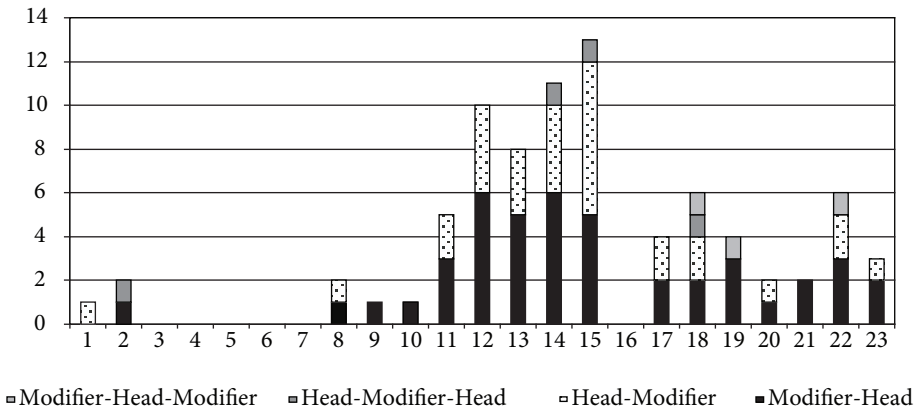

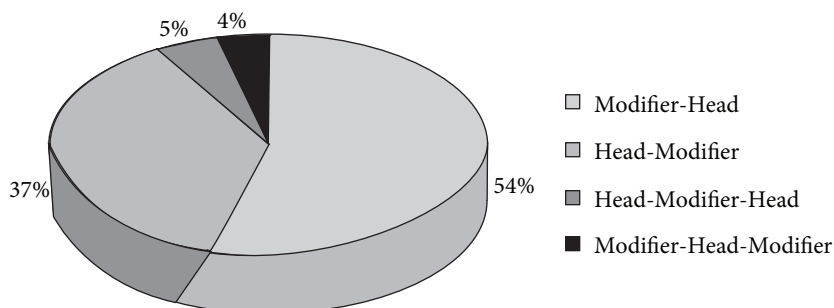**Figure 7.** Structure of endocentric compounds in ABSL: Head-modifier order in the production of each signer

Figure 8. Percentage of different Head- modifier orders in our data

to exhibit a modifier-head order.[18] This finding can be interpreted in the following way: there is a high degree of variability, both within and across signers. But compounds that are agreed upon in the community, that is, the most conventionalized ones, tend to exhibit a particular structure. In a way, then, conventionalization within the community may arise before conventionalization in individual members of the community. These data and the interpretation we propose here are in support of Saussure's conception of language as a social construct.

Notice also that the order modifier-head is the reverse of the order found in phrases (Sandler et al. 2005). It therefore calls into question the assumption that compounds arise from the grammaticalization of phrases. The difference in word order in compounds (at least in those compounds that appear to be undergoing conventionalization) as opposed to phrases may indicate that today's morphology is not always yesterday's syntax, contra Givon (1971; but see Comrie 1980 for a different view).

In quite a few ABSL compounds, it is difficult to determine headedness. Some examples are: GUN^POLICE 'soldier', TAP-ON^STRONG 'iron', SWEAT^SUN 'summer'. This is, by no means, a peculiarity of ABSL. The examples in Table 1 and in Section 2.1 above show that many American Sign Language compounds are exocentric as well, and that therefore exocentricity is not necessarily a feature of compounds in a very young language.

Apart from the SASS and endocentric compounds, two other classes of compounds with consistent structure are found in our data. Both classes appear in the vocabulary elicited by translation from one of our consultants, but we have seen them used by other ABSL signers. Since these notions do not denote objects, they cannot be elicited in a picture naming task. One class denotes place names. In these compounds, one member is a pointing sign, which we gloss as THERE. Some examples are: PRAY^THERE 'Jerusalem', LONG-BEARD^THERE 'Lebanon,' HEAD-MEDALLION^THERE 'Jordan', HEAD-SCARF^THERE 'Palestinian

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18. There is one noticeable counter-example: the signs for 'grandmother' and 'grandfather' are MOTHER^OLD and FATHER^OLD respectively. This order is quite consistent across signers, and the fluidity of the transitional movement between the signs is evidence for its lexicalization.

Authority' and WIDE-HAT^THERE 'America'. These signs are characterized by a fluid transitional movement, and a consistent order: the pointing sign is final.

The second class of compounds consists of those whose first member is a pointing sign towards the head, eye or mouth: HEAD^GOOD 'smart', HEAD^'SO-SO' 'stupid', EYE^SOON 'wait', HEAD^OPPOSITE 'mistake', HEAD^WELL/PRECISELY 'understand'. Such compounds are found in many sign languages (see, e.g., Meir and Sandler 2008 for ISL, and Brennan 1990 for BSL). Pointing to a sense organ or a mental organ (i.e., to the head) seems to be a rich resource for word formation in gestural-visual languages, and ABSL is no exception.

3.   Conclusion

All specific languages must arise through a process of conventionalization, both of structure and individual lexical items. In English, for example, N N compound structure is by far the most common and the most productive, and individual lexical items that follow that structure form many conventionalized compounds (*birdseed, earthwork*, etc.). French has conventionalized the V N compound structure and the individual lexical items that follow it (*ouvre-bouteilles*, *lave-vaiselle*). Neither language has many compounds of the type that is conventionalized in the other. We don't know exactly how these two languages arrived at the particular structures that they manifest (though each is also found in related languages and hence must have occurred in Germanic and Romance). As to individual lexicalized compounds, well *chaque mot a son histoire*.

The advantage of studying a new language is that we can see the process of conventionalization happening before our eyes. In ASL, for example, as noted above, Klima and Bellugi (1979) found that three-element dvandva compounds like CLARINET^PIANO^GUITAR 'musical instrument' were common enough to posit an N^N^N construction for the language. More recently, though, this construction has fallen out of favor, or at least become stigmatized. Thus, in a very short time frame, at least by most standards, one sign language has conventionalized a structure, one that is quite unusual because it has three parts rather than the usual two, and is losing it.

ABSL, which is younger than ASL, provides some evidence for the answer to a more general chicken-and-egg question: which comes first, the individual lexicalized compounds or the structural patterns? Overall, for compounds in ABSL, structure seems to be conventionalized faster, at least for some constructions (e.g., SASS and place compounds). Specifically, we see word order regularity before we see conventionalization of the individual lexical items that make up the compound. It may be that once a construction is conventionalized, it can serve as a tool or frame for creating new lexical items in a faster way, by adding lexical items into the slots. But this study shows that the construction itself is not there from the beginning. It has to be created and conventionalized as well. Furthermore the two compound constructions that we have found to be productive in ABSL, SASS compounds and place names, are far from what one might expect on universal grounds, either cognitive or grammatical. In fact, they

are not even common in most other sign languages that have been studied. In the case of compounds, at least, it may be that structure simply happens.

Conventionalization goes hand in hand with other properties that characterize words rather than phrases – stable structure and more compact phonological form. In this, sign languages resemble spoken languages (as Klima and Bellugi have already shown) and ABSL compounding is indeed beginning to resemble compaction of the sort that has been identified in ASL by Klima and Bellugi and others. In older sign languages, however, the processes of compaction are already conventionalized and spread throughout the community. ABSL thus gives us the opportunity to see how a language might arrive at such constructions, how linguistic structure is carved from a much more diffuse "language blob".

Appendix

Information about participants

Participant	Group	age	Deaf/Hearing	Gender	languages
1	3	28	D	F	ABSL, ISL, [Hebrew]
2	3	22	D	M	ABSL, ISL, [Hebrew]
3. (=19)	3	23	D	M	ABSL, ISL, [Hebrew]
4	3	12	D	M	ABSL, [Arabic], some ISL signs
5. (=23)	3	late 40s	D	M	ABSL
6	3	6	D	F	ABSL, [Arabic], some ISL signs
7. (=11)	3	10	D	F	ABSL, [Arabic], some ISL signs
8	3	19	D	F	ABSL, ISL, [Hebrew]
9. (=12)	3	23	D	F	ABSL, ISL, [Hebrew]
10. (=14)	3	late 40s	D	F	ABSL
*11	1	7	D	F	ABSL, [Arabic], some ISL signs
*12	1	20	D	F	ABSL, ISL, [Hebrew]
13	1	17	H	F	ABSL, Arabic
*14	1	late 40s	D	F	ABSL
15	1	late 40s	D	F	ABSL
16	2	12	D	M	ABSL, Arabic, some Hebrew
17	2	16	H	M	ABSL, Arabic, Hebrew
18	2	17	D	M	ABSL, ISL, [Hebrew]
*19	2	19	D	M	ABSL, ISL, [Hebrew]
20	2	40s	H	M	ABSL, Arabic, Hebrew
21	2	40s	D	M	ABSL
22	2	40s	D	M	ABSL
*23	2	late 40s	D	M	ABSL

Three participants (7, 9, 10) participated in task 1 and task 3. These tasks were administered three years apart. Two participants (3, 5) participated in tasks 2 and 3, which were administered four years apart. The participants' ordinal number corresponds to the numbers in Figure 5 and 7.

Family relatedness:

Family A: Participants 1, 5, 10 and 15 are siblings. Participants 2, 6, 7, 8, and 9 are siblings and children of 10. Participant 13 is the child of 15.

Family B: Participants 3, 17 and 18 are siblings.

Family C: Participant 4 is the son of 22.

Family D: Participant 16 is the nephew of 21.

Family E: Participant 20

Language knowledge: Deaf signers have different degrees of limited knowledge (indicated by square brackets in the table) of the written form of Hebrew or Arabic, depending on their schooling.

Acknowledgements