Variation and conventionalization in language emergence

The case of two young sign language of Israel

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Languages are constantly formed and changed by the opposing forces of variation and conventionalization. Yet it is not clear whether one of the two forces is prior to the other in language emergence, nor do we know how the two interact early in the life of a language. By comparing two young sign languages, Israeli Sign Language (ISL) and Al-Sayyid Bedouin Sign Language (ABSL), both about 90 years old, we argue that the initial stages of a language are characterized by great variation. Conventionalization ensues, but it does not proceed in a unified manner in all linguistic domains of a language or in all languages equally; some domains and structures conventionalize before others, and in some languages the drive towards conventionalization is stronger than in others. We provide evidence for the claim that the drive towards conventionalization is the result of various socio-linguistic factors, such as time, the expansion of the community, the expansion of language use to new communicative domains, and the need to signal social identity.

1. Introduction: Conventionalization and variation in language

Language is a conventional system – in order for language to be shared by all its users, it has to be conventionalized. Conventionalization must occur on different linguistic levels: the lexicon, syntax, morphology, phonology, and phonetics.

Saussure (1959) regarded conventionalization as a necessary outcome of the social nature of language:

> [Langue] … is both a social product of the faculty of speech and a collection of necessary conventions that have been adopted by a social body to permit individuals to exercise that faculty … It belongs both to the individual and to society. (p. 9)

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> Among all the individuals that are linked together by speech, some sort of average will be set up: all will reproduce – not exactly of course, but approximately – the same signs united with the same concepts. (p.13)

According to this view, then, Language (Saussure's *Langue*) is a homogeneous system, its homogeneity arising from the fact that a communication system used within a community has to be conventionalized in order to be effective. A similar view of homogeneity as a central trait of language structure is expressed by Chomsky, relying on the notion of "the ideal speaker-listener, in a completely homogenous speech community" (Chomsky 1965: 3–4).

Yet language is also highly variable. In fact, variation in language is to be found on all linguistic levels, between speech communities of a language, between speakers of the same community, and between different communicative situations that a single speaker finds him/herself in (Trudgill 2000; Bybee 2010). In the words of Walt Wolfram, "If structure is at the heart of language, then variation defines its soul" (Wolfram 2006: 333).

Saussure does acknowledge that languages are not static systems, but rather changing or evolving. He attributes these changes to the social force of the community: "impressions gathered from listening to others modify our linguistic habits" (Saussure 1959: 19), and, crucially, – to time (p. 76). Though Saussure does not state it explicitly, one can deduce that he regards conventionalization and homogeneity as the basic trait and starting point of language, while variability and change are the outcome of social interaction over time. In other words, conventionalization is, in a sense, prior to variation.

But is this really the way it is? Does language start off as a homogeneous conventional system within a community, while new linguistic variants appear only as the language 'grows older' and diversifies? Variation is usually associated with and attributed to expansion in size, to the geographical area and to the social stratification of the linguistic community. But it could be that the picture is exactly the reverse: Perhaps language starts off as a manifestly variable system, and becomes conventionalized over time because of social or other factors. In either of these two competing hypotheses, we may further ask whether the initial stage changes over time, which forces cause it to change, and how the change takes place – in one step, or gradually? On all linguistic levels at a unified pace, or at variable paces for different levels of structure?

In order to decide between the two hypotheses, we need to investigate variation and conventionalization in new languages, languages that only recently came into being. Traditionally, the object of study has been spoken languages, which typically evolved from older spoken languages through processes of gradual changes over millennia. However, sign languages offer an opportunity to track the process of language emergence from the outset. Sign languages, which arise in communities

of deaf people, often have an identifiable 'starting point', since they come into being when there is a group of deaf people who have opportunity to interact regularly over a period of time.

Israel has been blessed with a plethora of sign languages (Meir et al. 2013, 2016, 2017; Kastner et al. 2015), and most of them are less than a century old. Here we report on studies of two rather new sign languages that emerged and exist in Israel – Israeli Sign language (ISL) and Al-Sayyid Bedouin Sign language (ABSL). Though these two languages are more or less of the same age – each about 90 years old – they arose under very different socio-linguistic circumstances, and this offers us an opportunity to address the two hypotheses laid out above.

Al-Sayyid Bedouin Sign language (ABSL) is a sign language that arose in a small rural community, with hardly any contact with other sign languages (Sandler et al. 2005; Sandler et al. 2014). ABSL can be regarded as an example of a language emerging de novo, and as such it provides a natural laboratory for studying processes of language emergence and the forces that shape language in the early stages of its existence. Since it emerged in a small, closed, geographically coherent community, it might be expected that ABSL would show a high degree of uniformity in its earlier stages. Yet we were surprised to find out that this is not the case. Our ongoing research on various aspects of the linguistic structure of ABSL shows that: (a) the language is characterized by a high degree of variation on different linguistic levels; (b) conventionalization does not proceed at the same pace on each level and linguistic domain; (c) conventionalization of structure (e.g, word order in specific constructions or domains) and of the lexicon need not go hand in hand.

We compared the variation found in ABSL to that of Israeli Sign language (ISL) (Meir & Sandler 2008; Meir et al. 2010a: 2013). ISL emerged when people from various linguistic backgrounds including different sign languages came to Israel and started forming a social community in the early 1930s. The interaction among the members of the community gave rise to a new language, ISL.

Our comparison of variation between the two language communities shows that ISL exhibits less variation than ABSL on some linguistic levels and structures. This was rather surprising, since the ISL community is much more varied and diffuse than the ABSL community. It seems, then, that uniformity of community stands in opposition to the uniformity of the language used in that community. In particular, we suggest that three characteristics of the structure of the community are operative here: size, relative homogeneity, and usage domains, primarily whether the language is used in formal settings. In what follows we present a series of studies that, taken together, enable us to address these issues empirically.

We start by providing a more detailed description of the two languages and their communities (Section 2). We then look at specific linguistic phenomena on two linguistic levels: the lexicon, and phonology. In the lexicon, we look at variation

and conventionalization in two domains: basic vocabulary (Section 3) and compounding (Section 4). We then turn to phonology, and report on a study of variation at the sublexical level (Section 5). We also show that despite the fact that ABSL does not have a fully conventionalized phonological system, it has developed a characteristic pronunciation or accent (Section 6). Taken together, these studies show that (a) language starts off with a good deal of variation, and conventionalization emerges over time; (b) characteristics of the community may enhance or hinder conventionalization, so that languages of different communities may conventionalize at different paces; (c) even within the same language, conventionalization does not proceed at a unified pace on all linguistic levels. In Section 7 we suggest possible explanations to account for these observations.

2. ABSL and ISL: Two types of sign language

ABSL and ISL emerged and are used in the geographical area of the current State of Israel. Both are young, as languages go, dating back to the 1920s and early 1930s (Meir & Sandler 2008 for ISL; Kisch 2012 for ABSL). But the circumstances of their emergence and the characteristics of the two language communities are very different.

ABSL is a *village sign language* (Meir et al. 2010a). Such languages arise in small, relatively closed communities with a high incidence of hereditary deafness (Meir et al. 2010b).[1] In such communities the deaf members do not form a separate social group, but are rather part of the general close-knit village community. Many of the hearing members of the community use the local sign language, and therefore the number of signing members of the community is much larger than the number of deaf members of the community.

Al-Sayyid Bedouin Sign Language (ABSL) arose in this small community as a result of the high incidence of non-syndromic recessive deafness (Scott et al. 1995). The first Al-Sayyid man to migrate to present-day southern Israel came from Egypt about 200 years ago and took a wife. Four generations later, in the 1920s and 1930s, four deaf siblings were born into the community (Kisch 2008). In the next two generations, deafness appeared in a number of other families resulting in what is estimated today at approximately 130 deaf adults, teenagers and children. The sign language that arose in the village is different in vocabulary from the sign languages

1. De Vos and Zeshan (2012) discuss the various terms used in the literature to refer to these communities. Kisch (2008) coined the term *shared-signing communities*, to emphasize the fact that the sign language is shared by hearing and deaf members of the community, as we describe below.

of the region, ISL and Jordanian Sign Language (Al-Fityani & Padden 2010).[2] It differs in word order from ISL as well as from the surrounding spoken languages, the local spoken Arabic dialect, and Hebrew (Sandler et al. 2005). ABSL is used widely throughout the community by both deaf and hearing people (Kisch 2000, 2004), and is seen as the alternative language of the village, after spoken Arabic.

ABSL is a fully functional language. Its users use it to converse on any topic they are interested in – social topics such as national insurance, childbirth and fertility, as well as topics that are far from the here and now, such as life histories and folk remedies, politics, planning events, etc. People converse on such issues with fluency and ease, "on the fly", to use Arbib's words (2012).

Israeli Sign language (ISL) arose under different sociolinguistic circumstances, and is regarded as a *deaf community sign language*, of a type that develops when deaf people from different places get together over an extended period of time, often in schools for the deaf (Meir et al. 2010a). Most sign languages that have been studied in linguistic detail, such as American, British, Dutch, and Swedish sign languages, are deaf community sign languages. In communities of this kind, some hereditary deafness may be present, but deafness also arises through illness or other traumas. In these communities, the number of hearing signers is small, and most deaf children are born into hearing families, and have no signing relatives, either hearing or deaf. ISL evolved along with the Israeli deaf community in the early 1930s, in a pidgin-like situation (Meir & Sandler 2008). The members of the first generation came from different backgrounds, both in terms of their country of origin and their languages. A small number were born in Israel, and some of them attended the school for the deaf in Jerusalem, founded in 1932, but the majority were immigrants who came to Israel from Europe (e.g, Germany, Austria, France, Hungary, Poland), and later on from North Africa and the Middle East (e.g, Morocco, Egypt, Algeria, Iran, Iraq). Some of these immigrants brought with them the sign language of their communities of origin. Others had no previous sign language experience, and used some kind of homesign with their hearing families. Today, four generations of signers co-exist within the ISL community, which numbers about 10,000 members: from the very first generation, which contributed to the earliest stages of the formation of the language, to the fourth generation, whose members acquired the modern language as a full linguistic system.[3]

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2. Kisch (2008), who conducted a detailed anthropological study of the community reports that people in the community, when watching ISL or Jordanian Sign Language on television, would often comment "This is not at all like our signs" (Kisch 2008: 289).

3. For an overview of the linguistic mosaic context see Sandler (2014) and Sandler, Belsitzman, and Meir (to appear).

3. The lexicon: Basic vocabulary

One of the first of many surprises confronting us in investigating the vocabulary of ABSL was the variation in lexical signs, even those representing everyday concepts. For example, three different signs for 'cat' were documented, as shown in Figure 1. Other everyday concepts with more than one corresponding sign include 'morning', 'tomato', 'onion', 'horse', 'fish', 'red', and 'black'.

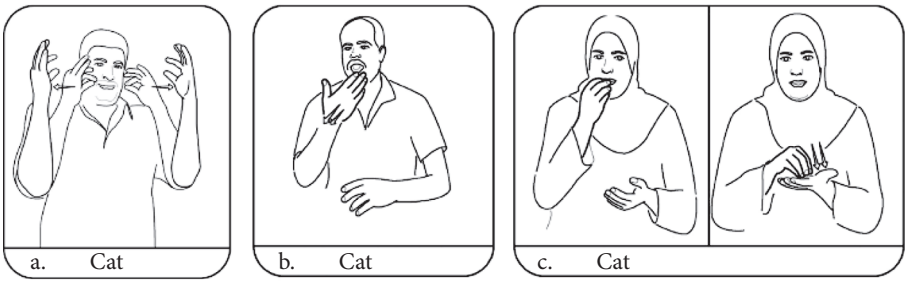

Figure 1. Three lexical variants for 'cat' in ABSL (Meir et al. 2013)

These lexical variants exist in the language of our consultants, who were second and third generation signers.

At the current state of research, we do not know whether lexical variation decreases or increases over time in ABSL. By contrast, we have conducted a study of lexical variation across generations of signers in Israeli Sign Language. In our pilot study of three age groups in ISL, participants were asked to name objects in 38 pictures. As can be seen in Table 1, the mean number of variants per sign decreased with age: younger signers produced on average fewer variants per picture than older signers. Furthermore, the range of variants decreased over time, from up to 8 variants per concept in the older group, to 4 variants in the younger group. In the older group, concepts with only one or two variants constituted only 21% of the signs; in the middle group, their percentage went up to 37%, and in the younger group, the majority of concepts (63%) have only 1–2 lexical variants. Based on Labov's (1963, 1994, 2001) Apparent Time hypothesis, the differences between the age groups can be interpreted as reflecting a diachronic change in the language: there are fewer lexical variations as the language matures. In other words, earlier stages of the language are characterized by more lexical variation than subsequent stages.

Table 1. Lexical variation measures in three ISL age groups

Age	N	Number of variants	Range of of variants	1 variant	2 variants	4 variants
63–89	13	4	1–8	2 (5%)	6 (16%)	12 (31%)
44–60	10	3	1–7	8 (21%)	6 (16%)	7 (18%)
18–40	12	2.36	1–4	8 (21%)	16 (42%)	8 (21%)

4. The lexicon: Compounding

To assess variation and conventionalization in word formation processes, we examined compounding. Compounding is the earliest type of word formation to develop in the life of a language, and it is accordingly abundant in pidgins and creoles (Plag 2006). It has also been suggested that compounds are a remnant of very early stages in the evolution of syntax in human language (Jackendoff 2002, 2009). ABSL, as a young language, offers us the possibility of studying the emergence and conventionalization of individual compounds and compound constructions in a community. Conventionalization necessarily takes place at two levels: at the level of the lexical items used in a compound, and at the level of linear ordering of these items. Our data suggest a correlation between conventionalization in individual compound words and grammaticization of form: those compounds that are more conventionalized throughout the community are also characterized by more clear-cut structural properties. The results reported here are based on Meir et al. (2010b).

4.1 Lexical variation in compounds

We elicited compounds by using a picture naming task: signers were shown a picture of an object and were asked to name it. Responses were analyzed as compounds if they: (a) contained more than one sign; (b) shared at least two components with at least one more signer, and (c) were produced with ease and with fluid movement, that is, without the hesitation which tends to characterize novel constructions in our tasks. If we were unable to judge responses with respect to these criteria, the responses were not included in the study.

We conducted three sessions with different groups of ABSL signers, who were shown sets of pictures (Table 2).[4] Groups 1 and 3 consisted of several participants from the same nuclear family.

4. The sets differed in size, but used the same pictures. That is, the pictures shown to groups 1 and 3 were subsets of the pictures shown to group 2.

Table 2. Three groups of participants who participated in the picture naming task

Group 1	Group 2	Group 3
5 signers: 2 second generation, 3 third generation	8 signers: 4 second generation, 4 third generation	10 signers: 3 second generation, 7 third generation
60 pictures	66 pictures	40 pictures
29 compounds	14 compounds	8 compounds

Our results show a high degree of variation, both within participants (different participants produced different responses for the same item) and within items (some items elicited more variation than others). To give readers a taste of the variability found within participants, Example (1) shows some of the responses for the item 'calendar'. ABSL does not have a conventionalized lexical item for 'calendar', though calendars are used in the community, and the picture of a calendar that served as a stimulus was photographed in one of the participants' houses. Some of the responses for 'calendar' are given in Example (1).[5] The words in these responses relate to the function of a calendar (referring to time), its arrangement (rows), its internal form (written), its shape (rectangle), how it is handled (by flipping pages).

(1) a. TIME + SEE + COUNT-ROWS + WRITE + TIME + CONTINUE + FLIP + SEE + COUNT-ROWS
b. WRITE + ROW + MONTH + ROW + WRITE
c. NUMBERS + ROW + MONTH + FLAT-ON-WALL + FLIP
d. FLIP + WRITE + FLIP

Responses vary greatly among signers, and they can also vary within a signer from one utterance to another. The example in (d) was produced by the youngest signer in this group (about 20 years old); the expression is reduced to two lexemes, encoding its internal form and how it is handled.

'Calendar' is an extreme example: there seems to be no conventionalization at all across these tokens. 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, narrowing down the number of words related to a concept. For 'stovetop', found in every household, signers draw on five lexical items: COOK, FIRE, TURN, WIDE-OBJECT, INSERT. However, signers vary as to how many and which items they select from this list, as in Example (2):

5. We use the following notational conventions: signs are represented by English glosses in upper-case letters. When two (or more) English words are needed to represent one sign, the glosses are represented with a hyphen (e.g., LONG-THIN-OBJECT). Compounds are indicated by ^ between signs. When we weren't sure about the compound status of the response (as in the examples in (1)), we used + to show multi-word responses.

(2) a. TURN^COOK^WIDE-OBJECT
b. TURN^FIRE^4^BURNER^FIRE
c. TURN^WIDE-OBJECT
d. COOK^INSERT
e. COOK^WIDE-OBJECT

At the other end of this continuum, we expected to find items in which all signers use the same components in the same order. In our data, remarkably, we do not have any one compound that is signed uniformly by all signers in the study. However, some signs are conventionalized within a family, leading us to coin the term *familylect* (Sandler et al. 2011). An example is the sign KETTLE. There are different sign combinations meaning 'kettle', but members of each of two different families uniformly sign the same combinations (shown in Figure 2, Sandler et al. 2011).

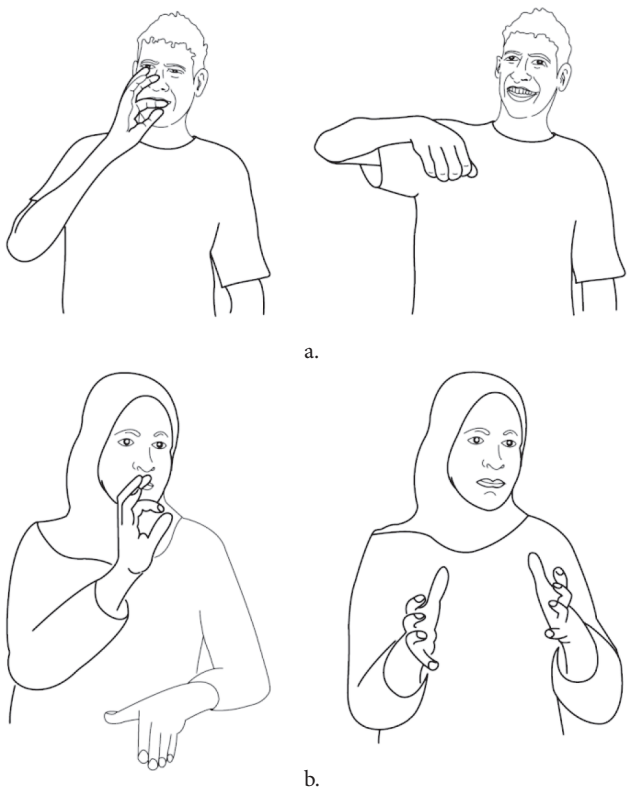

Figure 2. Two different familylect compounds meaning 'kettle': (a) CUP^POUR, as signed uniformly by all three members taped from one family, and (b) CUP^ROUND-OBJECT, as signed uniformly by all five members taped from a different family (Sandler et al. 2011)

There are many intermediate degrees of conventionalization. In some cases all signers share one lexical component of a compound word, but differ in the others. Signers may share components but differ in their order. In order to measure the degree of variation we found in the three picture naming tasks, we use two measures (Israel 2009). One measure is the *mode*, the most common value (or the most common form) in a set.[6] 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.[7] 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 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*.

The mean mode values and the mean values of number of variants are presented in Figure 3. Of the three groups, group 3 is the most uniform as it has the highest mode value and the lowest value for number of variants. But even in group 3, on average each sign has more than three variants, and only half of the signers use the same form.[8] In the domain of compounding, then, ABSL is characterized by great variation.

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6. 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 than half, so long as no other choice constitutes a greater fraction of the total.

7. 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%.

8. 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.

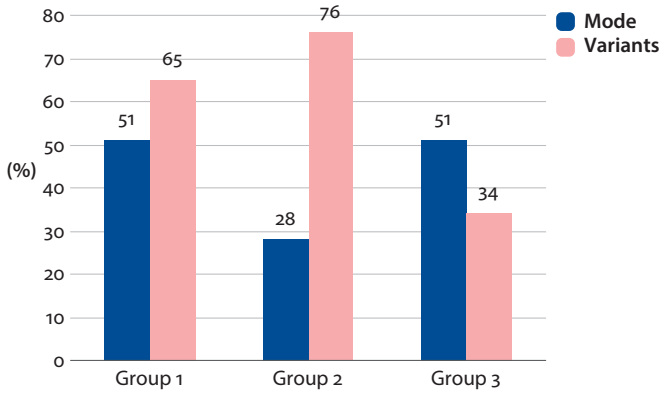


Figure 3. Degrees of conventionalization in ABSL compounds according to two measures: mean values for mode and number of variants in three ABSL groups (from Israel 2009)

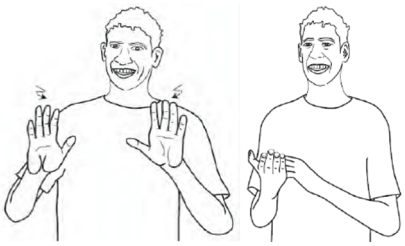
4.2 Increased structural regularity in compounds

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 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?

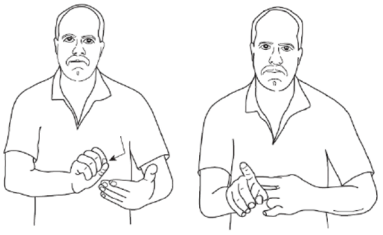
We found two structural tendencies emerging in the language. The first, which is stronger, has to do with compounds containing a Size and Shape Specifier (SASS). There is a tendency for the SASS member to be last. The other tendency is towards a modifier-head order in compounds containing a head and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

SASS compounds are compounds in which one of the signs used to refer to an object describes the Size And Shape of the object.[9] Some examples follow in (3) (the last two are illustrated in Figure 4):

9. SASS signs are common in sign languages in general, though their form and distribution may vary from language to language.



Remote control
TV+FLAT-RECTANGULAR-OBJECT



Pencil
WRITE+LONG-THIN-OBJECT

Figure 4. Two SASS compounds in ABSL (Sandler et al. 2011)

(3) a. COLD^BIG-RECTANGLE 'refrigerator'
b. DRINK-TEA^ROUNDED-OBJECT 'kettle'
c. WATER^ROUNDED-OBJECT 'pitcher'
d. SQUEEZE-BY-MOUTH^LONG-THIN-OBJECT 'cucumber'
e. PHOTO^FLAT-OBJECT 'photograph'
f. CHICKEN^SMALL-OVAL-OBJECT 'egg'
g. WRITE^LONG-THIN-OBJECT 'pencil'
h. TV^RECTANGULAR-OBJECT 'remote control'

Compounds containing SASSes are very widespread in the language: they constitute 37% of the compounds in our data set. These are the most uniform compounds, and they also show a very strong structural tendency for the SASS to be the final member in the compound (Figure 5).

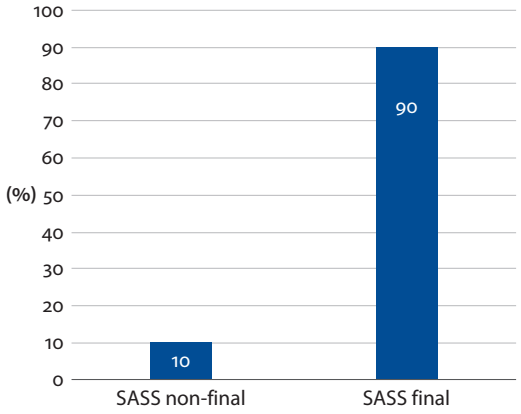


Figure 5. Percentage of SASS- final vs. SASS non-final compounds across signers (Meir et al. 2010b)

b. Head-modifier order: The other structural tendency is for a modifier-head order in endocentric compounds, as in Example (4):

(4) a. PRAY^HOUSE 'mosque'
b. SCREW-IN^LIGHT 'light-bulb'
c. BABY^CLOTHES 'baby clothes'
d. 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 (Figure 6).

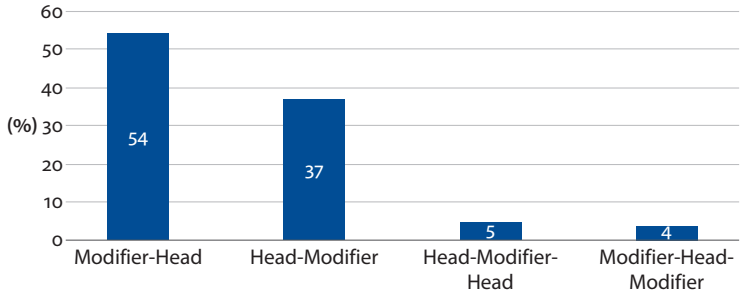


Figure 6. Percentage of different head-modifier orders (Meir et al. 2010b)

As Figure 6 shows, modifier-head order occurs more often than 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 to exhibit a modifier-head order.[10] We return to this finding in Section 4.3.

4.3 Variation and conventionalization in ABSL compounds

On the whole, ABSL compounds show a high degree of variation. The variation is manifested in the lexical items comprising the compound's components, in the number of components, and in their relative order. However, we were able to identify certain tendencies towards conventionalization in all three parameters.

In terms of the lexical components of the compounds, some compounds are more uniform, especially within families. This finding highlights the role of the

10. 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.

family as an important sub-unit in the language community, that may serve as a vehicle towards conventionalization.

In terms of structure, we found two tendencies: SASS compounds have a strong tendency for the SASS component to occur in the final position, and in endocentric compounds there is a tendency for modifier-head order. Structural regularity is much stronger in the SASS compounds than in the endocentric compounds. These findings show that different structures may conventionalize at different paces, even within one linguistic domain such as compounding.

The responses that consisted of endocentric compounds showed another interesting tendency towards conventionalization: the most uniform endocentric compounds, that is, those that received a high mode score, tend to exhibit a modifier-head order. This finding can be interpreted in the following way. There is a high degree of variability, both within and across signers. However, 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, represented by statistical tendencies, may arise before conventionalization in each individual member of the community. These data and the interpretation we propose here are in support of Saussure's conception of language as a social construct.

When examining the interaction between lexical and structural aspects of conventionalization, we find that while structural regularity does not necessarily imply lexical similarity, lexical similarity tends to exhibit structural regularity. The different compounds for 'oven' illustrate the first point (Example 5): the variants that have a SASS component (WIDE-OBJECT) place the SASS in final position (structural regularity), yet the lexical item that precedes the SASS is different:

(5) a. TURN^COOK^WIDE-OBJECT
    b. TURN^WIDE-OBJECT
    c. COOK^WIDE-OBJECT

The second point, regarding structural regularity, is illustrated by the compounds that got the highest uniformity scores. These show that compounds that share the same lexical items tend to exhibit structural regularity as well: SASS final (e.g, responses for lemon, tomato, egg, kettle, clock, radio) and modifer-head order (BABY-CLOTHES, COFFEE-POT, LIGHT-BULB). It seems, then, that structural regularity can emerge before full lexical conventionalization; or to put it in other words, lexical conventionalization is not a condition for the emergence of structural regularity.

5. Phonology: Sublexical variation[11]

Both ISL and ABSL have conventionalized lexicons. ISL also has sublexical structure; like other established sign languages, it has a phonology (see Meir & Sandler 2008 for ISL; Sandler & Lillo-Martin 2006; Brentari 2012; Sandler 2012, 2017). To say that there is a phonological level of structure means that there are discrete and meaningless formational elements that work together in a system. The existence of minimal pairs, meaningful words distinguished by such elements drawn from a finite list, is strong evidence for a system of this kind. In spoken languages, distinctions between words are made by sounds that are divided at the highest level into the categories of consonants and vowels. In sign languages, the major categories of phonological organization are Hand Configuration, Location, and Movement (Stokoe 1960), each with its own hierarchy of features (Sandler 1989). Figures 7a–c illustrate minimal pairs along these parameters in ISL.

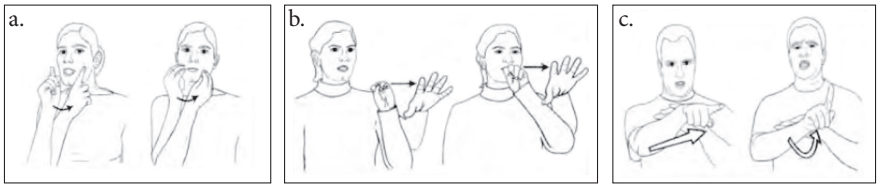


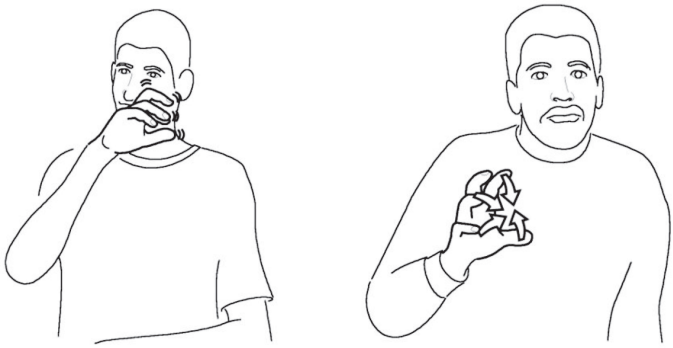
Figure 7. ISL minimal pairs distinguished by features of: (a) hand configuration; (b) location; (c) movement (from Sandler 2017)

For MOTHER, the Hand Configuration is a flattened 'O' shape, and for NOON, it is extended index finger. All other aspects of the two signs are the same. The signs SEND and TATTLE have the same Hand Configurations and Movements, but are distinguished by Location: near the signer's torso for SEND, and near the face for TATTLE. The signs ESCAPE and BETRAY are distinguished by the shape of the path Movement, straight for ESCAPE, and arced for BETRAY.

However, in ABSL we have yet to find clear-cut cases of minimal pairs distinguished solely by form, parallel to the ISL examples presented here. In the apparent minimal or near-minimal pairs that we have encountered, the differences between them are easily explained by iconic rather than formally contrastive detail. In addition, we noticed that different individuals often adopt different phonetic forms for the same ABSL signs – they vary widely in sublexical components, that is, in the use of hand configuration, location and movement. An example of such variation

11. This section borrows from Meir et al. (2013).

is given in Figure 8. The Figure shows two variants for the ABSL sign DOG. The variants, produced by two different signers, have different locations and different movements. Specifically the token in 8a is produced in front of the mouth and has a rapidly, repeated slight clawing movement of the fingers. The token shown in 8b is produced in the pace in from of the signer's chest and has a combination of path movement (i.e. the hand moves) accompanied by a hand shape – from opned to closed. As TATTLE and SEND in ISL show (Figure 9), major body area (head or torso) creates important distinctions in established sign languages, and it was surprising to see evidence like the two productions of DOG, in Figure 10, that this is apparently not the case in ABSL.



a. b.

Figure 8. ABSL variants of DOG: Mouth and torso, major contrastive places of articulation in established sign languages, are not contrastive in ABSL (Sandler et al. 2014)

5.1 A comparative study of sublexical variation in three sign languages

Our initial impression was that the amount of variation in ABSL in such potentially contrastive features was unusually large (Aronoff et al. 2008). That impression led us to develop a comparative study in which the amount of sublexical variation in ABSL was measured and compared with the amount of variation found in two other sign languages, ISL and American Sign Language (ASL) (Israel 2009; Israel & Sandler 2010, 2011). Since ASL is older and has a longer history of grammatical innovation and change across generations of signers, the level of variation in this language could serve as a reference point with which to compare the amount of variation in ABSL and ISL.

Israel & Sandler (2010) collected 15 signs produced in isolation by ten signers in each language, and coded them according to detailed sublexical features of the

three major phonological parameters. For each lexical item (a sign), and each feature (e.g., the location, the type of movement, etc.) the amount of variation across signers within each language was quantified using two measures: the mode and number of variants (see Section 4.1 above). Each of these two measures was averaged over different signs for each phonological feature to provide a global measure of the amount of variation for that feature.[12]

The results indicated differences among the three languages. As we suspected, ABSL had the greatest amount of cross-signer variation, followed by ISL and then ASL. Although the data set used for the quantification of variation was relatively small, and therefore statistical significance for the cross-linguistic differences was not established for most of the features coded by Israel (2009),[13] the ABSL > ISL > ASL pattern was found across subcategories of phonological features as well as at the global level (the entire sign), and hence was fairly robust.

5.2 Sublexical variation and characteristics of the community

The relative degree of variation between the three languages stands in reverse ratio to the degree of social homogeneity of the groups of signers in each language. The group of ABSL participants consists of signers from the same extended family, with six out of the ten belonging to the same immediate family. The ISL group was less socially homogenous: four of the signers were members of the same immediate family, and among the rest two pairs were siblings. The ASL group was the least socially homogeneous: only two of the ten signers were siblings. The other eight signers were unrelated to each other. The different degrees of homogeneity are characteristic of the communities at large. ABSL is the most homogeneous of the three communities: it is rather small (about 4,000 members, 130 are deaf), all of whom belong to the same ancestral lineage, and many related to each other by marriage. They all live in one village, and share the same social and cultural background. ISL has a larger community (about 10,000 people), spread all over the country, and most of them are not relatives. They come from different backgrounds and grew up in different social circumstances. ASL has the largest community (about 300,000 people), spread over the U.S. and parts of Canada; most of them are not related to

12. See Israel (2009) for a complete description of the methodology.

13. In the individual features studied by Israel, statistical significance was only found for differences in the amount of variation in thumb position. However, when a difference for any feature was counted as a difference between two tokens, statistical significance for variation was reached across the three sign languages (see Israel 2009 for the complete methodology).

each other; and many do not know each other.[14] ASL is also older than ISL and ABSL: it is about 200 years old, whereas both ISL and ABSL are about 90 years old. We attribute the differences in conventionalization to the social and linguistic characteristics of communities, a point to which we return in the conclusion.[15]

6. Signaling community identity: A signature accent in ABSL

As described in Section 2, ABSL began life in relative isolation, as the first generation and older second generation signers did not benefit from schooling, and did not have regular contact with ISL signers (Kisch 2012). Contact with ISL began in the 1980s, and has increased with the third generation, when deaf children of Al-Sayyid began to be exposed to signs from Israeli Sign Language at school, where teachers typically use bare (uninflected) signs from ISL to accompany their speech, either Hebrew or Arabic. That is, the input is pidgin-like and does not convey the grammar of ISL. In their late teens, a number of boys were exposed to native ISL from deaf teachers at a residential vocational school, while some teenaged girls and young women were exposed to ISL at social meetings for deaf people, whose organizers are ISL signers. Within the village, older deaf people, pre-school deaf children, hearing family members, and other hearing people maintain ABSL. However, because of the contact with people who use ISL signs in the educational system and in deaf clubs, there is a good deal of borrowing of signs from ISL into ABSL, mostly among third generation signers.

However, when ISL consultants in our lab view video recordings of Al-Sayyid borrowings from ISL and whole narratives with ISL vocabulary, they invariably remark that the signing does not look like ISL. There is a signature Al-Sayyid 'accent'.

Our data concerning the ABSL 'accent' come from two sources. One is a vocabulary study in the Al-Sayyid village. We compared the citation form of six ISL signs, that were elicited from twenty signers (seven ISL signers and thirteen ABSL signers). The other data set consists of narratives by two young female ABSL signers (around age 20), compared with the same narratives signed by a native ISL signer.[16]

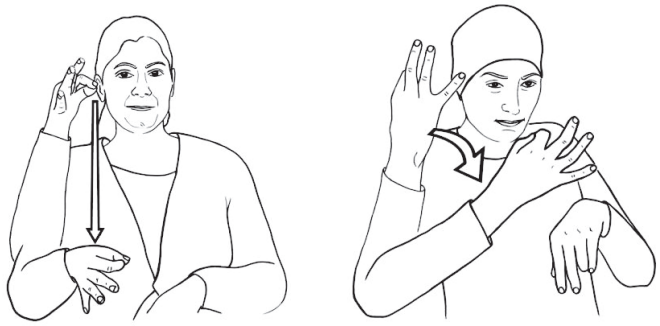
The accent has several features, among them, dorsal hand prominence, unbounded nondominant hand spread, lenition, lax handshapes, and movement

14. Population figures vary quite widely in different sources for ASL and ISL, and the figures cited here should be taken as approximate.

15. At the same time, we identified kernels of phonological structuring, for example, assimilation that targeted formational elements based on form and not meaning. See Sandler, Aronoff et al. (2011), Sandler (2011) and Sandler (2017) for details.

16. See Sandler, Belsitzman & Meir (to appear) for methodology details.

simplification. All of these characteristics are described and illustrated in Sandler et al. (2017). A flavor of the accent can be seen in the characteristic labeled dorsal hand prominence. We noticed that in the signing of ABSL signers, the dorsal part of the hand, the back of the hand, faces the addressee much more often than in the signing of ISL signers, for whom the fingertip, radial, or ulnar part of the hand more often faces the addressee. In order to quantify the impressionistic difference between the two accents, we compared the number of video frames with dorsal prominence in the Al Sayyid and native ISL renditions of the same narratives. We found dorsal salience in 68% of the video frames in the Al-Sayyid versions, compared to 38% for the ISL signer. Compare the ISL sign EXACTLY signed by a native ISL signer, characterized by finger tip prominence, with the Al-Sayyid version, illustrating characteristic dorsal prominence, shown in Figure 9a, b.



a. b.

Figure 9. The ISL sign EXACTLY, (a) signed by a native ISL signer and (b) signed with dorsal prominence in the Al-Sayyid accent (Sandler et al. 2014)

The ABSL accent is very noticeable when looking at ABSL signers. In spite of the vast phonological variation which characterizes the ABSL community, features of the accent seems to stand out (both in ISL signing and in ABSL signing), giving the ABSL signing community a particular 'flavor' that distinguishes them from the ISL community. Accent, indeed, has an important role is signaling group identity, as Docherty and Foulkes (2000: 111) point out:

> Systematic properties of speech production are determined not simply by the need to achieve lexical contrast … speakers not only produce lexical items in sufficiently distinct form that their message can be successfully conveyed to listeners, but in doing so … [they] signal aspects of their social identity.

What we find most interesting here is the signaling of group identity through accent, even before a full-fledged phonological system has crystallized.

7. Discussion and conclusions: From variation towards conventionalization

7.1 Variation at the initial stages of a language

At the beginning of this paper we posed the question of what comes first – variation or conventionalization. Is the earliest stage of language emergence marked by variation or uniformity? The studies reported here indicate that earlier stages of the language are characterized by a large degree of variation. Our study of lexical variation in ISL shows that the lexicon of older signers (representing earlier stages of the language) exhibits more variation than that of younger groups of signers. Other studies not reported here show similar results. Two studies, focusing on the development of argument structure, one in ISL (Meir 2010) the second in Central Taurus Sign Language in Turkey (Ergin et al. in preparation) found that older signers use a larger variety of strategies to convey information related to argument structure than younger signers in their respective communities. It seems, then, that in the beginning, there was variation.

As a language evolves over time, it becomes more conventionalized, for reasons that we discuss shortly. However, a language is a complex system, comprised of many sub-parts and domains. What we find is that conventionalization does not proceed at the same pace on different levels and linguistic domains. The study of ABSL compounds shows that conventionalization of structure (e.g, the structure of compounds in terms of the linear order of its constituents) conventionalizes before conventionalization of the lexical components of compounds. Furthermore, different types of compounds show different degrees of conventionalization: SASS compounds exhibit a greater degree of uniformity than modifier-head (endocentric compounds). Finally, different languages may conventionalize at different paces, as the comparison of ISL and ABSL sub-lexical structure indicate: in spite of the fact that both languages are more or less of the same age, ISL has less sub-lexical variation than ABSL.

The fact that language begins in a state of variation might be surprising. The community is still rather small (sometimes very small, as in the case of ABSL, whose first generation consisted of four siblings), and its members know each other well. It might be expected that they all learn from each other and arrive at a conventionalized system very quickly. On the other hand, when a language starts 'from scratch', as ABSL did, there was no model from which to work, no set of signs given in advance. Every member (or family) might come up with different solutions to pressing communicative needs, resulting in different lexical items, different ways of pronouncing them, and different linguistic structures and strategies. It is precisely the fact that the community is so small that makes it able to sustain

so much variation: community members know each other very well, and they are acquainted with the particular ways of expression of others. Furthermore, they can rely on shared background knowledge and shared cultural practices to support the interpretation of the linguistic message, which needs to be less explicit in such circumstances. The iconicity of the signs also helps in understanding them in spite of the lack of conventionalization.

Communities that are small, close-knit, and homogenous, and whose speakers share background knowledge and assumptions, can arrive at specific idiosyncratic features or items. In the context of language evolution, Bernstein (1971) suggested that such a community would use a 'restricted code', an economical linguistic code that can convey a vast amount of meaning in a few words, since speakers can rely on shared connotations that the verbal message encodes. Wray and Grace (2007) refer to such communities as 'esoteric', and argue that the languages spoken in such communities are more likely to have complex, irregular morphology and idiosyncrasies. This correlation between complex, irregular and redundant morphology and the small size of the community is also made by Lupyan and Dale (2010) in their statistical analysis of over 2,000 languages. All of the above studies refer to the ability of such communities to sustain and even enhance morphological irregularity and idiosyncrasies.

We add here that it is precisely these characteristics that enable these communities to sustain a large degree of variation. The intimate relationship between the members of the community and the vast amount of shared knowledge make it possible to interpret linguistic expressions that are idiosyncratic, both in terms of linguistic structure and in terms of variability between language users.

It is not clear whether languages that emerge in bigger and less homogeneous communities, such as ISL, are characterized by less variation in their initial stages. We do not have a comparative study of the first generations of ISL and ABSL, and we leave this for future research.

7.2 Later stages: Pressure for conventionalization

In later stages of the development of a language, we found a tendency for more uniformity. That is, lexical items and linguistic structures get more conventionalized. Assuming that conventionalization takes time, it might be expected that older languages exhibit a higher degree of conventionalization than younger languages. This hypothesis is supported by our findings showing that ASL is more conventionalized than ISL and ABSL, as it is 100 years older.

However, time alone cannot account for the differences we find between ISL and ABSL. The two languages are of the same age more or less, yet ISL is more

conventionalized than ABSL, and we have shown elsewhere that it has more conventionalized organization in other areas of grammar as well (Meir et al. 2007; Meir 2010; Meir et al. 2013). How can we account for this?

One fundamental difference in the histories of these two languages which may be related to differences in the amount of variation is their linguistic origin (Israel 2009). Unlike the first ABSL signers, who had no sign language input, some of ISL's first signers who immigrated to Israel from Europe and North Africa had already used sign languages in their countries of origin (Meir & Sandler 2008). That experience must have developed automaticity in sign production in those ISL signers, as well as intuition about what constitutes a well-formed sign, and awareness of the formal differences between their own signs and signs produced by other members of the new community. In contrast, the four deaf children who created the first ABSL signs did not have a model against which to compare the new signs that they invented with their hearing family members. It is possible, then, that the first signers of ISL were more finely tuned to process new linguistic input, because some of them already had linguistic experience with signs (Israel 2009). Therefore, the starting point for ISL was different from the linguistic void from which ABSL first emerged.

Another factor that may have played a role in enhancing conventionalization is the expansion of the community. We can hypothesize that the expansion of the community and the prolonged interaction between people in the community, which entails constant feedback on linguistic productions from other members of the community, lead to more conventionalization. When unfamiliar signers join the language community, the degree of intimacy and shared background necessarily reduces, putting more pressure on a linguistic system to become more explicit and more uniform across the community.

Third, ISL has a much larger community that ABSL, and it is much less homogeneous, as people come from different backgrounds and live in different geographical regions, and most of them are not related to each other. Community size and social heterogeneity, then, might have promoted faster conventionalization in ISL than in ABSL.

A fourth important difference is the domains of use of the two languages. ISL is used in formal settings: it is used in the educational system – schools and universities, in the media (there is ISL interpreting in various news programs on TV) and in academic and professional conferences. There are two academic programs for training ISL interpreters. Furthermore, over the years, several ISL dictionaries were published, the latest being an on-line dictionary with more than 3,000 lexical entries.[17] Both the compilation of a dictionary and the training of interpreters

17. The dictionary can be found at: <http://isl.org.il/he/%D7%93%D7%A3-%D7%94%D7%91%D7%99%D7%AA/>

necessarily lead to uniformity, since it is impractical to include all lexical and sub-lexical variations. ISL users are well aware of the need for more uniformity and conventionalization, and there are various social networks of ISL teachers and interpreters where people discuss the appropriate signs for various concepts. ABSL, on the other hand, is used mainly in the family domain, and has not expanded to the public sphere. It is used primarily in informal settings, between acquaintances and family members. It is not used in the schooling system or in any formal settings, nor in the media. Therefore, although the language community has expanded over the years, the communicative functions of the language and its domains of use have not changed much. The pressure towards conventionalization in ABSL is therefore much weaker than in ISL.

It seems, then, that several factors drive a language towards more conventionalization: the size of the community, its homogeneity/heterogeneity, the age of the language, and the functions and domains in which the language is used. Another factor that should be taken into consideration is the social status of the language. That social prestige or identity can drive language change has been shown in the socio-linguistic literature since Labov's seminal studies on vowel change in the Martha's Vinyard community (Labov 1963). In the case of ABSL, we see that certain accent features are present, even before a phonological system crystallizes. Accent is an important component in marking social identity, and its appearance early in the emergence of a language underscores the significant role played by marking social identity in language change. While we have not yet measured the amount of variation in the ABSL accent, we find it noteworthy that generalizations may be observed at this early stage, before a phonological system has been fully conventionalized.

In conclusion, our comparative study of certain linguistic aspects of ISL and ABSL indicate that language starts off in a state of variation, in which different members of the community favor different strategies and signs to get the linguistic message across to other members. Signs and structures arise through constant (non-conscious) negotiation among community members. Different solutions, that is, different lexical items and different structures, exist side by side in the community, and do not seem to hinder communication because of the close and intimate relations between community members, and the large amount of shared knowledge and cultural practices.

A community may sustain such variation for quite a long time. But changes in its socio-linguistic circumstances may pressure it towards more conventionalization. These changes include expansion in size and the inclusion of unfamiliar members with different social, educational, and cultural backgrounds into the community, expansion of the use of the language to new, more formal, communicative domains, and the role played by language in signaling social identity.

In the history of any language, there is a constant tug of war between variation and conventionalization; the two overlap and occur at different rates in different linguistic forms. Since sign languages can arise de novo in contemporary social groups, they can provide empirical evidence for the characteristics of this tug of war, and insight into the circumstances that affect it. By studying two relatively young sign languages, of the same age but shaped by different social forces, we are able to pinpoint an initial stage of variation, and provide context for processes of conventionalization that follow.

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References

Al-Fityani, Kinda & Padden, Carol A. 2010. Sign language geography in the Arab world. In *Sign Languages: A Cambridge Survey*, Diane Brentari (ed.), Cambridge: CUP. https://doi.org/10.1017/CBO9780511712203.020

Arbib, M. 2012. *How the Brain Got Language*. Oxford: OUP. https://doi.org/10.1093/acprof:osobl/9780199896684.001.0001

Aronoff, Mark, Meir, Irit, Padden, Carol A. & Sandler, Wendy. 2008. The roots of linguistic organization in a new language. *Interaction Studies* 9(1): 131–150. Special issue on *Holophrasis vs. Compositionality in the Emergence of Protolanguage*.

Bernstein, Basil. 1971. *Class, Codes and Control*, Vol. 1. London: Routledge and Kegan Paul. https://doi.org/10.4324/9780203014035

Brentari, Diane. 2012. Phonology. In *Sign Language: An International Handbook*, Roland Pfau, Markus Steinbach & Bencie Woll (eds), 21–54. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110261325.21

Bybee, Joan L. 2010. *Language, Usage, and Cognition*. Cambridge: CUP. https://doi.org/10.1017/CBO9780511750526

Chomsky, Noam. 1965. *Aspects of the Theory of Syntax*. Cambridge MA: The MIT Press.

De Vos, Connie & Zeshan, Ulrike. 2012. Introduction: Demographic, sociocultural, and linguistic variation across rural signing communities. In *Sign Languages in Village Communities: Anthropological and Linguistic Insights*, Ulrike Zeshan & Connie de Vos (eds), 2–23. Berlin: Walter de Gruyter & Nijmegen: Ishara Press. https://doi.org/10.1515/9781614511496.2

Docherty, Gerard J. & Foulkes, Paul. 2000. Speaker, speech, and knowledge of sounds. In *Phonological Knowledge: Conceptual and Empirical Issues*, Noel Burton-Roberts, Philip Carr & Gerard J. Docherty (eds), 105–129. Oxford: OUP.

Ergin, Rabia, Meir, Irit, Ilkbaşaran, Deniz, Padden, Carol A. & Jackendoff, Ray. In preparation. The development of argument structure in Central Taurus Sign Language.

Israel, Assaf. 2009. Sublexical Variation in Three Sign Languages. MA thesis, University of Haifa.

Israel, Assaf & Sandler, Wendy. 2010. Duality of patterning as an emergent property: Evidence from a new sign language. In *The Evolution of Language. Proceedings of the 8th International Conference (EVOLANG 8)*, Andrew D. M. Smith, Marieke Schouwstra, Bart de Boer & Kenny Smith (eds), 423–424. Singapore: World Scientific.

Israel, Assaf & Sandler, Wendy. 2011. Phonological category resolution: A study of hand shapes in younger and older sign languages. In *Formational Units in Sign Language*, Rachel Channon & Harry van der Hulst (eds), 177–202. Nijmegen: Ishara Press. https://doi.org/10.1515/9781614510680.177

Jackendoff, Ray. 2002. *Foundations of Language*. Oxford: OUP. https://doi.org/10.1093/acprof:oso/9780198270126.001.0001

Jackendoff, Ray. 2009. *Language, consiousness, culture: Essays on mental structure*. Cambridge MA: The MIT Press.

Kastner, Itamar, Meir, Irit, Sandler, Wendy & Dachkovsky, Svetlana. 2015. The emergence of embedded structure: Insights from Kafr Qasem Sign Language. *Frontiers in Psychology* 5: 1–15. https://doi.org/10.3389/fpsyg.2014.00525.

Kisch, Shifra. 2000. Deaf Discourse: The Social Construction of Deafness in a Bedouin Community. MA Thesis, Tel-Aviv University. (in Hebrew)

Kisch, Shifra. 2004. Negotiating deafness in a Bedouin community. In *Genetics, Disability and Deafness*, John V. Van Cleve (ed.), 148–173. Washington DC: Gallaudet University Press.

Kisch, Shifra. 2008. The social construction of deafness in a Bedouin community in the Negev. *Medical Anthropology* 27(30): 283–313. https://doi.org/10.1080/01459740802222807

Kisch, Shifra. 2012. Demarcating generation of signers in the dynamic sociolinguistic landscape of a shared sign-language: The case of the Al-Sayyid Bedouin. In *Sign Languages in Village Communities: Anthropological and Linguistic Insights*, Ulrike Zeshan & Connie de Vos (eds), 87–125. Berlin: Walter de Gruyter & Nijmegen: Ishara Press. https://doi.org/10.1515/9781614511496.87

Labov, William. 1963. The social motivation of sound change. *Word* 19: 273–309. https://doi.org/10.1080/00437956.1963.11659799

Labov, William. 1994. *Principles of Linguistic Chang*, Vol. I: *Internal Factors*. Oxford: Blackwell.

Labov, William. 2001. *Principles of Linguistic Chang*, Vol. II: *Social Factors*. Oxford: Blackwell.

Le Page, Robert & Tabouret-Keller Andrée. 1985. *Acts of Identity: Creole-based Approaches to Language and Ethnicity*. Cambridge: CUP.

Lupyan, Gary & Dale Rick. 2010. Language structure is partly determined by social structure. *PLoS ONE* 5: 1.e8559. https://doi.org/10.1371/journal.pone.0008559

Meir, Irit. 2010. The emergence of argument structure in two new sign languages. In *Syntax, Lexical Semantics and Event Structure*, Malka Rappaport Hovav, Edit Doron & Ivy Sichel (eds), 101–113. Oxford: OUP. https://doi.org/10.1093/acprof:oso/9780199544325.003.0006

Meir, Irit, Padden, Carol A., Aronoff, Mark & Sandler, Wendy. 2007. Body as subject. *Journal of Linguistics* 43: 531–563. https://doi.org/10.1017/S0022226707004768

Meir, Irit & Sandler, Wendy. 2008. *A Language in Space: The Story of Israeli Sign Language*. New York NY: Lawrence Erlbaum Associates.

Meir, Irit, Sandler, Wendy, Padden, Carol A. & Aronoff, Mark. 2010a. Emerging sign languages. In *Oxford Handbook of Deaf Studies, Language, and Education*, Vol. 2, Marc Marschark & Patricia Spencer (eds), 267–280. Oxford: OUP.

Meir, Irit, Aronoff, Mark, Sandler, Wendy & Padden, Carol A. 2010b. Sign languages and compounding. In *Compounding* [Current Issues in Linguistic Theory 311], Sergio Scalise & Irene Vogel (eds), 301–322. Amsterdam: John Benjamins.

Meir, Irit, Israel, Assaf, Sandler, Wendy, Padden, Carol A. & Aronoff, Mark. 2013a. Community structure and language structure. *Linguistic Variation* 12(2): 247–291. https://doi.org/10.1075/lv.12.2.04mei

Meir, Irit, Sandler, Wendy, Padden, Carol A. & Aronoff, Mark. 2013b. Competing iconicities in the structure of languages. *Cognitive Linguistics* 24(2): 309–343. https://doi.org/10.1515/cog-2013-0010

Meir Irit, Sandler, Wendy, Ben-Zeev, Yifat Ziv, Lanesman, Sara & Sarsour, Meyad. 2016. How does a lexicon emerge in a new language? Insights from village sign languages of Israel. *Iyunim be Safa ve-Hevra* 8(1–2): 11–43. (in Hebrew)

Meir Irit, Aronoff, Mark, Börstell, Carl, Hwang, So-One, Ilkbasaran, Deniz, Kastner, Itamar, Lepic, Ryan, Lifshitz Ben Basat, Adi, Padden, Carol A. & Sandler, Wendy. 2017. The effect of being human and the basis of grammatical word order: Insights from novel communication systems and young sign languages. *Cognition* 158: 189–207. https://doi.org/10.1016/j.cognition.2016.10.011

Plag, Ingo. 2006. Morphology in pidgins and creoles. In *The Encyclopedia of Language and Linguistics*, Keith Brown (ed.), 305–308. Oxford: Elsevier. https://doi.org/10.1016/Bo-08-044854-2/00161-9

Sandler, Wendy. 1989. *Phonological representation of the sign: Linearity and nonlinearity in American Sign Language*. Dordrecht: Foris. https://doi.org/10.1515/9783110250473

Sandler, Wendy. 2011. The phonology of movement in sign language. In *Blackwell Companion to Phonology*, Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds), 577–603. Oxford: Wiley-Blackwell. https://doi.org/10.1002/9781444335262.wbctp0024

Sandler, Wendy. 2012. Phonological organization of sign languages. *Language and Linguistics Compass* 6(3): 162–182. https://doi.org/10.1002/lnc3.326

Sandler, Wendy. 2014. The emergence of phonetic and phonological features in sign language. *Nordlyd* 14(1): 183–212. Special issue *Features*, Martin Krämer, Sandra-Iulia Ronai & Peter Svenonius (eds).

Sandler, Wendy. 2017. The challenge of sign language phonology. *Annual Review of Linguistics* 3: 43–63. https://doi.org/10.1146/annurev-linguistics-011516-034122

Sandler, Wendy, Meir, Irit, Padden, Carol A. & Aronoff, Mark. 2005. The emergence of grammar: Systematic structure in a new language. *PNAS* 102(7): 2661–2665. https://doi.org/10.1073/pnas.0405448102

Sandler, Wendy & Lillo-Martin, Diane. 2006. *Sign Language and Linguistic Universals*. Cambridge: CUP. https://doi.org/10.1017/CBO9781139163910

Sandler, Wendy, Aronoff, Mark, Meir, Irit & Padden, Carol A. 2011. The gradual emergence of phonological form in a new language. *Natural Language and Linguistic Theory* 29(2): 503–543. https://doi.org/10.1007/s11049-011-9128-2

Sandler, Wendy, Aronoff, Mark, Padden, Carol A. & Meir, Irit. 2014. Language emergence. In *The Cambridge Handbook of Linguistic Anthropology*, Nicholas J. Enfield, Paul Kockelman & Jack Sidnell (eds), 250–284. Cambridge: CUP. https://doi.org/10.1017/CBO9781139342872.012

Sandler, Wendy, Belsitzman, Gal & Meir, Irit. To appear. Visual foreign accent in an emerging sign language. *Sign Language and Linguistics*, special issue in memory of Irit Meir.

de Saussure, Ferdinand. 1959. *Course in General Linguistics*, translated, with an introduction and notes by Wade Baskin. New York NY: McGraw-Hill.

Scott, D. A., Carmi, R., Elbedour, K., Duyk, G. M., Stone, E. M. & Sheffield, V. C. 1995. Nonsyndromic autosomal recessive deafness is linked to the DFNB1 locus in a large inbred Bedouin family from Israel. *American Journal of Human Genetics* 54(4): 965–968.

Stokoe, William. 1960. *Sign Language Structure: An Outline of the Visual Communications Systems* [Studies in Linguistics, Occasional Papers 8]. Buffalo NY: University of Buffalo.

Trudgill, Peter. 2000. *Sociolinguistics: An Introduction*. London: Penguin.

Wolfram, Walt. 2006. Variation in language: Overview. In *Encyclopedia of Languages and Linguistics*, Keith Brown (ed.), 333–340. Oxford: Elsevier.
https://doi.org/10.1016/B0-08-044854-2/04256-5

Wray, Alison & Grace, George W. 2007. The consequences of talking to strangers: Evolutionary corollaries of socio-cultural influences on linguistic form. *Lingua* 117: 543–578.
https://doi.org/10.1016/j.lingua.2005.05.005