The noun-verb distinction in two young sign languages

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Many sign languages have semantically related noun-verb pairs, such as 'hairbrush/brush-hair', which are similar in form due to iconicity. Researchers studying this phenomenon in sign languages have found that the two are distinguished by subtle differences, for example, in type of movement. Here we investigate two young sign languages, Israeli Sign Language (ISL) and Al-Sayyid Bedouin Sign Language (ABSL), to determine whether they have developed a reliable distinction in the formation of noun-verb pairs, despite their youth, and, if so, how. These two young language communities differ from each other in terms of heterogeneity within the community, contact with other languages, and size of population. Using methodology we developed for cross-linguistic comparison, we identify reliable formational distinctions between nouns and related verbs in ISL, but not in ABSL, although early tendencies can be discerned. Our results show that a formal distinction in noun-verb pairs in sign languages is not necessarily present from the beginning, but may develop gradually instead. Taken together with comparative analyses of other linguistic phenomena, the results lend support to the hypothesis that certain social factors such as population size, domains of use, and heterogeneity/homogeneity of the community play a role in the emergence of grammar.

Keywords: noun-verb distinction, sign language, language emergence, Al-Sayyid Bedouin Sign Language, Israeli Sign Language

> No logical scheme of the parts of speech — their number, nature, and necessary confines — is of the slightest interest to the linguist. Each language has its own scheme. Everything depends on the formal demarcations which it recognizes.
>
> Edward Sapir (1921, p. 119)

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Introduction

Since Aristotle's *Logic*, linguists, philosophers of language, and philologists alike have taken for granted that nouns and verbs are distinct word classes. This assumption about the universality of nouns and verbs arises from the fact that there are usually some explicit means for distinguishing between these two parts of speech in any given language, such as syntactic relations (e.g., with arguments or modifiers) and inter-relationships with co-occurring grammatical categories that are often marked morphologically (including tense and mood with verbs and case marking with nouns).

Today, not everyone accepts the universality of nouns and verbs. For example, Haspelmath (2007) argues that many linguists either confuse universal functions with language-specific categories[1] or believe that regardless of what set of tools a particular language starts out with, all languages end up with the same word categories (see also Croft, 2000, for a discussion of parts of speech as language universals).[2]

Some researchers expressed doubts about the universality of nouns and verbs as early as the 1920s (Sapir, 1921). More recently, a number of fieldwork studies have attempted to demonstrate empirically that some languages do not distinguish between nouns and verbs, either morphologically (Broschart, 1997, on Tongan), or syntactically (Jacobsen, 1979, on Nootka; Himmelmann, 1991, on Tagalog; Gil, 1991, on Riau Indonesian; Jelinek, 1995, on Salish; Launey, 2004, on Classical Nahuatl), and the debate over whether these languages distinguish between nouns and verbs, perhaps through other means, is ongoing (see Evans, 2000, for discussion). This debate notwithstanding, the belief that nouns and verbs are universally distinct word classes, regardless of whether or not they are formally distinguished in any particular language, is widely held among linguists.

In the field of sign language research, the history of the debate over universality of parts of speech has undergone the opposite evolution from that of spoken languages. At the inception of linguistic studies on American Sign Language (ASL), Stokoe, Castorline, and Croneberg (1965) claimed that this language lacked any formational distinction between nouns and verbs. Indeed, in many sign languages, a large class of nouns and semantically related verbs that are iconically motivated look very similar to one another, as exemplified by Israeli Sign Language (ISL) in Figure 1; from these illustrations, it is not possible to determine whether the signer is producing the noun or its related verb.

Later, however, Supalla and Newport (1978) argued that Stokoe and his colleagues' failure to find the distinction can be explained by their methodology, and that in fact ASL has very reliable morphological means for distinguishing between nouns and verbs within a subset of noun-verb pairs that are semantically and

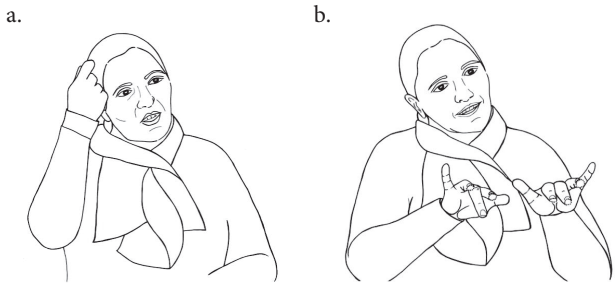

Figure 1. Examples of the iconic signs (a) BRUSH(-HAIR) and (b) (PLAY-)PIANO[3] in Israeli Sign Language (ISL)

formationally related. Indeed, a number of studies on subsequent sign languages have demonstrated the existence of noun-verb distinctions in such pairs, as we discuss in the section on previous noun-verb studies in sign languages.

All sign languages in which a noun-verb distinction has been found are established sign languages that have been in use in deaf communities for 150 years or more.[4] Even though they are very young compared to spoken languages, the lack of documentation of their earlier stages leaves unclear whether a noun-verb distinction arose from the very beginning or whether it developed gradually, over several generations of signers. The present study investigates this distinction in two very young sign languages that emerged in Israel over the past 75 years, Israeli Sign Language (ISL) and Al-Sayyid Bedouin Sign Language (ABSL). ISL is an established sign language of a deaf community, the same type of sign language as those previously investigated for a noun-verb distinction, while ABSL is of a different type, a village sign language that arose in relative isolation under very different social circumstances. Meir et al. (2010) categorize all sign languages into village sign languages and deaf community sign languages. *Village sign languages* emerge when there is a high incidence of hereditary deafness in small and isolated communities with shared culture and social environment, a situation that can potentially lead to less explicit vocabulary and over-reliance on shared context. Typically, both deaf and hearing members of the community sign (though to various degrees). *Deaf community sign languages* arise when unrelated signers of different backgrounds come to communicate with each other on a regular basis, for instance in schools for the deaf or in deaf clubs. The bulk of their users are deaf people, and language transmission happens mostly through peers and unrelated teachers (since the majority of deaf children are born to hearing parents). American Sign Language and other 'official' state languages belong to this type. Notice that this categorization differs from a similar one found in sign language literature, that of village sign languages vs. urban sign languages (see Schuit et al., 2011). According to Meir et al. (2010), not every deaf community sign language

can be classified as urban sign language, for instance, Nicaraguan Sign Language is neither village nor urban, but can be classified as a deaf community sign language.

This study aims to determine whether these two languages make a distinction in the formation of nouns and verbs in semantically related pairs, and, if so, how. We find that the two languages are different in this regard, and we suggest that certain social factors such as population size, domains of use, and heterogeneity/homogeneity of the community can play a role in the development of grammatical structure (following Israel & Sandler, 2009; Meir, Sandler, Padden, & Aronoff, 2010; Senghas, 2005). We will elaborate this line of thinking in the Conclusion.

We begin this study of nouns and verbs in ISL and ABSL with a brief overview of the most typical functions of nouns and verbs in spoken languages and common linguistic approaches to the noun-verb distinction in the spoken modality. We then examine some modality-specific characteristics of sign languages and some of the difficulties they present for identifying the "parts of speech" of signs. Next, we discuss previous studies of the noun-verb distinction in various sign languages and derive implications for our methodology. We also provide background about the specific sign languages in our study — ISL and ABSL. After describing our methodology and results, we discuss possible reasons for the differences between the two languages under investigation. We argue that certain social factors that differ between ISL and ABSL may contribute to the development of a noun-verb distinction in the former and may sometimes obviate the development of systematic distinctions in the latter.

Distinguishing nouns and verbs

Ways to distinguish between nouns and verbs

There are two common approaches to defining parts of speech. *The semantic approach* assigns words to word classes based on their meaning, and *the morphosyntactic approach* assigns words to word classes based on their syntactic function and morphological marking. The most widely known definitions of nouns and verbs are semantic: nouns denote persons, places, or things and verbs denote actions or processes. However, most languages have nouns that are neither persons, places, nor things (e.g., *power*) and verbs that are neither actions nor processes (e.g., *lack*) (Haspelmath, 2001, p. 16540). Additionally, the same concept can be represented by different parts of speech in different languages. For instance, French *savoir* 'to know' is a verb and its Kayardild equivalent *muŋuru* is a predicate nominal (Evans, 2000, p. 708). Furthermore, two words with the same form and related meaning

can belong to different parts of speech within one language, such as the English words *cut* and *kiss*.

For these reasons the structuralist linguists in the beginning of the 20th century opted for a morphosyntactic approach specific to each individual language, which is still widely used. This approach relies on the fact that languages commonly have an explicit morphosyntactic means of distinguishing nouns and verbs. In many familiar languages, nouns commonly function syntactically as arguments of predicates and can be combined with definiteness markers and demonstratives (e.g., *this woman*). Cross linguistically, nouns are commonly marked morphologically for categories such as number, gender, case, possessor person/number, and/or definiteness (e.g., Hebrew *kitot*, 'classes', in which *–ot* marks feminine plural). According to Evans (2000), verbs have the most complex morphological possibilities across languages, most typically marked by operators with clausal scope (such as tense or negation), argument structure information such as argument, and interclausal relations. Verb morphology can also express spatial orientation, as in Russian: *vy-letat'* 'fly out', *v-letat'* 'fly in', *vz-letat'* 'fly up' (examples from Haspelmath, 2001). In fact, Evans writes that in some languages verbs receive all morphological marking, leaving nouns unmarked and in this way clearly demarcated from them, as in Nahuatl. In Korean, verbs have a fixed position in the sentence, and in fact are the only obligatory element. When nouns and verbs are formationally related, as with English nouns derived from verbs by conversion, they are sometimes distinguished by stress as in prótest]$_N$/protést]$_V$.[5]

The morphosyntactic approach is not perfect either, however. Many languages distinguish these two parts of speech neither morphologically nor syntactically, and in some languages a word may belong to one class morphologically, but to another class syntactically (Evans, 1995). Also, language-specific descriptions of nouns and verbs can make cross-linguistic comparison difficult since languages differ from each other in both their morphological marking and their syntactic patterns.

As neither the semantic nor morphosyntactic approach is fully adequate for cross-linguistic comparison, a more common approach is to adopt a combination of the two, as Payne does in his on-line *Sample grammatical sketch of English,* defining English nouns as concrete, bounded entities that have plural marking, articles, and possession as their morphosyntactic properties (p. 7), and English verbs as concepts involving actions or change, appearing in either a 'past-tense' or a 'non-past-tense' form, and taking a suffix *–s* in a non-past-tense form if the subject is third person singular (p. 11).[6]

This combination of two approaches has been adopted in sign language research as well. In the seminal study by Supalla and Newport, the initial list of related noun-verb pairs chosen for the investigation was determined on semantic

grounds (the nouns depict concrete objects and the verbs describe actions with those objects, e.g., HAMMER]$_N$ and HAMMER]$_V$) and then analyzed for morphological differences. The methodologies of later studies built on their approach. In the next section we discuss studies on noun-verb distinctions in several sign languages along with the limitations of their methodologies and implications taken into account in constructing the methodology for the present study.

Modality-specific characteristics of sign languages

Sign languages are notably different from spoken languages, produced mainly by movements of the hands, face, and head rather than vocally; and perceived visually rather than auditorally. Nevertheless, they have been demonstrated to be quite similar in many ways to spoken languages in terms of linguistic structure (Sandler & Lillo-Martin, 2006), acquisition (Newport & Meier, 1985; Pettito & Marentette, 1991), and the neural systems supporting them (Emmorey, 2002; MacSweeney, Capel, Campbell, & Woll, 2008). At the same time sign languages involve different physical and in some ways different computational/representational domains than do spoken languages (Sandler, 1993), and linguists believe that by comparing the two modalities we can better understand the nature of human language in general.

Distinctions between word classes in sign languages may be different from those of spoken languages because of unique features of the visual-spatial modality, such as widespread iconicity. A non-arbitrary relationship between a symbol and its referent can sometimes blur the distinction between phonology and morphology (Meir, Padden, Aronoff, & Sandler, 2013). The phonology of sign languages is comparable to yet different from that of spoken languages. Three major formational categories of sign languages — handshape, location, and movement — provide contrasts and may alternate in different contexts, depending on the particular formal constraints of the system (Stokoe, 1960). However, the features of these formational categories can have a meaning of their own: in the ISL verb EAT]$_V$ all three of its formational units map onto components of its meaning — the handshape represents holding a solid object, the mouth (location) corresponds to the eating mouth, and the double movement represents putting food into the mouth repeatedly (Meir, 2010, 2012). Though iconicity exists in spoken languages as well (for instance, onomatopoeic words imitating the sound of what they describe), at least at the level of individual words it is much more prevalent in signed languages.[7] The phenomenon of iconicity in sign languages is complex because, among other things, (a) not all components of a sign are necessarily iconic, and (b) native signers are not always aware of the iconicity (Klima & Bellugi, 1979; Taub, 2000). However, iconicity is a salient property of all known primary sign languages, and cannot be ignored. With the property of iconicity in mind, we

return to the question of whether semantic, syntactic, or morphological tests for lexical categories are useful.

Iconicity renders the semantic approach alone difficult for determining parts of speech in sign languages. As seen in Figures 1a and 1b, iconic signs may at once appear to have either nominal meaning, as objects, or verbal, as actions involving the object. 1a might represent either 'a brush' or 'to brush', and 1b could be either 'a piano' or 'to play piano'.

Morphosyntactic tests can be equally challenging, because an individual sign can be used in a variety of syntactic functions. For instance, previous research on German Sign Language (DGS) (Erlenkamp, 2000; cited in Schwager & Zeshan, 2008) and Indo-Pakistani Sign Language (IPSL) (Zeshan, 2000; cited in Schwager & Zeshan, 2008) has claimed that most signs in these sign languages can appear either in the predicate or in an argument slot, without any formal marking. As for traditional morphological markings such as case or gender markings, these are usually not found in young languages, either spoken or signed. Meir (2012) argues that both spoken creoles and sign languages have many such multifunctional words, that is, words used both as nouns and as verbs, or as nouns and adjectives.

Schwager and Zeshan (2008) propose a systematic approach to word classes of sign languages that both provides descriptions of word classes of specific languages and allows cross-linguistic comparison. Signs are first assigned to different classes according to their semantics and then analyzed according to morphological and syntactic behavior. This approach (semantics first, morphology second) was adopted in the studies on the noun-verb distinction in a number of sign languages; first elicitation material prompts semantically-motivated responses from the participants, and then these responses are analyzed for systematic differences in form. The next section discusses these studies.

Previous noun-verb studies in sign languages

In the original Supalla and Newport study, the authors examined one hundred pairs of formationally and semantically related nouns and verbs, in which the nouns depicted concrete objects and verbs described actions with those objects, such as HAMMER]$_N$ and HAMMER]$_V$, CHAIR]$_N$ and SIT]$_V$, and so on, as explained in the previous section. Their findings demonstrated that the signs under investigation are indeed produced with identical hand configuration, place of articulation, and type of movement, as Stokoe et al. (1965) had claimed. Stokoe's types of movement included straight, arc, alternating, toward the signer, away from the signer, twist, nod, grasp, and several other parameters, and these indeed did not typically distinguish nouns from verbs in the pairs. However, Supalla and Newport

identified certain differences in **frequency** and **manner of movement** that distinguished the two lexical categories.

Frequency of movement refers to the number of iterations of the sign: either single, when the sign is produced in its entirety only once, or repeated, when it is signed twice or more times with no pause between repetitions. Manner of movement can be either continuous, 'hold', or restrained. Continuous signs are produced with one or both hands moving in a smooth, continuous manner with no tension. In holds the hands also move smoothly and in a continuous manner, but their movement ends in an abrupt stop. In the restrained manner, there is tension of the hands, and their movements are short and limited in space. The hand may also bounce back to its initial position.

In their study of 100 noun-verb pairs, Supalla and Newport found that nouns demonstrate quite uniform behavior: restrained in manner and repeated, usually involving at least one repetition of the movement. Verbs behave more diversely on this measure: they are characterized by either single or repeated movement (determined by the semantics of the verb) and continuous or hold manner, but typically not in the restrained manner that is characteristic of nouns. For example, in a noun-verb pair FLY]$_V$ (by plane) and AIRPLANE]$_N$ the verb is a single-movement continuous sign and the noun is repeated and restrained; the verb IRON]$_V$ is a repeated movement sign with a continuous manner, while the noun IRON]$_N$ is also repeated, but with a restrained manner.

The study by Supalla and Newport inspired a number of similar studies on various sign languages over the last decade. Table 1 summarizes four studies on various sign languages that have been demonstrated to distinguish noun-verb pairs formationally. The table shows that different sign languages distinguish nouns and verbs by different means and to various degrees.[8]

In the table, percentages are given where available. Features listed without percentages were noted in the studies but not quantified. In order to interpret the table, and as background for the present study, it is important to take into consideration the different methodologies used by different researchers and certain difficulties they report in conducting their studies.

In his study of Australian Sign Language (Auslan), Johnston (2001) used the same list of one hundred noun-verb pairs as in Supalla and Newport's study, comparing citation forms in three different corpora of Auslan. He found that Auslan employs the same means for distinguishing nouns and verbs as ASL does, though in a less systematic manner, and that those distinctions are also supported by native signers' intuitions (2001, p. 236). The distinction was further confirmed in production and comprehension tests, conducted using 20 pairs of formationally related nouns and verbs.

Table 1. Noun-verb distinctions in different sign languages

Language	Manner	Iteration	Duration	Size	Mouthing
American Sign Language (ASL) (Suppala & Newport, 1978)	Verbs: continuous, Nouns: restrained	Verbs: vary, Nouns: repeated			
Australian Sign Language (Auslan) (Johnston, 2001)	Verbs: continuous, Nouns: restrained	Verbs: 79.4% single, Nouns: 57.2% repeated			Nouns: 69.6% mouthed, Verbs: 13.1% mouthed
Austrian Sign Language (ÖGS) (Hunger, 2006)			Verbs 2x longer than nouns		Nouns: 92% mouthed, Verbs: 50% mouthed
Russian Sign Language (RSL) (Kimmelman, 2009)		Nouns: 72% repeated, Verbs: single		Verbs: 93% larger than nouns	The ratio of mouthed nouns to mouthed verbs – 1.43: 1

Johnston was the first to report mouthing as a distinguishing feature in noun-verb pairs. Mouthing is a visual depiction of words or parts of words as pronounced in the ambient spoken language, made with the mouth while signing. Although mouthing is not speech, but rather a particular kind of borrowing from a spoken language, it is more common in sign languages in countries with a strong bias toward oral education for deaf children (see Boyes Braem & Sutton-Spence, 2002, for discussion).

Johnston notes a number of problems with his studies which are instructive for interpreting the results of such studies generally. First, in the production-perception tests he coded his data for only one category, single or repeated movement, ignoring other potential differences between nouns and verbs. While Johnson observes that nouns and verbs are distinguished by manner of movement, he had not coded for this feature in this study, and refers the reader to his dissertation (Johnston, 1989). Second, the elicitation material itself was sometimes ambiguous, and some of the pictures that were intended to elicit a verb elicited nouns instead (for instance, a picture of a book being opened was sometimes interpreted as BOOK instead of OPEN-BOOK (2001, p. 247)).

Hunger (2006) used a compilation of pictures, videos, and written German sentences to investigate the noun-verb distinction in Austrian Sign Language (ÖGS). Fourteen noun-verb pairs were produced by 6 native deaf adult signers of ÖGS. She focused on the movement component as the most significant in the previous studies, and found that the main distinction was the temporal duration

(measured in frames at 24 frames per second) of the production of nouns and verbs, with verbs lasting twice as long as nouns on average (a ratio of 2.2 : 1). This distinction held not only for concrete noun-verb pairs, but for abstract ones as well, such as INTEREST]$_N$ /TO-BE-INTERESTED-IN]$_V$, though it was weaker than in concrete pairs such as COMB]$_N$ /COMB]$_V$.[9] Hunger's study also demonstrates one of the potential disadvantages of using a spoken language as a means for eliciting sign language structures. She observes that her participants' control of spoken German was fairly poor, and some had difficulty reading even relatively common words such as *Busch* 'bush.' We will return to this problem later.

Kimmelman (2009) investigated the noun-verb distinction in Russian Sign Language (RSL) using 43 concrete nouns-verb pairs. He reports that only 60% of all usages were different in one or more features. In the pairs that distinguished nouns and verbs, he found three differences: (a) repeated vs. single movement; (b) amplitude difference — a wider amplitude movement in verb production; and (c) somewhat more mouthing on nouns, as reflected in Table 1.

Strengths and weaknesses of earlier studies informed our methodology, described in the Methodology section. First, we provide relevant background about the two languages we investigated.

Languages in our study

Two sign languages of similar age but widely different social characteristics are the target of this study: Israeli Sign Language (ISL) and Al-Sayyid Bedouin Sign Language (ABSL). These sign languages are of special interest for the investigation of the noun-verb distinction because they are very young, each having emerged only about 80 years ago. Furthermore, while ISL is a community sign language, similar to sign languages whose N-V distinctions have previously been studied, ABSL is a village sign language (Meir et al., 2010; see note 5).

Language scholars have attributed certain types of differences in linguistic structure among languages to the nature and size of community where the language is spoken, and these characteristics may profitably be applied to sign languages. For example, in terms of communicative context, Wray and Grace (2007) distinguish between *esoteric* communication, that is, chiefly inter-group communication that happens mostly in small communities and usually exhibits semantically and grammatically complex features, and *exoteric* communication, intra-group communication typical of larger communities with a tendency toward rule regularization and semantic transparency. In smaller, homogeneous communities all the members share a culture, an environment, and intimate knowledge of the community members. Only the children born into this community learn its

language. Such communities are opposed to larger, more heterogeneous communities, which have less shared culture and context, and whose members do not all know each other. Large communities of this type also have more second language learners (Wray & Grace, 2007). The better people know each other, the less formal (i.e., less structured and predictable, see Irvine (1979, p. 774)) and less explicit their language has to be (Joos, 1962). According to Bernstein (1971) people who do not have shared background have to use more elaborated language and to make their linguistic messages more explicit.

Village sign language communities correspond to the small, homogeneous type (Meir et al., 2013, to appear). They emerge when there is hereditary deafness in small and isolated communities with a shared cultural and social environment. This facilitates relative ease of communication among the members of the community, a situation that has been hypothesized to result in less explicit vocabulary and more reliance on shared context than might be the case in larger and more diverse communities. In village sign languages, both deaf and hearing members of the community sign (though with varying degrees of proficiency).

The exact number of such sign languages existing today is unknown, but they have been reported all over the world: Martha's Vineyard in the U.S. (now extinct) (Groce, 1985), Yucatec Mayan in Mexico (Johnson, 1991,1994; Le Guen, 2012); Providence Island in the West Indies (Washabaugh, Woodward, & DeSantis, 1978; Washabaugh, 1979, 1986), Urubú in Brazil (Kakumasu, 1968, 1978), Adamorobe in Ghana (Nyst, 2007; Kusters, 2012), Ban Khor Sign Language in Thailand (Woodward & Nonaka, 1997; Nonaka, 2012), Al-Sayyid Bedouin Sign Language in Israel (Sandler, Aronoff, Padden, & Meir, 2012; Kisch, 2012), and Kata Kolok in Bali (Marsaja, 2008; de Vos, 2012).

Al-Sayyid Bedouin Sign Language (ABSL) is a village sign language. ABSL started with the home sign system of just one household among four deaf siblings and their family about 80 years ago. These four children were the first deaf signers of a language now used by approximately 130–150 deaf people and many hearing people as well in the village of about 4,000 people. This rapid increase of the deaf population in such a short time frame results both from the custom of endogamy common in the Middle East, and from large numbers of children born into each household. The Al-Sayyid village may have one the highest percentages of deaf people of any community in the world: 3.75% of its total population are profoundly deaf (Kisch, 2004; Meir et al., 2010).

ABSL has been the object of study for about a decade (see Sandler et al., to appear, for a recent overview). The language arose with little or no outside influence, either from other sign languages in the Middle East (Al-Fityani & Padden, 2010), or from surrounding spoken languages (Sandler, Mair, Padden, & Aronoff, 2005). Beginning with younger members of the second generation, children began to be

sent to deaf education classes outside the village where ISL was used, so that some vocabulary influence can be seen in younger signers. However, even borrowed words are formed differently, and no influence from the grammar of ISL has been detected in these signers. ABSL has the beginnings of linguistic structure, such as highly regular SOV word order (Sandler et al., 2005), word-internal compounding (Meir et al., 2010), and certain types of classifier affixes (Sandler, Aronoff, Mair, & Padden, 2011). It is used by both deaf and hearing members of the community (Kisch, 2004), with varying degrees of proficiency, and linguistic diversity across the community appears to be quite high, with patterns found within what the researchers call familylects (Sandler et al., 2011).

The other broad type, deaf community sign languages, arise under very different circumstances, typically, when unrelated signers of different backgrounds come to communicate with each other on a regular basis, for instance in schools for the deaf or in deaf clubs. Many bring with them their own unique gestural communication systems used with their hearing family members — homesigns (Goldin-Meadow, 2003) — which all contribute to the richness of the resulting sign languages. Others may arrive with a village sign language, as was the case when Martha's Vineyard Sign Language merged with American Sign Language in the Hartford School (Groce, 1985). After the school years, deaf people join a community with its own institutions and social groups. The bulk of deaf community sign language users are deaf people, and language transmission happens mostly through peers and teachers (only about 5–10% of deaf children are born to deaf adults[10], so native signers are in the minority). American Sign Language and other widely used national sign languages belong to this type, as are the other sign languages in Table 1.

Israeli Sign Language (ISL) is also a typical representative of a deaf community sign language (Meir & Sandler, 2008). Deaf people began to have regular group meetings in Tel-Aviv in the early 1930s; the first school for the deaf was established in 1932, and the national deaf association was established in 1944. New immigrants from all over the world joined the small numbers of deaf people who were already in Israel, bringing with them sign languages of their countries of origin and home sign systems they were using before immigration. These factors resulted in rapid development of the young sign language: documentation shows that by 1955 the Association of the Deaf in Israel had Hebrew-ISL interpreting for public lectures, and by the 1970s, when the first studies of the grammar of ISL were conducted, ISL was already reported to exhibit a number of important grammatical features, such as grammatical use of space and facial expressions for amount/extent (Cohen, Namir, & Shlesinger, 1977). Today, the deaf community of Israel has about 10,000 members, and ISL is used mostly by deaf people. It is currently in its third generation of adult signers. ISL is characterized by grammatical organization

at all levels of linguistic structure, and is widely used in education, in courts, by interpreters on television, and in other settings.

There are two reasons why these two sign languages are of interest in investigating noun-verb pairs. First, both languages are very young, one to two hundred years younger than the sign languages previously investigated for this phenomenon.[11] While there may be a functional advantage for language users to distinguish nouns from verbs that are so closely related semantically and formationally, it is not clear whether languages develop distinguishing features for each lexical category immediately, or whether, like other types of grammatical structure, a noun-verb distinction requires time and particular types of interaction in order to emerge. Our study speaks to this question. In addition, since these two sign languages belong to different types as described above, the findings will contribute to our understanding of possible connections between social factors and the development of grammar, following the line of inquiry set out in Meir et al. (2010).

Methodology

Participants

Seven deaf signers of ISL, six female and one male, and eight deaf signers of ABSL, six female and two male, participated in the study. All ISL signers have at least one deaf parent or older sibling. Five of the ABSL singers have a deaf parent or older sibling, while the remaining three have other deaf relatives.

Stimuli and procedure

In constructing our elicitation materials, we took into account the experience of the previous research, more specifically, the issues that proved to be problematic and that created ambiguity in the results of the previous studies discussed in the Previous Noun-Verb Studies section.

We did not use spoken languages in our elicitation because there was a great deal of in-group variation in participants' command of spoken language and reading ability. Also, we wished to avoid any possible influence of spoken languages on the production of those participants who were proficient in one. Therefore, the elicitation materials consisted only of pictures. The pictures depicted concrete objects and people manipulating those objects. They were presented in mixed order on a computer screen using Microsoft Powerpoint software. The participants were asked to say what they saw in the pictures by signing their responses to an age- and language-matched peer, who was allowed to ask for clarifications if the

participant's utterance was not clear. A pair of illustrations exemplifying the stimuli appears in Figure 2.[12]

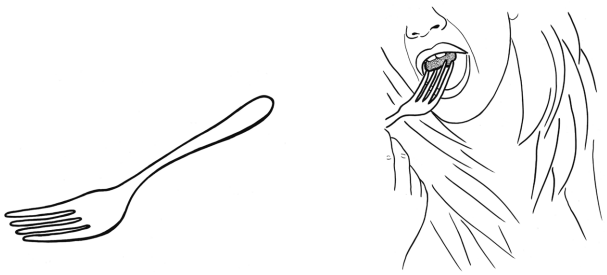

Figure 2. Illustrations exemplifying elicitation material for the noun-verb pair FORK]$_N$ and EAT-WITH-FORK]$_V$

We selected 41 pairs of object-action pairs that we predicted would be semantically and formationally related in both ASL and ABSL based on previous research and a discussion with a deaf consultant native in ISL and familiar with ABSL. We used only images of objects and actions familiar to both groups regardless of social status, level of education, or occupation of the participants (e.g., no images of specialized agricultural tools or unusual instruments of technology were used for elicitation). Of the 41 pairs, 24 yielded signs that were formationally related for all participants, and analysis was conducted on these 24 pairs. The full list of the noun-verb pairs used in the study can be found in Appendix 1, and the pairs excluded from the analysis — in Appendix 2.

The data were coded for categories commonly used in previous studies (e.g., repetition) and others that emerged as important in at least one group of our participants. Each feature was coded separately from the rest. Some features were coded just for presence/absence, for instance, the presence or absence of a classifier on a sign. Other features, i.e., restrained vs. continuous movement, were coded relative to the signing space available to a particular joint involved. All signs that were signed in more than 50% of the signing space available to their biggest joint involved were coded as continuous, and the signs signed in less than 50% of the signing space available were coded as restrained. For example, in the ISL sign CAMERA]$_N$ only the index finger moves (as if pushing a button), so it was coded relative to the signing space available to the index finger. In the ISL sign APPLE]$_N$ the biggest joint involved is the wrist (which rotates, as in eating an apple), and in the ISL sign PIANO]$_N$, the elbows (as the hands move sideways in the signing space and back), and each sign was coded for restrained or continuous relative to the signing space available to the relevant joints determined with the help of a grid superimposed on the video image. The sign for PIANO]$_N$ involves

both path movement (from the elbow) and internal movement (finger wiggling, as seen in illustration 1b). For purposes of coding restrained/continuous, only the joint more proximal to the body, the elbow, was considered. The features coded for were directionality of movement, manner of movement, frequency of movement, presence or absence of tension[13], presence or absence of internal movement, one-handedness versus two-handedness, instrumental versus handling[14], differences in place of articulation, lack of path movement, the most proximal joint involved, difference in orientation, mouthing, presence or absence of size-and-shape specifiers (SASSes), and difference in size.

Results

In ISL, nouns and verbs were reliably distinguished by two features: manner of movement and mouthing. In ABSL, no feature was found to reliably distinguish between nouns and verbs, although some interesting tendencies have appeared. Below we discuss relevant features and their behavior in the two languages in detail. Each feature was coded separately for each signer and each sign, that is, nouns were coded separately from their related verbs and vice versa. Each sign was coded for each feature: either as present or absent in the sign (for instance, mouthing was either present or absent); or as manifesting one of the two available options (e.g., one-handed or two-handed).[15]

Since the sample sizes were insufficient to meet parametric assumptions, bootstrapping-based related-sample T-test and one-sample T-test were used to analyze the results.

Manner of movement, which has been found to be important in the noun-verb distinction of several sign languages, plays an important role in ISL as well: in 70% of all the pairs, the nouns were restrained and the verbs were continuous. One-sample T-test (bootstrapping-based) showed a significant difference between these pairs and pairs with no difference between nouns and verbs: $M_{diff} = 45.14$, $SE_{diff} = 5.69$, $t_{(6)} = 7.65$, $p < 0.01$. The verbs marked with continuous movement all depicted an event that was itself continuous in nature, such as PLAY-PIANO]$_V$. The fact that ISL employs particular manners of movement on verbs seems to be compatible with Wilbur's *Event Visibility Hypothesis* stating that the semantics of the event structure is visible in the phonological form of the predicate sign (2004). In ABSL, however, manner of movement did not distinguish nouns from verbs, though one-sample T-test (bootstrapping-based) still showed that the percentage of pairs with restrained nouns and continuous verbs was significantly higher than chance distribution: $M_{diff} = 14.19$, $SE_{diff} = 2.01$, $t_{(7)} = 6.50$, $p < 0.01$. These results are shown in Figure 3.

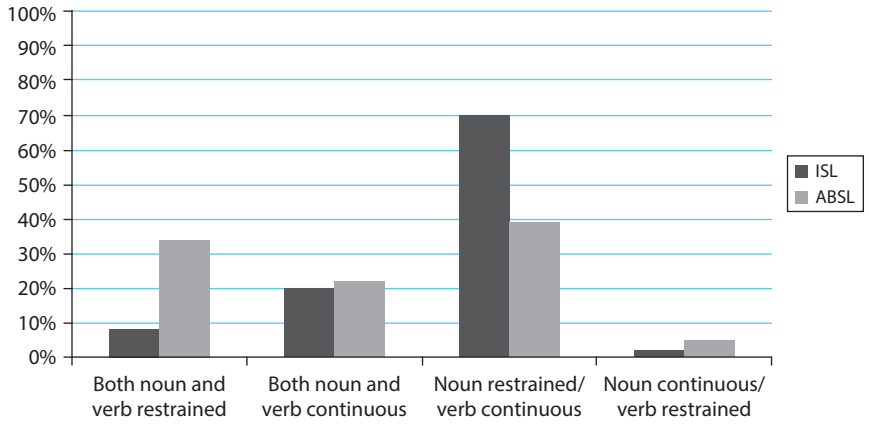

Figure 3. Manner of movement in the noun-verb distinction of Israeli Sign Language (ISL) and Al-Sayyid Bedouin Sign Language (ABSL)

Frequency of movement was not found to be a distinguishing feature in either ISL or ABSL. In 69% of the ISL noun-verb pairs and 45% of the ABSL pairs both noun and verb were repeated. While none of the ISL pairs had single movement on both noun and verb, about a fifth of the ABSL pairs were so characterized. Pending more fine-grained semantic analysis, the broad generalization is that frequency of movement does not distinguish the pairs in our study for either language.

Mouthing, the feature that most frequently distinguished nouns from verbs in the previously investigated sign languages, was not attested in ABSL at all. As explained in the section on the noun-verb distinction in sign languages, mouthing is primarily found in sign languages of countries with a strong bias towards oral education, which is typically not found in the villages where sign languages have arisen. The education system in Israel was strictly oral until the 1970s, and, although signing is now widely used, deaf education still includes a strong oral component. Predictably, in ISL, mouthing was found to be a highly reliable feature for the noun-verb distinction: 92% of the nouns and only 35% of the verbs were marked by mouthing (see Figure 4). Related-sample T-test (bootstrapping-based) found a significant difference between percentage of mouthed nouns and percentage of mouthed verbs: $M_{diff} = 57\%$, $SE_{diff} = 5.42$, $t_{(6)} = 9.92$, $p < 0.001$.

SASS classifiers.[16] An interesting tendency that emerged in both the ISL and ABSL data is use of a particular kind of classifier compounds. *Classifiers* are special morphemes that represent classes of entities by denoting salient characteristics and combine with other morphemes, of location and movement, for example (Supalla, 1986; Emmorey, 2003; Zwitserlood, 2012). Here we refer to a certain subset of classifiers, called size-and-shape specifier or SASSes (Klima & Bellugi, 1979)

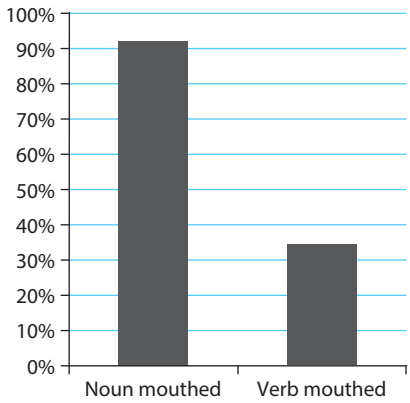

Figure 4. Mouthing in the noun-verb pairs in Israeli Sign Language (ISL) only

which depict shapes, outlines, and/or relative sizes of objects (Supalla, 1986). These constructions are compound-like, where the first sign is a noun sign and the second sign is a SASS[17]. In our data, 24% of the ISL nouns and 15% of the ABSL nouns were marked by SASSes. Examples of SASS compounds in ISL and ABSL are shown in Figure 5. As can be seen in Figure 6, all the nouns but two that were marked with SASSes in ABSL were also marked with SASSes in ISL (although not necessarily by all signers, and the SASSes themselves did not necessarily have the same form).[18] This similarity suggests that marking of nouns with SASSes is not random but rather has a specific semantic motivation. However, there were differences in the pattern of distribution of SASS compounds in the two languages: in ABSL, use of SASSes was more lexically driven, whereas in ISL it was signer driven. That is, in ABSL, particular lexical items, such as PITA, tended to be marked with SASSes by the majority of signers while other lexical items were not so marked, whereas in ISL, certain signers tended to mark nouns with SASSes while other signers marked either very few or no nouns with SASSes.

It should be noted that we do not claim that the use of SASSes is a distinguishing feature either in ISL or in ABSL, at least not yet. The present study paves the way for future investigations into how systematic the use of SASSes is in each of the languages under investigation as well as whether SASSes tend to occur on nouns with specific properties.

There are thus three issues regarding SASS use that merit further attention: first, the semantic trends that drive the same pictures to be labeled with SASS-marked signs in both languages; second, the differences in distribution between SASSes in ISL and ABSL; and third, the potential for SASS use to become a distinguishing feature in noun-verb distinctions in the future. We will return to all three of these questions in the discussion.

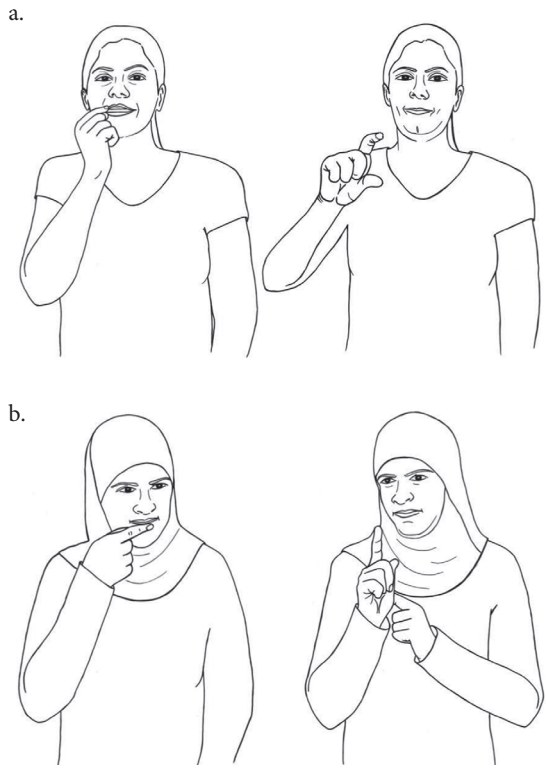

Figure 5. Size-and-shape specifier compounds (SASS compounds) (a) in Israeli Sign Language, LIPSTICK]$_N$ +SMALL-OBJECT-SASS and (b) Al-Sayyid Bedouin Sign Language, LIPSTICK]$_N$ +STRAIGHT-OBJECT-SASS

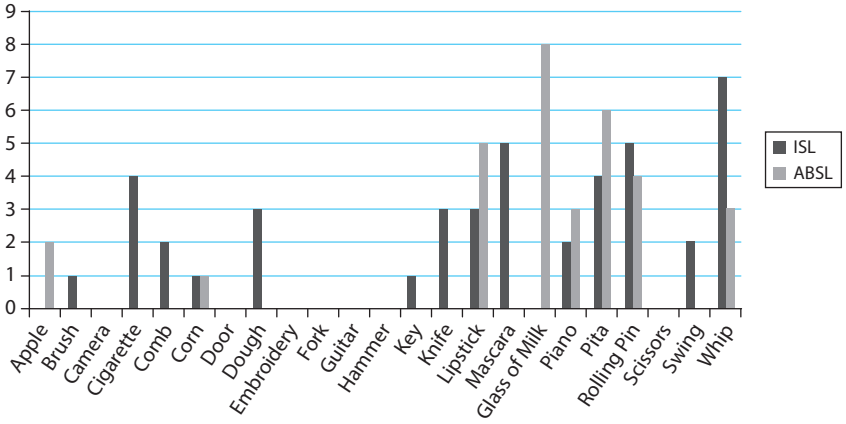

Figure 6. Number of SASS classifiers used per noun in isolation in Israeli Sign Language (ISL) and in Al-Sayyid Bedouin Sign Language (ABSL)

Size. Another tendency found in ABSL that may become a distinguishing feature is the relative size of the signs. In 29% of the ABSL pairs, the verb was noticeably larger than the corresponding noun (for example, in pairs such as DOUGH-KNEAD and EMBROIDERY-EMBROIDER). In more than half of these same pairs, in which the verb was larger, the verb was also continuous while the noun was restrained. Size difference between nouns and verbs has previously been found in Russian Sign Language. The possible significance of this tendency will also be explored in the Discussion.

Table 2. The comparison of the noun-verb distinction in the languages under investigation and other previously studied sign languages

Language	Manner	Iteration	Duration	Size	Mouthing
American Sign Language (ASL) (Suppala& Newport, 1978)	Verbs: continuous, Nouns: restrained	Verbs: vary, Nouns: repeated			
Australian Sign Language (Auslan) (Johnston, 1989, 2001)	Verbs: continuous, Nouns: restrained	Verbs: 79.4% single, Nouns: 57.2% repeated			Nouns: 69.6% mouthed,Verbs: 13.1% mouthed
Austrian Sign Language (ÖGS) (Hunger, 2006)			Verbs 2x longer than nouns		Nouns: 92% mouthed, Verbs: 50% mouthed
Russian Sign Language (RSL) (Kimmelman, 2009)		Nouns: 72% repeated, Verbs: single		Verbs: 93% larger than nouns	The ratio of mouthed nouns to mouthed verbs – 1.43 : 1
Israeli Sign Language (ISL) (present study)	**In 70% of the pairs: Nouns restrained, Verbs continuous**				**Nouns: 92% mouthed, Verbs: 35% mouthed**
Al-Sayyid Bedouin Sign Language (ABSL) (present study)	**In 39% of the pairs, Nouns restrained and Verbs continuous**			**In 29% of the pairs, Verbs are larger than Nouns**	

Discussion

All known sign languages contain a subset of iconically-motivated nouns and verbs that are related to one another both semantically and formationally. Presumably it would be functionally advantageous for languages that have such related noun-verb pairs to develop a regular formal means for distinguishing between the members of each pair, and indeed previous research on noun-verb pairs has revealed that a number of sign languages have developed such devices, but none have been compared by the same researchers using the same methodology. The present study, the first such comparative study investigated two young sign languages, Israeli Sign Language (ISL) and Al-Sayyid Bedouin Sign Language (ABSL). Both languages are significantly younger than previously investigated languages, and this offers us an opportunity to learn about the development of the noun-verb distinction in the earliest stages of language development. Although the languages are about the same age, they have very different social histories: one is a deaf community sign language with 10,000 deaf signers and the other is a village sign language with about 130–150 signers.

We now consider the results of our investigation in the context of these two factors, focusing first on our findings about noun-verb pairs in ISL, then on our findings about noun-verb pairs in ABSL, and finally discussing what we can learn from considering the differences between the two languages.

Israeli Sign Language, a deaf community sign language[19], was found to have a robust noun-verb distinction along two parameters: manner of movement and mouthing. Based on these findings, we conclude that by the third generation of signers, ISL has developed various means for distinguishing between nouns and verbs in semantically and formationally related pairs.

At present it is not possible to determine whether a distinction developed in ISL independently or whether it was borrowed from one of the sign languages in use during the early days of the deaf community of Israel. Furthermore, even if a distinction did emerge due to language contact, it may not have arisen through simple borrowing of an existing distinction but rather through what historians and anthropologists call *trans-cultural diffusion*, that is, borrowing a concept but not its specific details. For example, it is not inconceivable that some early immigrants used Russian Sign Language (RSL), which has been shown to distinguish nouns from verbs, but the features employed for the noun-verb distinction differ from the pattern found in today's Israeli Sign Language (see Table 2). Other possible sources for such a borrowing or diffusion include German Sign Language and sign languages of Morocco, Egypt, and Algeria, each of which is known to have had varying degrees of influence on ISL (Meir & Sandler, 2008), but noun-verb pair distinctions have not yet been investigated for any of these languages, nor is

information on the structure of any of these languages from that period available, so we can only speculate.

Because a number of sign languages distinguish nouns from verbs by manner of movement, this category bears closer inspection. ISL employs manner of movement to distinguish nouns from verbs. In 70% of the ISL pair tokens in our data, the manner of movement was restrained for nouns and continuous for the corresponding verbs. Two previously investigated sign languages, American Sign Language (ASL) and Australian Sign Language (Auslan) distinguish nouns from verbs in the same way. For example, in their work on ASL, Supalla & Newport (1978) described three distinct manners of movement for signs in related noun-verb pairs: *continuous* and *hold* manners were found mainly in verbs, while *restrained* manner and doubled movement were found consistently in nouns.

The fact that three unrelated sign languages use manner of movement to mark the noun-verb distinction suggests a possible non-arbitrary motivation, along the lines of Wilbur's *Event Visibility Hypothesis* (2004). She proposes that the semantics of event structure is visible in the phonological form of the predicate and that "fundamental similarities across SLs may be related to these structural pieces". As an example of event structure being made visible, Wilbur describes an EndState morpheme in ASL: a phonologically overt rapid deceleration to a stop that affixes only to telic verbs or verb phrases, but not to atelic verbs or verb phrases. (The description of Wilbur's EndState morpheme closely resembles the description that Supulla and Newport gave of *hold* signs, suggesting that the Supulla and Newport *hold* verbs expressed telic predicates.) Wilbur argues that this and other similar ASL morphology provide examples of an iconic link between the meaning of a sign and its form, expressed via manner of movement. Her hypothesis lends itself not only to analysis of different categories of predicates, but also to analysis of noun-verb pairs, such as the data from Supalla and Newport: such characteristic manners of movement for ASL verbs can serve to distinguish verbs from ASL nouns. Our findings in ISL also support Wilbur's hypothesis: continuous movement on ISL verbs reflects the continuous nature of the events they depict whereas nouns were produced with restrained manner, since objects do not denote events of any type (and thus have neither duration nor endpoint).[20]

Perhaps the most interesting result of our study is the absence of a formational distinction in related noun-verb pairs in ABSL by any of the features coded for. Manner of movement, an important distinguishing feature in several previously investigated sign languages, was not found to distinguish nouns from verbs in ABSL (see Figure 3). Other aspects of movement, including frequency (iteration), were not attested in ABSL noun-verb distinctions either. Mouthing, a widespread feature of deaf community sign languages, was not attested in ABSL at all. Here we

look more deeply at our data in light of differences in social conditions that may explain our findings.

ABSL, like ISL, is less than a century old, with three generations of signers. However, it has been suggested that village sign languages exhibit a slower rate of development than deaf community sign languages (Meir et al., 2010; see also Senghas, 2005, for a comparison of ABSL and Nicaraguan Sign Language in this light), a suggestion we return to below. Thus, while ABSL has developed certain grammatical patterns, including a robust basic word order (Sandler et al., 2005) and compounding (Meir et al., 2010), it is still in the initial stages of grammatical development, so other fundamental properties such as a fully crystallized phonological system are just beginning to emerge (Sandler et al., 2011). We therefore infer that the fact that ABSL does not distinguish between the members of noun-verb pairs at present does not mean that it will not develop such a distinction in the future. Indeed, in our data we see two tendencies that could develop into distinguishing features in the future.

The first tendency is the relative size of verbs compared to their corresponding nouns. In 29% of the ABSL pairs, the verb is noticeably larger than its corresponding noun. Though the percentage of pairs with this feature is not high, if analyzed as a separate group, 65% of these pairs have restrained movement on the noun and continuous movement on the verb, which is exactly the pattern found in ISL, ASL, and Auslan. It is therefore reasonable to hypothesize that the opposition attested in so many other languages of "restrained noun/continuous verb" may be incipient in ABSL, beginning as a simpler opposition, "smaller noun/larger verb", and possibly developing into a manner of movement distinction similar to that found in other sign languages.

A second tendency in ABSL that deserves closer attention is the use of size-and-shape specifiers (SASSes) with nouns, exemplified in Figure 5. At first glance, the use of SASSes in our data is not high: only 15% of the nouns were so marked in ABSL, compared with 24% in ISL. But interestingly, all but two of the nominal concepts marked with a SASS in ABSL were also marked with a SASS in ISL (see Figure 6). It may be the case that SASSes are added primarily to those nouns that are not transparent enough despite their iconicity. A closer look at Figure 6 reveals that nouns marked with SASSes could potentially be ambiguous: for instance, both ISL and ABSL signers signed WHIP with a rotating movement of the wrist above the head, but this sign by itself, though iconic, may not be transparent enough to be uniquely interpreted as WHIP, and thus both groups added to the sign a classifier for a long thin object. For an in-depth discussion of iconicity in sign languages and competitions between types of iconicity, see Meir, Padden, Aronoff, & Sandler (2013).

Some nouns can be semantically more ambiguous than others, raising the interesting possibility that some semantic property or hierarchy of properties could predict which nouns are likely to be marked by a SASS classifier. A comparison with uses of classifiers in spoken languages may be informative for constructing such a hierarchy. For instance, Erbaugh (1986) found that the historical development of noun classifiers in Mandarin Chinese is paralleled by their acquisition by young children, with properties such as length marked before flatness and concrete objects before abstract. The Mandarin Chinese shape classifiers, a subclass of noun classifiers, refer mostly to concrete, discrete, movable objects, e.g., *tíao* is used to mark extension, *zhāng* — for flat things, *bǎ* — for portable things, especially those with handles and so on, while the *zuò* classifier for mountains and buildings is both historically late to develop, acquired later than other classifiers by children, and also one of the less-used classifiers in modern Mandarin (Erbaugh, 1986). Our data show some similarities to the earlier stages of the history of Mandarin Chinese: for example, ABSL signers used four different kinds of SASSes for length, two kinds of SASSes for size, and one for container (see Tkachman, 2012, for a more detailed discussion on the use of SASS compounds in ABSL and ISL). All classifiers in our data represent concrete, movable objects. To the best of our knowledge, no classifier for big landmarks such as mountains or buildings exist in ABSL. Interestingly, a similar use of haptic classifiers marking exclusively nouns in noun-verb pairs has been reported for Zinacatec family Homesign (Haviland, this issue). A cross-linguistic comparison of young sign languages as well as historical data on classifier development in spoken languages may help to investigate the hypothesis that use of SASS classifiers, and their path of emergence in a new language, can be predicted on semantic grounds.

Earlier research of the ABSL research team found that spatially organized verb agreement, so common in more established sign languages, is not in evidence in ABSL, and that it developed gradually in ISL, a language of about the same age but formed under very different social conditions (Padded, Meir, Aronoff, & Sandler, 2010). This hypothesis is explored in Meir, Padden, Aronoff, and Sandler (to appear), in which the authors support Wray and Grace's proposal that the presence or absence of intimate shared knowledge in a community can result in different linguistic structures. 'Esoteric communities', that is, communities whose members communicate chiefly inside the group, may not only develop more irregularities, but may also maintain more linguistic variability for a longer period of time (Wray & Grace, 2007). Meir and colleagues name several other important factors in the evolution of a young language. For example, language age can influence the amount of language variation, since it takes time to develop a conventionalized lexicon. The extent of linguistic variation at the beginning of the language community is another important factor, since knowledge of other linguistic systems,

as was the case for at least some of the early ISL community but not for the ABSL community, can contribute to the development of language structures (as in pidgins and creoles). Community size can influence the frequency of usage and of exposure to the same forms, which in turn can stabilize categories and narrow the margin of variation to enable intelligibility between unrelated signers (see Joos, 1962; Hay & Bauer, 2007). Finally, what the authors refer to as use of a language in formal settings (i.e., increased code structuring, see Irvine, 1979) encourages standardization of both vocabulary and articulation. The findings of the present study lend additional support to the idea that social factors such as these may influence the development of grammatical regularities.

As explained, ISL and ABSL belong to different typological classes, those of *a deaf community sign language* and *a village sign language*. This distinction is based on different degrees of social homogeneity of the two language types, but a number of other factors are usually associated with these classes as well. For instance, village sign languages are not only more socially homogeneous, but also have fewer deaf signers and more hearing signers (in proportion to the deaf signers), and all deaf children are exposed to the sign language from birth or early childhood. We suggest that these factors may explain the need for regular patterning in ISL and the tolerance for less systematicity of grammatical form in ABSL. A more detailed consideration of the possible role of social factors in the development of grammatical structure can be found in Meir et al. (2010) and specifically for noun-verb pairs in Tkachman (2012). The present study shows more systematic grammatical form in ISL — a language formed from contact among people from many different countries and used in a large population — than in ABSL, the language of a small insular community with a good deal of shared experience and context. Specifically, a systematic distinction between pairs of nouns and verbs, found in many sign languages that have been investigated, is not (yet?) attested in ABSL.

Conclusion

The present study asked whether there is a formational distinction between nouns and verbs in semantically and formationally related noun-verb pairs in two sign languages: Israeli Sign Language (ISL) and Al-Sayyid Bedouin Sign Language (ABSL). We found that ISL has developed formational distinctions between nouns and related verbs: different manner of movement, mouthing, and, to some extent, use of size-and-shape specifiers (SASSes). ABSL has not developed such a distinction to date, though our data reveal two tendencies that may eventually become distinguishing features between nouns and their related verbs: the larger size of the

signing space for verbs compared to nouns and the use of size-and-shape specifiers for nouns but not for verbs.

Our results demonstrate that a formal noun-verb distinction is not necessarily present in a language from the beginning but suggest that such a distinction may develop gradually. Our findings also suggest that the conventionalization of linguistic structure may be hindered or facilitated by the social factors surrounding the language community. ABSL — which has not developed a consistent way to mark a noun-verb distinction at this point — is used by a small signing community, did not have any linguistic models at its inception, has fewer domains of use, and is used by a more homogeneous community. ISL differs from ABSL in each of these characteristics, and indeed does have formational characteristics that differ for the two word classes in noun-verb pairs. In sum, our findings show that lexical category distinctions do not come ready-made into language, and lend support to the view that social factors play a role in the development of linguistic structure.

Acknowledgements

We wish to thank John Haviland and Pamela Perniss for valuable comments on earlier versions of this paper. The work was funded by U.S. National Institutes of Health grant No. R01 DC006473.

Notes

1. Though Haspelmath (2007) does not define explicitly what he means by universal functions and language-specific categories, typically linguists use those terms to distinguish between phenomena that are supposed to exist in all natural human languages vs. phenomena that are found only in some languages and not taken as atypical realizations of some universal feature. For instance, a set of permissible word orders and a means of expressing sentential negation are examples of universal functions that can be expected to be found in all human languages, while numeral classifiers and auxiliary verbs are examples of language-specific categories found only in some languages (Bender & Flickinger, 2005).

2. Older versions of generative grammar postulated two features: [±V] and [±N] or [±transitive] and [±predicative]. Their combinations gave four different parts of speech: N [-V +N]; V [+V -N]; A [+V +N]; and P [-V -N] (Chomsky, 1970). In the Minimalist Program (Chomsky, 1993, 1995) all words are fully formed in the lexicon and then merged with each other in a sentence by the syntax. In the Distributive Morphology framework parts of speech are not present in syntax, and open-class words are acategorical, with their lexical categories determined later by their local relations. For instance, the word whose closest c-command licenser is a determiner will be labeled as noun (see Harley & Noyer, 1999, for the discussion).

3. It is conventional in sign language literature to gloss the meanings of signs in small caps (SIGN).

4. American Sign Language is about 250 years old (Padden, 2010), Australian Sign Language is at least 170 years old (Johnston & Schembri, 2007), Russian Sign Language is 200 years old (Bickford, 2005), and Austrian Sign Language is about 150 years old (Dotter & Okorn, 2003).

5. For an extensive discussion on cross-linguistic identification of word classes see Evans (2000, pp. 708–720).

6. See also Langacker, 1987, for a notional view of nouns and verbs.

7. Both concrete and abstract meanings can be expressed iconically (through the use of metaphors in the latter case) (see Meir, 2010). Iconic motivation in sign languages has many complexities, and different types of iconicity may compete in lexicon formation (see Meir, Padden, Aronoff, & Sandler, 2013).

8. The only recent study reporting on the absence of a formational noun-verb distinction is Voghel (2005) on Quebec Sign Language (LSQ). Voghel does not use elicited forms but analyzes all nouns and verbs (for the most part unrelated to each other) in a natural discourse instead. She argues that morphosyntactic features such as possessive marking on nouns and negation marking on verbs as well as use of space distinguishes related nouns and verbs in LSQ, finding no differences in form. Nevertheless, one feature was found to distinguish nouns from verbs reliably, and this is mouthing, which occurred mostly on nouns.

9. Since Hunger used a combination of pictures with single-word stimuli, it was possible for her to investigate more abstract concepts like INTEREST — stimuli which are less typical of the noun-verb studies in sign languages.

10. It is frequently cited in the sign language literature that about 10% of deaf persons are born to at least one deaf parent (Schein, 1989, was apparently the first to report it). However, recent research suggests that the actual percentage of deaf persons born to deaf parents is even lower — less than 5% (Mitchell & Karchmer, 2004).

11. All of the sign languages in which the noun-verb distinction has been found thus far are established sign languages of deaf communities that have been in use for 150 years (Austrian Sign Language (ÖGS), Dotter & Okorn 2003) or more (ASL is around 250 years old, Padden 2010).

12. The actual stimuli were in the form of color photographs rather than line drawings.

13. Some ABSL signs seemed to be produced with an easily observed tension of the muscles of the arms, resulting in much stiffer movement than a similar sign produced without tension. Thus tension was not just an accompanying feature of a restrained movement since not all restrained signs were produced with the muscle tension, even in the same signer. For instance, some ABSL signers produced both KNIFE and CUT with restrained manner of movement and with no tension of the muscles, while the related sign for SLAUGHTER was also produced with restrained movement but with a noticeable tension of the muscles.

14. *Instrumental versus handling* refers to two different ways of depicting iconic signs (see Padden et al. in this issue). The signing hand can represent either the object it depicts or the hand handling the object. When the hand represents the object (e.g., the ABSL sign BRUSH that

is signed with spread and curved fingers on the hair), such a sign is called instrumental since the hand stands for the instrument. When the hand represents a hand that is engaged in a prototypical activity involving the represented object (e.g., the ISL sign BRUSH (Figure 1 (a)) that is signed with fingers closed as if holding the handle of a brush), the sign is called handling.

15. Not all of the coding features participated in marking a noun-verb distinction. Specifically, the following features showed no tendencies in distinguishing nouns from verbs in either of the languages under investigation, and we will have no more to say about them here: presence/absence of tension, presence/absence of internal movement, one-handedness vs. two-handedness, object vs. handling (that is, whether the signing hand represents the object it depicts or the hand handling the object it depicts; see Padden et al. in this issue), differences in the place of articulation, movement vs. lack of movement, number of joints involved, and differences in orientation of the hand.

16. Different classifications of classifiers exist, as well as different labels for what are here termed "size-and-shape specifiers" (e.g., extension, surface, perimeter classifiers). Also, some researchers (e.g., Zwitserlood, 2003) take SASSes to involve a tracing/outlining movement, and do not consider SASSes to be classifiers (on syntactic grounds).

17. Similar size-and-shape forms exist in Adamorobe Sign Language (AdaSL) (Nyst, 2007), but in AdaSL they are more limited and behave differently.

18. Figure 7 shows another interesting generalization. In ISL, the handshape for LIPSTICK represents the instrument, while the ABSL handshape reflects the object itself. Padden et al. (this issue) illuminates this preferential distinction.

19. ISL developed through creolization of sign languages brought from elsewhere and home sign systems (Meir & Sandler, 2008). This is not uncommon for deaf community sign languages, and in fact highlights the heterogeneity of the population, argued to have an impact on the development of a grammatical system (Meir, Padden, Aronoff, & Sandler, to appear).

20. Because almost all the pictures in our elicitation materials depicted some process in action with no apparent endpoint, and indeed almost no hold signs were produced in our data.

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Appendix 1

List of objects used for eliciting nouns and their corresponding verbs

Object:	**Action:**
apple	eat-apple
brush	to-brush
camera	take-picture
cigarette	smoke
comb	to-comb
corn	eat-corn
door	open-door
dough	knead
embroidery	embroider
fork	eat-with-fork
guitar	play-guitar
hammer	to-hammer
key	open-with-key
knife	cut-with-knife and slaughter
lipstick	apply-lipstick
mascara	apply-mascara
glass of milk	to-milk
piano	play-piano
pita	make-pita

rolling pin	roll-the-dough
scissors	cut-with-scissors
swing	to-swing
whip	to-whip

Appendix 2

List of pairs excluded from the analysis

Object:	**Action:**
ball	bounce-ball
boat	sail-in-boat
book	read-book
bottle	pour-with-bottle
candle	lit-candle
car	drive-car
flower	smell-flower
kettle	pour-with-kettle
money	pay-with-money
paints	to-paint
pen	write-with-pen
perfume	perfume-oneself
pillow	sleep-on-pillow
soap	wash-hands
soup	eat-soup
tray	serve-on-tray
tissue	blow-nose

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