Original Articles

The effect of being human and the basis of grammatical word order: Insights from novel communication systems and young sign languages

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ARTICLE INFO

ABSTRACT

This study identifies a central factor that gives rise to the different word orders found in the world's languages. In the last decade, a new window on this long-standing question has been provided by data from young sign languages and invented gesture systems. Previous work has assumed that word order in both invented gesture systems and young sign languages is driven by the need to encode the semantic/syntactic roles of the verb's arguments. Based on the responses of six groups of participants, three groups of hearing participants who invented a gestural system on the spot, and three groups of signers of relatively young sign languages, we identify a major factor in determining word order in the production of utterances in novel and young communication systems, not suggested by previous accounts, namely the salience of the arguments in terms of their human/animacy properties: human arguments are introduced before inanimate arguments ('human first'). This conclusion is based on the difference in word order patterns found between responses to depicted simple events that vary as to whether both subject and object are human or whether the subject is human and the object inanimate. We argue that these differential patterns can be accounted for uniformly by the 'human first' principle. Our analysis accounts for the prevalence of SOV order in clauses with an inanimate object in all groups (replicating results of previous separate studies of deaf signers and hearing gesturers) and the prevalence of both SOV and OSV in clauses with a human object elicited from the three groups of participants who have the least interference from another linguistic system (nonliterate deaf signers who have had little or no exposure to another language). It also provides an explanation for the basic status of SOV order suggested by other studies, as well as the scarcity of the OSV order in languages of the world, despite its appearance in novel communication systems. The broadest implication of this study is that the basic cognitive distinction between humans and inanimate entities is a crucial factor in setting the wheels of word ordering in motion.

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1. Introduction

Word order is both a necessity and a resource. It is a necessity in the sense that the linguistic signal is linear (de Saussure, 1959), and words in a clause have to be arranged linearly. But languages take advantage of this state of affairs and employ differential orders for various linguistic tasks, including signaling information structure, sentence type (e.g. indicative vs. interrogative, main vs.

embedded), and syntactic/semantic roles such as subject and object or agent (or actor) and patient.[1]

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[1] It is important to distinguish the event that is depicted and its structure from the linguistic description of the event and its structure. In this paper, we use the term *entity* to denote the persons or objects that are depicted in the video clips (in the elicitation tasks described below) and the term *relation* to denote the state or activity depicted. If one of the depicted entities is acting on the other, we call this entity an *agent*. We call the other entity in such a relation a *patient* and the relation an *action*. For the linguistic description we use the standard terms S(ubject), O(bject), and V (erb), as used e.g. in Dryer (2013a), which we refer to as syntactic/semantic roles, since they refer both to the syntactic roles of Subject-Object and the semantic roles of Agent-Patient of the arguments.

The use of uniform word orders for signaling the roles of arguments seems to be a basic device in human languages. First, it is quite prevalent. Out of the 1377 languages sampled for word order in the *World Atlas of Language Structures* (2013), over 85% are characterized by a dominant order for signaling the arguments in a transitive clause (Dryer, 2013a). Furthermore, word order is reported to be in use in a variety of emerging communication systems. Word order regularities have been found in homesign systems, the gestural communication systems invented by deaf children not exposed to any language, spoken or signed (Goldin-Meadow, 2003). Young children may rely on word order to encode syntactic/semantic roles before they learn to attend to morphological cues such as case marking, as has been shown for German-speaking children by Dittmar, Abbot-Smith, Lieven, and Tomasello (2008). In pidgins and creoles, word order is the main device for encoding these relations, since inflectional morphology (verb agreement and case markings) is largely absent (e.g. Arends, Muysken, & Smith, 1994). Consistent word order also appears very early on in the development of a new language. Sandler, Meir, Padden, and Aronoff (2005) found that in Al-Sayyid Bedouin Sign Language (ABSL), a sign language that developed de novo in a Bedouin village in Israel with a high percentage of congenital deafness, consistent word order appeared in the signing of second generation signers.

These observations have been taken as evidence that the use of word order to indicate syntactic/semantic roles is an important and basic property of human languages. It has long been known, though, that the particular order employed varies across languages. Indeed, each of the six possible orders of the components of a transitive event - the agent/subject (S), the patient/object (O) and the relation/verb (V) – is dominant in some fraction of the world's attested languages (Dryer, 2013a). This fact suggests that no order is cognitively or linguistically impossible. Still, the distribution of these orders in languages of the world is uneven. Of the six possible orders, two are by far more common than the others: SOV and SVO, 565 and 488 languages respectively in Dryer's sample of 1188 languages with dominant word order, together accounting for almost 90% of these languages.[2] The next most common, VSO, is found in only 95 languages (8%), and the three orders in which O precedes S total 40 altogether (3%). SOV and SVO are also predominant in sign languages. In a comparative study of word order in 42 sign languages (out of about 150 attested), Napoli and Sutton-Spence (2014) found that only SOV and SVO word orders are attested as dominant orders. This uneven distribution suggests the possibility that cognitive and/or communicative factors are involved in determining the dominant order in a language.

This distribution of dominant word orders across languages and language families raises questions from evolutionary and historical perspectives: what gave rise to this particular distribution? Is one order more basic than others? In what way is it more basic – diachronically or cognitively? If it is more basic in one sense or another, how and why did other orders develop? As is always the case when trying to suggest a scenario for events for which we can have no direct data, the question is what can count as evidence. Three types of studies have been suggested (Schouwstra, 2012, ch. 2, 23–24): (i) comparative

and diachronic studies of existing languages; (ii) studies of word order in linguistic systems that are new or very young; and (iii) studies of word order in novel communication systems invented in the laboratory, such as elicited pantomime. The study we present in this paper is unique in combining two types of evidence, word order in young languages and elicited pantomime, as we discuss below.

Based on comparative and diachronic studies of existing languages, Newmeyer (2000, 372) hypothesizes that "the earliest human language had a rigid SOV order"[3] and that SVO order developed later as a response to various processing efficiency demands. His hypothesis is based on the current distribution of SOV and SVO orders in the world's languages, and on diachronic studies of word order change. SOV order is predominant in all continents except Africa, where both SOV and SVO are widespread. SVO is more restricted in its geographical distribution, occurring mainly in Africa and Eurasia, and is hardly represented in the languages of the Americas and Austronesia (see also Dryer, 2013a). Diachronically, there is evidence for many SOV languages shifting historically to SVO, while a shift in the opposite direction is usually attributed to language contact (Gell-Mann & Ruhlen, 2011; Givón, 1979; Vennemann, 1975).[4] Newmeyer concludes that SOV is likely the basic order in early human languages (the conclusion that Givón, 1979; Gell-Mann & Ruhlen, 2011 also arrive at), and that the current distribution, where SVO is almost as widespread as SOV, is the result of many SOV languages shifting to SVO.

New languages may shed some light on the issue at stake, since they are closer to their "point of origin" than already existing languages in the sense that in early stages of a language there is no stable set of linguistic conventions that users can rely on. Therefore users of these systems need to improvise when they put words together, relying on whatever strategies are available to them. Identifying these strategies may give us a clue to the factors that determine word order to begin with (cf. Schouwstra, 2012, ch. 4).

While we have no consistent evidence on word order in pidgins (Bakker, 2008), creole languages are largely SVO (Bakker, 2008; Huber & the APiCS Consortium, 2013; McWhorter, 2001; Seuren, 1998), leading Bickerton to suggest that the basic word order of the Bioprogram, presumably from a Universal Grammar perspective, must have been SVO (Bickerton, 1981). Other researchers argue that the SVO order in creoles results from the influence of the superstratum languages, many of which are SVO (Gell-Mann & Ruhlen, 2011).

Another type of a communication system that is new in the sense that its users have yet to learn the linguistic conventions to rely on is known as the Basic Variety (BV). This term was coined by Klein and Perdue (1997) to refer to the form of language used by adults who acquired a second language outside the classroom. Klein and Perdue conducted a comprehensive longitudinal study of the form of language used by adult second language learners from various mother tongues and various target languages, and described its properties. Concerning the linear order of arguments and events, they posit two major principles: (a) a semantic principle by which the NP referent with highest control comes first, and (b) a pragmatic principle according to which the focus expression comes last. The NP with the highest control is typically the agent,

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[2] Dryer uses the term 'dominant word order', which we adopt here, rather than the term 'basic word order', used in many other frameworks. According to Dryer, a dominant order is the sole order possible in a language, or the most frequent order. See Dryer (2013b) for theoretical considerations in determining the dominant word order in a language. The term 'basic word order' is used to mean different notions in different works, e.g. the most common order, an underlying order from which all other orders in the language are derived, the order that emerged first diachronically and the order that is easiest to process. In order to avoid confusion, we adhere to Dryer's terminology, which takes the dominant order to be the most frequent one.

[3] Newmeyer (2000) assumes that 'the earliest human language' is already one evolutionary step ahead of 'proto-language'. According to him, proto-language must not have used word order to mark thematic relations, but rather used some kind of inflectional morphology for this purpose. That is, he surmises that morphology developed before syntax as a means of encoding thematic relations.

[4] Yet Vennemann (1974, 370) does not rule out other causes for an SVO language becoming SOV, such as the development of a consistent morphological case marking distinguishing S from O. He gives Persian as an example of a language that developed a definite object marker from a noun meaning 'goal', and concomitantly changed from being more SVO-type to predominantly SOV type.

which is highly correlated with the syntactic role of subject. Principle (a) then is compatible with the strong tendency found in the world's languages for subjects/agents to precede objects/patients. The pragmatic principle of 'focus last' does not correlate with any specific grammatical role but rather has to do with the flow of information in a clause. The BV, then, shows that word order in a communication system is not always best expressed in terms of syntactic principles. In an evolutionary context, Jackendoff (2002, 246–251) takes the BV findings as evidence for a semantic stage in the emergence of language in which clauses were organized according to semantic and pragmatic rather than syntactic principles.

Pidgins, creoles and the BV are new in the sense that their users do not have a consistent interaction with a stable linguistic model to rely on when creating utterances. Yet the users of pidgins and of the BV are native speakers of their mother tongue, and creole users are exposed to some linguistic input (a pidgin or earlier stages of the creole). The only languages that are known to have emerged with little direct influence from any other language system are sign languages that have been created de novo in communities with a high incidence of hereditary deafness, often called 'village/rural sign languages' (Meir, Lifshitz, Ilkbasaran, & Padden, 2010; Meir, Sandler, Padden, & Aronoff, 2010; see also de Vos & Pfau, 2015; de Vos & Zeshan, 2012). Early on in our investigation of one such language, Al-Sayyid Bedouin Sign Language (ABSL), we found that a predominant SOV order appeared within the span of two generations (Sandler et al., 2005). However, reports on word order in other village sign languages are less clear-cut. Kata Kolok, a village sign language of Bali, adheres to SVO order when possible ambiguities may arise (e.g., when both entities in an action can be either the subject or the object), but uses more flexible word order when the sentence can be disambiguated by its semantics alone (Marsaja, 2008, 168–169). In a sign language that emerged in Providence Island, Colombia, there is much variation in word order (Washabaugh, 1986, 60). Deaf signers in Washabaugh's study tended to put the verb at the end, but did not use consistent order between agents and patients. Hearing signers were more consistent: they tended to have agents before patients in 99% of their utterances. As for the position of the verb, hearing signers who had deaf family members placed the verb in final position in 64% of their responses, while those who did not have daily contact with deaf people had verb-final order only 23% of the time. This may be interpreted as more interference from the spoken vernacular, Providence Island Creole, which, like almost all other creoles, has SVO order (Arends et al., 1994). It is difficult to form generalizations based on these studies, since their methodologies and analyses vary greatly, though there appear to be two tendencies: to place subjects before objects (yielding both SOV and SVO orders) and to put the verb at the end.

The third type of evidence comes from communication systems that are invented on the spot, in a laboratory setting. In a seminal study, Goldin-Meadow, So, Özyürek, and Mylander (2008) showed that participants who are asked to create a novel gestural system use SOV order, regardless of the order in their native spoken language. Forty hearing participants with no exposure to a sign language were asked to describe in gestures, without speech, a set of short video clips depicting various transitive and intransitive events. The subjects, native speakers of four different languages, showed a strong preference for SOV order in their gesturing, irrespective of the dominant word order in their language (SVO for English, Spanish and Chinese speakers and SOV for Turkish speakers). Goldin-Meadow et al.'s explanation of these results is that SOV is cognitively more basic. They suggest that participants are cognitively more salient than actions, hence actions occur last, and objects (patients) are more tightly related to the actions, therefore appearing close to the V, leaving the subject (actor) to the

initial position.[5] They further suggest that other word orders found in the world's languages arose as a result of growing demands in the communicative needs as language communities grew and became more complex. In evolutionary terms, their study suggests that languages started as SOV because it is cognitively basic, and changed over time to other orders because of growing communicative needs and the development of individual grammars.

Langus and Nespor (2010) also found a strong tendency for SOV when Italian and Turkish speakers were asked to convey in gesture simple transitive events. Yet when these transitive events were embedded in another event (as in 'The girl said that the man fished a shoe...'), the embedded event followed the 'matrix' verb, yielding what Langus and Nespor regarded as an SVO order. Embedding is important to their argumentation, as it represents recursion, a hallmark of grammar. The fact that embedded structures yield a different word order led them to suggest that the two orders originate from different cognitive systems. SOV relies on direct interaction between the sensory-motor system and the conceptual system with no access to a grammatical system. SVO, which emerges when embedded structures are involved, is the order preferred by the computational system of grammar.[6]

Schouwstra (2012, Schouwstra & de Swart, 2014) argues against the hypothesis that there is one basic word order in elicited pantomime. Rather, word order is determined by semantic considerations, such as the nature of the event. The events depicted in the elicitation tasks used by both Goldin-Meadow et al. and Langus and Nespor (for the simple events) were all extensional events; the patient argument was concrete, specific, and existed independently of the event it participated in. Schouwstra suggests that when the patient argument has different properties, it will occupy a different position in the clause. Specifically, intensional events, whose patient argument can be abstract, non-specific or need not exist at all, may trigger a different word order. In her study, she compares the word order in the pantomimed descriptions of extensional vs. intensional events. And indeed, while the dominant word order of extensional events was SOV, in intensional events it was SVO. Her explanation has to do with the nature of the patient (object) argument. In intensional events, the ontological status of this argument is less clear, since it is less concrete, and does not necessarily have independent existence. In line with Goldin-Meadow et al.'s suggestion that information that is cognitively simpler precedes more complex information (2008, 9166), Schouwstra suggests that in intensional events the object (patient) is the most complex constituent and therefore it occurs last. Schouwstra and de Swart (2014, 435) suggest that in emerging

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[5] Newmeyer (2000) similarly claims that O and V form the conceptual category of 'predicate', and that they form a syntactic constituent following a general principle of iconicity by which conceptually close elements tend to be co-constituents, thus resulting in SOV order. There is also a long line of research in the generative literature that identifies the verb and object as a special cluster to the exclusion of the subject, based on the premise that combinations of verb and object can result in an idiosyncratic meaning but combinations of subject and verb do not do so as readily (e.g., Kratzer, 1996; Marantz, 1984).

[6] A different possible interpretation of the order of clauses in the embedding condition is that the responses do not consist of one clause embedded in another, but rather two independent clauses ordered consecutively. Because there are no conventional gestural means to convey embedding in these novel communication systems, gesturers produce two simple independent clauses. Therefore, these productions are not actually instances of SVO clausal order, but rather of SV, SOV production. Schouwstra (2012, 151) suggests another explanation to these results. Sentential complements are intensional (in the sense that they are created by the main verb, and are more abstract in nature), and in her study intensional events triggered SVO word order in an elicited pantomime task, as described below. Furthermore, some natural languages, e.g. Italian Sign Language and Hindi, show precisely this pattern, as pointed out by an anonymous reviewer: SOV order with nominal patients, SVO order with clausal patients. Would that imply that their word order also arises from two distinct systems, grammatical and conceptual? If not, what is the motivation for positing this distinction in an artificial system?

communication systems "There is no pre-set basic word order, but a range of possible linearization options, and choices are driven by different factors". SOV and SVO orders are the result of the different semantic characteristics of the verb and the patient argument.[7]

Remarkably, all the action events depicted in the above studies, including our own, are similar: the agent is human, while the patient is inanimate. Such events are *non-reversible*, in the sense that only one interpretation of the string is plausible: the human agent entity acting on the inanimate patient entity. In describing such events linguistically, the assignment of syntactic roles to the NPs denoting the entities follows directly from the nature of the event: the Subject denotes the agent entity and the Object denotes the patient entity. No special machinery is needed to disambiguate the message. The fact that consistent word order appears in the descriptions of such events, as the above studies have found, even when it is not needed to interpret the clause, is significant and interesting by itself, and we discuss it below. But what happens when the natures of the event and entities cannot be relied upon in interpreting a clause? If both entities are human, either might in principle be the agent or the patient, all else being equal, and the linguistic strings are therefore ambiguous. We call such events *reversible*.

A few recent studies (Gibson et al., 2013; Hall, Mayberry, & Ferreira, 2013; Meir, Lifshitz et al., 2010; Futrell et al., 2015) compared word order in gestured productions of hearing participants (speakers of various mother-tongues) in reversible vs. non-reversible events. All studies found a difference in the preferred word order in linguistic depictions of the two types of events. Furthermore, while all studies found a strong preference for SOV in depicting non-reversible events (when the patient is inanimate), thus replicating the results of Goldin-Meadow et al. and Langus and Nespor, they all found that SOV was not as strongly preferred when describing a reversible event.[8] The studies differ in their interpretation of these results. Meir, Lifshitz et al. (2010), Gibson et al. (2013) and Futrell et al. (2015) suggest an explanation in terms of *confusability*: clauses describing a reversible event are potentially ambiguous, since both entities are potential subjects. A word order in which the two entity signs are adjacent to each other (as in SOV) presents a greater challenge for interpretation (Gibson et al. couch their argument in terms of a *noisy-channel hypothesis*). Speakers tend to avoid it, and resort to an order in which the linguistic arguments are separated by the verb, as in SVO. As Hall et al. (2013) point out, such an explanation is comprehension-based; it assumes that the driving force behind the drift away from SOV is to ease the task of the comprehender, and that the producer takes the comprehender's perspective into account (cf. Grice's, 1975 maxim of manner). The comprehension-based explanation, however, cannot account for the OSV order found in the depictions of reversible events of some of the participants in all three studies. We will return to this problem later.

Hall et al. offer a production-based explanation, focusing on *role-conflict* between the gestures depicting a human O and V.

According to them, when describing human entities in gesture, gesturers often take the role of that entity in pantomime (e.g. assuming a flexed-biceps pose to gesture 'man', indicating long hair on their own head for 'woman'). When describing an inanimate entity, the gesturers do not take the role of that entity (that is, they do not 'become' a box or a ball). As for the relation, participants usually gesture it from the point of view of the agent, as if they themselves are the agents performing an action. For example, when pantomiming lifting a box, participants acted out the action as if they were the agent doing the lifting (Hall et al., 2013, 7). When producing an SOV string to describe an event with an inanimate patient, the gesturer takes the role of the agent, then produces a gesture to represent the patient (without adopting its role), and then gestures the action from the point of view of the agent. When describing an event with both a human agent and a human patient, the gesturer takes on the role of the agent, then the role of the patient, and then produces the action, which requires him/her to re-assume the role of the agent. Hall et al. suggest that "If the participant were to produce an action gesture without first doing something to switch back into the agent role, it may "feel" to him or her as if it is the patient and not the agent that is carrying out the action" (ibid., 7). According to Hall et al., participants try to avoid this conflict between the patient role and the agentive perspective of the action by resorting to word orders in which the patient-denoting argument does not directly precede the action sign. This explanation accounts for the use of SVO, SOSV and OSV orders, which indeed occur as responses to events with a human patient. But their explanation fails to account for the SOV and SVOV orders which are also found in the responses to these events.[9] In addition, it is not clear whether role-conflict can also account for existing sign languages, where lexical items are conventionalized and signers do not need to enact an argument in order to refer to it.[10]

Though the studies presented above differ in the explanations they provide, they all share two central theoretical assumptions: (a) word order generalizations in these systems are best captured in terms of semantic/syntactic roles; that is, gesturers use word order to encode semantic/syntactic roles, and (b) there is a direct link between the word orders found in these invented systems and the word orders found in languages of the world; in other words, these invented systems provide evidence for word order patterns in the initial stages of a human language and maybe of human language in general. In what follows, we challenge the first assumption, and we argue that word orders in terms of S, O and V are derivative of more basic, non-syntactic and even non-linguistic principles.

Another characteristic shared by these studies is that they employ one specific method to study word order from an evolutionary perspective, namely novel communication systems invented in the laboratory. Other studies, mentioned earlier in this section, appeal to naturalistic data in young languages or restricted language systems (pidgins and creoles, emerging sign languages, the BV, homesign). As Schouwstra (2012) points out, each method has its own advantage and disadvantage, and an ideal method would be to combine both. This is precisely what we do in the present study.

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[7] Similar results concerning the influence of the nature of the patient argument (extensional vs. intensional, which they refer to as manipulation vs. construction events) were reported in Christensen, Fusaroli, and Tylén (2016). They offer an explanation in terms of structural iconicity: word order reflects the structural relationship between events and event referents in real world. A referent that is created by an action is subsequent to the action in the real world, and therefore gesturers tend to place the gesture referring to this referent after the gesture denting the action, yielding a VO order.

[8] Gibson et al. (2013) looked only at the relative order of O and V. They assumed (as is apparent from their discussion) that OV is an instantiation of SOV, and that VO is an instantiation of SVO. Our findings suggest that one must be cautious in making such an assumption, since OV can also be an instantiation of OSV. By collapsing SOV and OSV into one order (OV), an important distinction is lost.

[9] In Hall et al.'s results, SOV is quite rare in responses describing reversible clauses, and their explanation may account for the distribution they found. In our data, SOV is not so rare in responses for reversible clauses, as we present below, and therefore an explanation in terms of role-conflict does not account for the data.

[10] In a follow-up study, Hall, Ferreira, and Mayberry (2014) show that SVO is more common in more 'language-like' conditions, e.g. when the participants used a consistent gesture 'lexicon' and communicated with an addressee. Christensen et al. (2016) suggest that word order may be influenced by communicative pressures, such as a tendency to use a word order produced by that of the interlocutor.

We elicit clause productions in two types of communication systems: invented gestural systems and young sign languages. Our young sign language sample consists of three sign languages that developed in the past 75–100 years in the geographical area of present-day Israel – Al-Sayyid Bedouin Sign Language (ABSL), Israeli Sign Language (ISL) and Kafr Qasem Sign Language (KQSL). All three languages are quite young, and some of the signers participating in the study are from the first or second generation of signers in the languages. Assuming Labov's apparent time construct (Labov, 1963, 1994, 2001), the language of these signers reflects the language used by the community when the signers were in their teens, that is, early stages of the language. In two of the languages, ISL and ABSL, we have participants from different age groups, enabling us to track developments in word order as the language gets older.

The hearing participants represent three mother tongues with different dominant word orders: Hebrew, an SVO language, Turkish, an SOV language,[11] and Arabic, a language characterized by diglossia (Ferguson, 1959) as well as substantial dialectal variation, including in word order (Holes, 2004). Modern Standard Arabic, the language variety used in formal settings and in writing, is VSO, while the vernacular (in our case, a Bedouin dialect used in the town of Rahat, Israel), which is used in all daily interaction and is the mother tongue of the participants, is SVO. The ability to compare the productions of hearing gesturers who invent a communication system in the laboratory with those of signers who use their sign language to convey the same events provides special insight into the forces that drive the use of specific word orders, as we argue below.

2. Method

2.1. Task

In order to elicit simple clauses from the participants, we used a set of 30 video clips, each depicting a single event. Of these, relevant to our study are 17 clips depicting a two-place (transitive) or three-place (di-transitive) event. The clips vary with respect to whether the patient is human or inanimate. Five clips depict a reversible event with two human entities (e.g. **a girl** pulling **a man**), seven depict a non-reversible event with a human and an inanimate entity (**a girl** pulling **a shopping cart**). The five di-transitive events all depict a reversible event with two human entities and one inanimate entity (e.g. **a woman** giving **a shirt** to **a man**). There are no non-reversible events for di-transitives since events of transfer, the typical di-transitive events, involve two possessors, which are usually human or at least animate. Since we looked only at human animates, and not non-human animates, there are no di-transitive events with non-human possessors. The full list of the elicitation clips appears in Appendix A. Participants were asked to view the clips and describe the event in each clip to an addressee. The signers were asked to describe the events using their own sign language. The hearing gesturers were asked to describe the events without speech, by using gestures alone. All participants signed or gestured to another participant. Signers signed their responses to an addressee who is fluent in their sign language and with whom they have regular contact. Hearing gesturers gestured their responses to another hearing person who speaks the same language. To check for comprehension, the addressee was asked to identify one of three pictures best corre-

sponding to the action just described.[12] One of the three pictures correctly depicted the action and entities involved, the second had a different agent entity but the same action, and the third shows the same agent entity performing a different action from that shown in the video (see an example in Appendix B). If the addressee chose an incorrect picture, the addressor was asked to repeat the description. In the coding process, the word orders of all responses, including repeated descriptions, were recorded. However, for the purposes of this study, only the first responses were included in the analysis. The inclusion of all responses would mean that responses that reflected producers' cognition-based orders would be counted the same as responses that were added for clarification. The inclusion of only the first responses for analysis maintains consistency across all the groups and individuals, whereas data on all responses may be variable depending on the number of attempts made per trial. Nevertheless, when analyzing the data for all responses and first responses at different stages of the study, we found substantially the same pattern of results.

2.2. Participants

Six groups of participants took part in the study: three groups of hearing gesturers and three groups of signers. Since the sign languages and the social circumstances under which they developed are not well known in the literature, we start by providing the necessary background about these languages. We then proceed to describe the different groups of participants.

2.2.1. The sign languages

All three sign languages emerged and are used in the geographical area of the current State of Israel. All three languages are rather young, dating back to the 1920s and early 1930s (Meir & Sandler, 2008 for ISL, Kisch, 2012 for ABSL, Kastner, Meir, Sandler, & Dachkovsky, 2014 for KQSL). Two languages, ABSL and KQSL, are *village sign languages* that arose in small, relatively closed communities with a high incidence of hereditary deafness (Meir, Sandler et al., 2010).[13] 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.

The first deaf people in the Al-Sayyid community were four deaf siblings, born between 1924 and 1940 (Kisch, 2012). In the next two generations, deafness appeared in a number of other families, resulting in what today is estimated at about 130 deaf adults, teenagers and children in a community of about 4000 inhabitants (ibid.). The sign language that arose in the village is different in vocabulary from the sign languages of the region, ISL (Kastner et al., 2014) and Jordanian SL (Al-Fityani & Padden, 2010).

Kafr Qasem Sign Language (KQSL) arose mainly in one kinship group in the town of Kafr Qasem, a town which lies in the so-called Triangle area of Arab towns in central Israel and which has existed for 350 years. Of its 20,000 residents, approximately 100

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[11] Though the dominant order in Turkish is SOV, it has been referred to as a language with relatively free order, since all six possible orders are grammatical and attested. In a sample of 500 clauses in naturally occurring utterances of child-directed speech and children's utterances (Slobin & Bever, 1982), SOV order was found in less than half of the clauses (48%), while SVO (24%), OVS (13%) and OSV (8%) were also attested.

[12] Other studies of elicited pantomime (Goldin-Meadow et al., 2008; Gibson et al., 2013; Hall et al., 2013) did not include a comprehension component. We decided to include a comprehension component because we wanted the task to be more naturally communicative. We had found in our earlier work that signers or gesturers often omit referents when they do not have an addressee. For example, instead of signing 'woman gives shirt to a man', they would sign 'shirt give'. By addressing another person who has to demonstrate comprehension, participants tend to produce the arguments rather than omit them.

[13] 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.

are deaf, a smaller proportion than in Al-Sayyid but still much larger than the norm elsewhere. Deafness occurs mainly in one clan in the town. We have learned from interviews with residents of the town that the deafness in the clan is attributed to a deaf woman from the south of the country who married a hearing man from the village over 100 years ago, later giving birth to a number of deaf children. We have no corroborating external or genetic evidence for the age of the language or the etiology of the deafness. As with the case of the Al-Sayyid community, in Kafr Qasem too, hearing individuals who are in close contact with deaf people use the local sign language. Kafr Qasem Sign Language has not been studied to any extent until recently, when we became acquainted with a few deaf members of the community. Accordingly, the number of participants from this group is very small. By contrast, we have worked in Al-Sayyid for over a decade and have developed a fairly broad social network in the village, which gives us contact with a proportionately larger number of deaf individuals.

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, Sandler et al., 2010). In communities of this kind, some hereditary deafness may be present, but deafness also arises through illness or other traumas. In these communities, there are likely to be more deaf children who have no signing relatives, either hearing or deaf, and the number of hearing signers is small. ISL evolved along with the Israeli Deaf community beginning a little over 80 years ago, 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 in terms of their language. A few 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. Some of these immigrants brought with them the sign language of their respective communities. Others had no previous signing experience, or used some kind of homesign. 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.

We conducted three pairwise comparisons of vocabulary between ISL, KQSL and ABSL (Kastner et al., 2014). We compared 161 pairs of signs in KQSL and ABSL, finding a 19% overlap in identical signs, rising to 36% when similar signs (signs that differ only in one phonological parameter) were included. The overlap is similar when comparing KQSL and ISL: of the 186 pairs of signs, 15% show overlap when limited to identical signs and 36% overlap when including similar signs. The comparison of 161 pairs of signs in ABSL and ISL showed less overlap: about 9% overlap for identical signs and 23% overlap when similar signs are included. Such a percentage of similarity rating in sign languages indicates the independence of the three languages (based on findings of other comparative studies such as Guerra Currie, Meier, & Walters, 2002).

2.2.2. Participants

2.2.2.1. Hearing gesturers. None of the hearing gesturers has had any previous exposure to a sign language. They fall into the following groups: (1) Hebrew speakers: 32 hearing participants (22 females, 10 males), native speakers of Hebrew (an SVO language), students at the University of Haifa; (2) Turkish speakers: 29 hearing participants (13 females, 16 males) native speakers of Turkish (an SOV language). Five of the participants are bilingual in Turkish and Kurdish (also an SOV language). Ten are medical staff members in a hospital in Ankara, and 19 are students at the University of

Ankara. (3) Arabic speakers: eleven hearing participants (all male), native speakers of the Bedouin dialect used in Rahat, a city in the southern region of Israel. The basic word order of the local dialect, as in other Arabic dialects, is SVO (Shawarba, 2007). These participants use Modern Standard Arabic, a VSO language, as the language of literacy. They have also studied Hebrew throughout their schooling, and are very comfortable using Hebrew for speaking as well as for writing and reading. Therefore their linguistic situation is the most varied of all hearing groups. All are graduates of a high school in Rahat, and had at least twelve years of schooling.

2.2.2.2. Signers. All deaf signers participating in the research use their sign language as their major means of communication. The three hearing signers (one in each group) are native signers who use the sign language regularly to communicate with their deaf family members.

(1) Israeli Sign Language (ISL): 31 participants (15 females, 16 males), divided into three groups. The first two groups are signers age 47 and up, constituting the first and second generations of the language. Members of this age group come from a variety of linguistic backgrounds. Some went to deaf schools in their country of origin or in Israel and were educated in an oral setting, where emphasis was put on learning the spoken language, while use of sign language was usually banned. Other members of that group had no education, and are not proficient in any spoken language. Since schooling has a major effect on signing,[14] we divided this group in two, based on whether they went to school and are literate in the spoken language of the community. Group 1 consists of twelve signers (5 females, 7 males) who did not have substantial schooling and are therefore nonliterate in the spoken language. Group 2 consists of eleven signers (6 females, 5 males), all with at least twelve years of schooling and good to excellent command of literacy in Hebrew. One of the signers in this group is a hearing native ISL signer. Group 3 consists of eight signers (4 females, 4 males) aged 25–44. All members of this age group were exposed to ISL from early childhood, and six of the eight (five deaf, one hard of hearing) are native ISL signers born to deaf parents and exposed to ISL from birth. All had at least twelve years of schooling and have good to excellent command of written Hebrew.

(2) Al-Sayyid Bedouin Sign Language (ABSL): 26 participants, divided into three groups: Group 1 consists of five signers (3 females, 2 males) aged 40–50. These participants are second-generation signers of the language. All are monolingual in ABSL and are nonliterate. The nine participants in Group 2 (8 females, 1 male) are 17–27 years old. Five members of this group went to a school for the deaf in Be'er Sheva, where they learned some Hebrew and interacted with ISL signers. The four younger members of this group went to school in Tel-Sheva and Kseife, two nearby Bedouin towns, where they learned some Arabic and were exposed to some ISL signs. All members of this group can be considered sign-bilingual to some extent, using ABSL to interact with their deaf relatives such as parents, aunts, uncles and cousins in the village, and ISL when interacting with their teachers and with ISL signers.[15] Group 3 consists of twelve signers (8 females, 4 males) aged 5–15. One signer is hearing, with a

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[14] On some possible effects of schooling on the signing of deaf people, see e.g. Sandler et al. (2005) and Meir (2010).

[15] It is not clear as yet whether the ISL used by ABSL signers is similar in grammatical structure to the ISL used by the Jewish deaf signers. Preliminary impressions indicate that the two varieties of ISL are not identical, but further research is needed to pinpoint where the differences lie.

deaf mother and five deaf siblings. The deaf members of this group study in special classes for the deaf in an Arabic middle school in Tel-Sheva or in the Al-Sayyid village, where they are taught Arabic, and are exposed to some ISL signs used by their hearing teachers. Five children have a deaf parent, and all have deaf siblings.[16]

(3) Kafr Qasem Sign Language: Six signers, 2nd and 3rd generation of Kafr Qasem (4 females, 2 males), age 42–67, five deaf and one hearing. Three out of the six participants are monolingual in KQSL and are nonliterate. Two participants (the youngest of the group) know ISL as well, but have grown up in the village, have deaf family members and use KQSL as their main means of daily communication. One is nonliterate, the other has had some years of schooling, but her abilities and interaction in Arabic or Hebrew are limited. One participant is a hearing daughter of a deaf mother, who uses KQSL regularly with her deaf mother, uncle and cousins. She attended school for 10 years. Table 1 summarizes the details about the participants in the study.

2.3. Coding

Videotapes of gesture and sign productions were coded according to the order of the gestures representing the agent (Subject), the patient (Object), and the relation (Verb). A clause was defined as a production containing the action sign (V) and at least one argument (S or O). Responses that contained only one element and responses that did not contain a V were excluded from the count. Within a clause, multiple consecutive gestures or signs denoting the same referent or the action were treated as belonging to the same constituent. For example, a string such as [MAN INDEX MAN GLASSES]$_S$ [KNOCK-ON]$_V$ [WATERMELON]$_O$ (example produced by a Hebrew speaker) was analyzed as SVO. Non-adjacent repetitions were analyzed as separate constituents, as in [WOMAN]$_S$ [GIVE]$_V$ [SHIRT]$_O$ [GIVE]$_V$ (example produced by a Hebrew speaker), which was analyzed as SVOV, or [SMALL]$_S$ [TALL]$_O$ [SMALL]$_S$ [FEED-SELF]$_V$ (example produced by a Turkish speaker) which was analyzed as SOSV. Word orders that were verb final and contained four members two of which are identical (SVOV, SOSV, OSOV, OSSV and others, see Appendix E for the non-collapsed list) were collapsed into one set (which we called XXXV). A response that contained signs referring to both a human patient and an inanimate patient was analyzed twice, once for each patient. Thus a production such as: [MAN]$_O$ [WOMAN]$_S$ [SHIRT]$_O$ [GIVE]$_V$ (example produced by an ABSL signer, describing a clip in which a woman is giving a shirt to a man), was analyzed as OSV for the human patient (the man) and as SOV for the inanimate patient (the shirt). The list of all word orders containing both objects appears in Appendix D.[17] Some responses contained two verbal signs/gestures, each preceded by a sign referring to an entity, yet there was no prosodic break in the production. These were analyzed as follows: (a) If the two verbs were identical or semantically related (partial synonyms, as in TAKE – GRAB), the response was

Table 1
Summary of participants in the study according to language groups.

Group	Literacy	Age range	Linguistic and demographic characteristics
ISL signers (n = 31)	Nonliterate (n = 12: 7 F, 5 M)	47 and up	Hardly any schooling, and therefore nonliterate
	Literate (n = 19)	47 and up (n = 11: 6 F, 5 M)	At least 12 years of schooling (with strong oral tradition), literate in Hebrew One hearing participant with a deaf parent
		25–45 (n = 8: 4 F, 4 M)	Early exposure to ISL, 6 native signers, at least 12 years of schooling, (some use of signing in schools), literate in Hebrew One hard of hearing participant
ABSL signers (n = 26)	Nonliterate (n = 5: 3 F, 2 M)	40–50	Monolingual in ABSL
	Literate (n = 9: 8 F, 1 M)	17–27	All have had at least 10 years of schooling (5 in Hebrew, 4 in Arabic) Exposed to ISL signs and can easily communicate with ISL signers
	Literate (n = 12: 8 F, 4 M)	5–15	All go to an Arabic speaking school Exposed to ISL signs All have deaf siblings, 5 have a deaf parent One hearing participant with deaf mother and siblings
KQSL signers (n = 6: 4 F, 2 M)	Nonliterate	42–67	3 monolingual in KQSL, 2 know ISL but use KQSL as main means of communication One hearing F who uses KQSL with her close relatives regularly and is literate in Arabic
Hebrew-speaking gesturers (n = 32: 22 F,10 M)	Literate		Native speakers of Hebrew (SVO)
Turkish-speaking gesturers (n = 29: 13 F,16 M)	Literate		Native speakers of Turkish (SOV) 5 are bilinguals (Turkish – Kurdish, also SOV)
Arabic-speaking gesturers (n = 11 M)	Literate		Native speakers of Arabic Bedouin vernacular (SVO) Use Modern Standard Arabic (VSO) as language of literacy Fluent in Hebrew (SVO)

analyzed as one clause, with SVOV word order. (b) If each entity sign denoted the agent of the action, then the production was analyzed as containing two clauses: SV, SV ([GIRL]$_S$ [STAND]$_V$, [MAN]$_S$ [PUSH]$_V$, for a clip showing a man pushing a girl by an ABSL signer).[18] (c) If

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[16] For a detailed description of the linguistic characteristics of deaf signers in Al-Sayyid, see Kisch (2012).

[17] We did not make a distinction between the relative order of the direct and indirect object with respect to each other, for several reasons. First, all word order studies focus on the relative order of S and O, regardless of the nature of O. This was our focus here too. Second, it is not clear whether the distinction between direct and indirect objects should be based on semantic or syntactic criteria. The syntax may differ from one language to another. For example, Kimmelman (2016) argues that the goal argument in Russian Sign Language is the direct object, while the patient argument is the indirect object based on their syntactic behavior in the language. Finally, when we analyzed separately mono- and di-transitive events, we find the same pattern of results (see Section 2.4) and we therefore collapsed the two event-types.

[18] Stative predicates such as STAND can in principle be used predicatively (as the V of the event) or attributively ('the standing girl'). This difference has implications for our coding, since an attribute would be regarded as part of the nominal constituent and would not head its own clause. In the case of the three sign languages in our study, we use prosodic cues such as the size of the sign and whether it was separated by a pause or change in facial expressions from the preceding nominal to determine the status of these predicates (see Kastner et al. (2014) for a detailed description of our methodology). In case of the hearing gesturers, prosodic cues cannot be used since we cannot assume that gestural productions invented on the spot have consistent prosodic structure. In these cases, we analyzed the stative predicate as the V in the clause.

the first verb was predicated of the agent and the second verb denoted a transitive relation taking the second entity as its patient, as in [WOMAN]$_S$ [SIT]$_V$ [BALL]$_O$ [ROLL]$_V$, then the production was analyzed as containing two clauses: SV, (S)OV. (S)OV was then analyzed as SOV. Signs denoting locations, such as SOFA, ROOM, TABLE, were disregarded for word order analysis purposes. Orders that constituted less than 5% of the responses, such as OVS, were classified as 'Other'. In summary, the word orders we identified in the participants' responses were SOV, SVO, OSV, XXXV, and Other, and they were divided according to whether the object referred to a human or inanimate argument.

2.4. Analysis

For each participant, we counted the number of sentences that were of the following types, as explained above: SOV, SVO, OSV, XXXV, and Other. When participants produced more than one response to describe a video clip, we analyzed the word order in the first response. For each participant, we counted the total number of sentences produced with objects referring to inanimate patients, and calculated the proportion of this total produced with each of the five word orders. We repeated the process for sentences produced with objects referring to human patients. At first, the rates of word orders produced to describe monotransitive and ditransitive events (see Appendix A for the characterization of events as mono- or ditransitive) were analyzed separately. However, because we found the same pattern of results for comparisons of interest, as described in the results section, we collapsed the responses across event types. Responses like SV that were missing any one of the three components were excluded from the analysis. These responses constituted the following percent of the total number of first responses in each group (reporting effect sizes with 95% confidence intervals, as we explain below): 41 ± 7% in ISL, 50 ± 7% in ABSL, 43 ± 14% in KQSL, 41 ± 7% in Hebrew speakers, 41 ± 4% in Turkish speakers, and 32 ± 6% in Arabic speakers.[19]

As described above, we tested three groups of deaf signers and three groups of hearing, non-signing gesturers. Because of social and socio-linguistic differences between the communities, the groups are not balanced in size. For example, the number of KQSL signers who are not influenced by ISL is very small, and some possible candidates could not or did not want to participate in the study. In the Bedouin community of Rahat videotaping in general, and of women in particular, is highly disfavored. Such factors make it very difficult to recruit participants from these groups. Accordingly, the numbers of these participants are smaller (very small in the case of Kafr Qasem) and the groups are not balanced in size, as would be the norm for experiments that draw on large populations of eligible participants who are accustomed to experimental elicitations. Small and unequal sample sizes (from 6 participants in KQSL to 32 in Hebrew) make it difficult to use common statistical tests used in many social and behavioral science disciplines. Thus, we draw our inferences based on descriptive statistics and the tendencies observed across the six groups. We report effect sizes of

the differences we find along with 95% confidence intervals, adopting the data analysis and interpretation approach encouraged by Cumming (2012). Where null-hypothesis significance testing is appropriate, we use non-parametric tests, the Wilcoxon Signed-Rank test when doing paired comparisons within groups and the Rank Sum test for comparing two independent samples of different sizes.

3. Results

When examining the entire data set, collapsing language groups and animacy of the Object, the list of the word orders from highest to lowest mean frequencies was as follows: SOV (50 ± 4%), SVO (25 ± 4%), OSV (16 ± 2%), XXXV (10 ± 2%), and Other (2 ± 1%). We describe below the changes in word order preferences due to animacy of the object, the language group, and literacy.

3.1. Decreased preference for SOV order with human versus inanimate Objects

We compared the rate at which SOV order was produced among responses with inanimate versus human objects. As Fig. 1 shows (means with 95% confidence intervals), the use of SOV was lower among all groups when the object is human. Across all the participants, there was on average 33 ± 5% reduction of SOV responses when the object is human. The statistical reduction was captured for each group in one-tailed Wilcoxon Signed-Rank tests (alpha = 0.05, using the W-value for KQSL where n < 10, the Z-value for all other groups): ISL ($Z = -4.6166$, $p < 0.0001$), ABSL ($Z = -3.3715$, $p < 0.001$), KQSL (W = 0, $p < 0.05$), Hebrew speakers ($Z = -4.566$, $p < 0.0001$), Turkish speakers ($Z = -3.86$, $p < 0.0001$), and Arabic speakers ($Z = -1.6893$, $p < 0.05$). These results are consistent with those of previous studies (Meir, Lifshitz et al., 2010; Hall et al., 2013; Gibson et al., 2013; Futrell et al., 2015). Word order is different for the two animacy conditions: for all language groups, participants are more likely to use SOV for clauses with inanimate objects than for clauses with human objects.

Moreover, when examining the individual participants in each group, we find the same tendency of SOV preference when the object is inanimate vs. human. When the object is inanimate SOV order was the highest produced order, or tied as the highest produced order, for the majority of participants in all six groups: 74% of ISL signers, 65% of ABSL signers, 100% of KQSL signers, 84% of Hebrew speakers, 64% of Arabic speakers, and 100% of Turkish speakers. In contrast when the object is human, only in two groups was SOV the highest produced order for the majority of participants, 67% of KQSL signers and 79% of Turkish speakers. In the other groups, the rates were 19% of ISL signers, 42% of ABSL signers, 16% of Hebrew speakers, and 45% of Arabic speakers. This comparison suggests that SOV preferences are more consistent within participants in each of the groups when the object is inanimate but become more variable when the object is human.

3.2. Increased variability of word-order with human versus inanimate objects

We examined the mean rates of all five word orders and their relative rankings for inanimate and human objects. The visualization of these comparisons is shown in Fig. 2 (see also Appendix C for a complete table of values). The two graphs demonstrate that word order preferences are more consistent across the groups when the object is inanimate and more varied when the object is human. As shown in Fig. 2A, when the object is inanimate, the mean percentages of SOV responses were highest for all six groups,

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[19] The high percentage of excluded responses can be attributed to several factors. First, in the manual modality, the handshape of the verb often contains information about the O arguments, especially inanimate patients. For example, the sign THROW-BALL indicates by its handshape that the thrown object is a ball, and therefore signers often do not explicitly mention the ball as an independent sign. This results in an SV production, that does not shed light on the relative order of the S and O arguments. Secondly, many participants expressed a transitive event as two intransitive events, as in the example GIRL STAND, MAN PUSH described above. Such responses yield two SV clauses, again excluded here as they do not inform us about the relative order of the S and O constituents in a clause. Finally, sometimes signers do not explicitly mention an argument because they do not find a strong communicative reason for mentioning it. This is quite typical of the nonliterate signers in our data set.
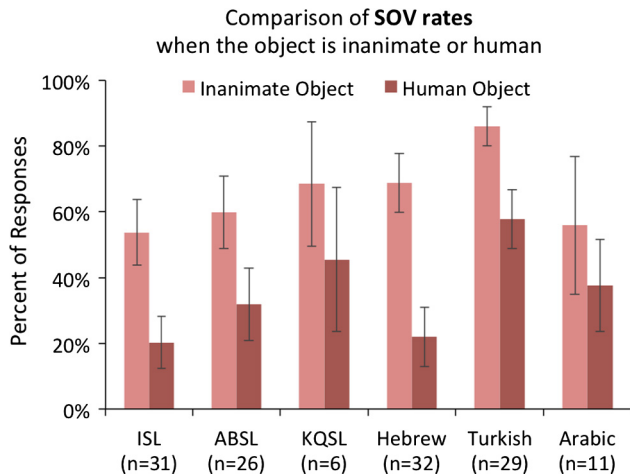
Fig. 1. Graph shows the mean percent of signed or gestured sentences that were produced with SOV order, with 95% confidence intervals. The use of SOV was lower among all groups when the object is human.

Fig. 2. The graph shows the mean percent of signed and gestured sentences by word order and by group. The groups show similar preferences in word order for sentences with inanimate objects (A) but more varied preferences for those with human objects (B).

and it was greater than 50% for all groups. But when the object is human, the pattern is different, as shown in Fig. 2B. First, SOV rates decrease for all groups (as pointed out in the previous section, Fig. 1). Second, the groups do not all prefer the same order: KQSL signers (46 ± 22% of responses), Turkish speakers (58 ± 9% of responses), and Arabic speakers (38 ± 14% of responses) prefer the SOV order, but ISL signers (37 ± 12% of responses) and Hebrew speakers (66 ± 13% of responses) prefer SVO order and ABSL signers (33 ± 10% of responses) prefer OSV order. In other words, we observe higher variability in word order preferences across groups. Third, the rates of the highest produced word order are lower when the object is human. Only in two groups (Hebrew speakers and Turkish speakers) was the rate higher than 50% for highest preferred word order. These lower rates reflect higher variability in word order preferences within groups.

3.3. Increased use of OSV order with human versus inanimate objects and the effect of literacy

When examining the data shown in Fig. 2B, we observed an increased use of OSV order with human objects for all groups. We also noted that the rates were higher for users of village sign languages (KQSL with mean rate of 28 ± 20% of responses, ABSL 33 ± 10%) than other groups (ISL 17 ± 9%, Turkish 22 ± 7%, Arabic 19 ± 12%, Hebrew 8 ± 6%). We now focus our analysis on the three signing groups. Although the KQSL signers who participated in this study are nonliterate (with the exception of the hearing participant, who is literate in Arabic and was not taken into consideration in the following comparison), ABSL and ISL signers comprise subgroups of literate and nonliterate signers. Literacy can be used as an indicator of bilingualism, and thus could reflect the impact of the spoken language (specifically, Hebrew and Arabic) on word-order preferences when signing.

Similar to Fig. 2, we present data on the mean percent of sentences by word order in Fig. 3, focusing on the five subgroups of signers. Fig. 3A shows that the general preference of SOV in clauses with inanimate objects holds in all five subgroups, though it is weaker in the groups of literate signers. When the object is human, the three nonliterate subgroups show a different preference from the literate signers: OSV becomes very common. It is the highest preferred order for nonliterate ABSL signers (56%) and almost as high as SOV for KQSL and nonliterate ISL signers (both 32%). Note that in those three groups, SOV and OSV account for more than 75% of all responses. With inanimate objects, there was no differ-
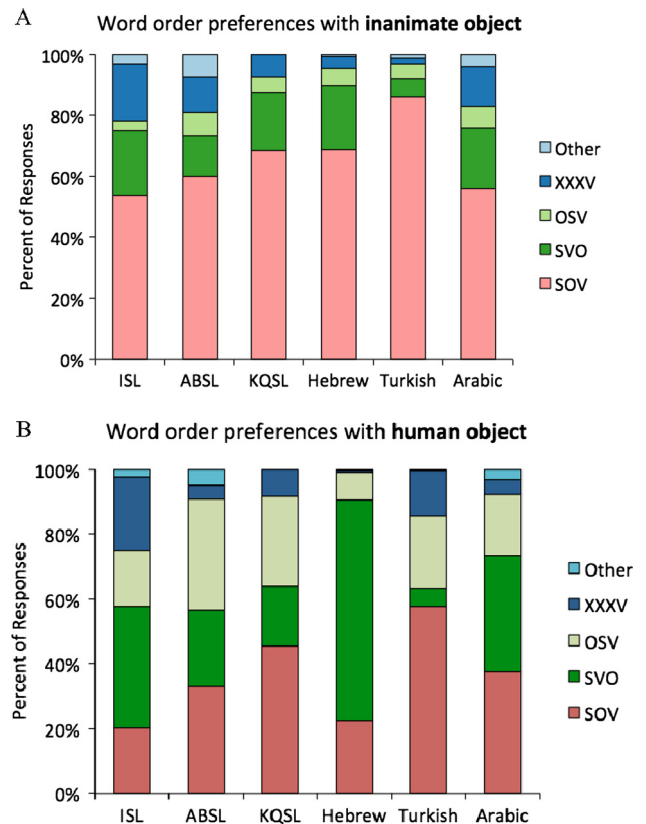
ence in the rate of OSV order between literate and nonliterate signers (one-tailed Wilcoxon Rank Sum test, Z = −0.10, p = 0.46). With human objects, however, there was a significant difference in the rate of OSV order among the two types of signers (Z = −2.71, p = 0.003). These comparisons are shown in Fig. 4. Notice also that the two literate groups show very different word order patterns with human objects: ABSL signers use SOV, SVO and OSV to a very similar degree (29%, 28% and 27% respectively), while ISL signers use SVO for more than half of their responses and XXXV is the second highly used order. SOV and OSV are hardly used at all in this group, in marked contrast to the nonliterate ISL signers.

4. Discussion

4.1. Explaining the humanness effect: a salience-driven account

In all groups, humanness of the object argument has an effect on clause type: the distribution of word orders used for clauses with an inanimate object differs significantly from the distribution of word orders for clauses with a human object. Moreover, while all groups showed similar use of word order in clauses with an inanimate object (the dominant order was SOV), the groups differ from each other regarding clauses depicting two human entities; there was no one specific word order that was dominant across all groups, and for some groups even within the group. The only generalization that can be made is that for all groups (with the exception of the Hebrew speakers) word order is more varied in signed or gestured clauses with a human object than in clauses with an inanimate object. What is the importance of these findings and how can they be explained?
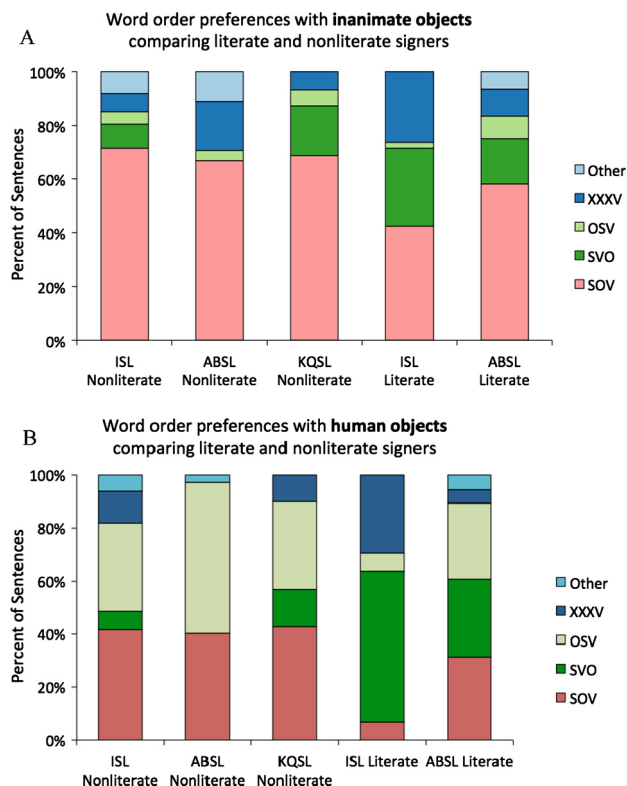
A

Word order preferences with inanimate objects
comparing literate and nonliterate signers

B

Word order preferences with human objects
comparing literate and nonliterate signers

Fig. 3. The graphs show the mean percent of sentences by word order for two literate groups and three nonliterate groups of signers.

Comparison of OSV order
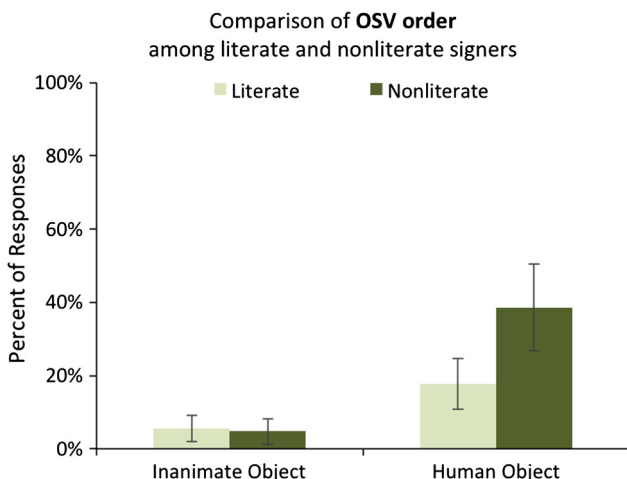among literate and nonliterate signers

Fig. 4. The graph shows the mean percent of sentences (with 95% confidence intervals) with OSV word order with human and inanimate objects, by groups of nonliterate and literate signers. Although there was no difference between the groups for events with inanimate objects, there was a significant difference for events with human objects.

The fact that word order in clauses with a human object is much more varied than in clauses with an inanimate object is quite puzzling in light of the kinds of accounts that have been provided in the past. In clauses with an inanimate object, the message can be understood based on the semantics and world knowledge alone; there is no need to devise a mechanism to encode arguments' roles. If what drives the use of a specific word order is ease of comprehension, we should not expect to find consistent word order use in clauses with an inanimate object,

since it is usually the case that a human entity acts on an inanimate entity and not vice versa. In clauses with a human object, in contrast, there is an acute need to mark the semantic/syntactic roles of the participants. Semantics or world knowledge cannot help determine in advance who is doing what to whom, since both arguments are equally eligible to play either role. If the participants in this study were using word order to mark arguments' roles, as all previous accounts have suggested, we would expect to see precisely the reverse of what we have found: varied word order in clauses with an inanimate object and consistent word order in clauses with a human object.

One possible explanation for this puzzling state of affairs, suggested by Meir, Lifshitz et al. (2010) and Gibson et al. (2013), is that clauses with a human object are more demanding because they are potentially ambiguous. Since the two arguments have similar semantic characteristics, putting them in adjacent positions (as in SOV, where both occur on the same side of the verb) might lead to confusion (Gibson et al., 2013), because the position of the argument with respect to the verb does not uniquely identify it as an agent or patient. However, as Hall et al. (2013) point out, such an explanation takes the point of view of the addressee, not the producer, because the producer knows which event s/he intends to communicate. For the producer, the event is unambiguous. An explanation in terms of cognitive load because of ambiguity assumes that the producer has in mind the possible ambiguity of these clauses *for the addressee*, and adjusts his/her behavior respectively.

Yet if the goal were reducing the cognitive load of the addressee, the most straightforward strategy would be to use a consistent word order in clauses describing two human entities, which is not what we find in our results. Furthermore, as Hall et al. point out, an explanation in terms of confusability fails to account for the word order patterns found in their results. Participants do not avoid all word orders that have both S and O on the same side of V. Though SOV is less common in clauses with a human object, other orders in which both arguments are on the same side of V, such as OSV and SOSV, are more widespread than in clauses with an inanimate object. Our results are similar to those of Hall et al., and lead us to agree with them that an account in terms of confusability cannot explain them.

Before trying to suggest an alternative explanation, let us turn to the first point of similarity among all the groups in the study, the prevalence of SOV order in clauses with inanimate objects. Recall that Goldin-Meadow et al. (2008) suggest that the reason for the dominance of the SOV order is cognitive, not communicative. They hypothesize that SOV is cognitively more basic (the "natural order of events"). Their explanation is that elements that are cognitively more salient precede those that are less salient. Arguments/entities are cognitively more salient than actions/relations, hence actions occur last; and objects (patients) are more tightly related to the actions, therefore appearing close to the V, leaving the subject (agent) to the initial position.

Schouwstra (2012, Schouwstra & de Swart, 2014) suggests that SOV is the basic order only for specific types of events, extensional events, where the patient argument exists independently of the event. Intensional events, in which the patient argument is possibly non-specific or non-existent, yield a different dominant order, SVO in elicited pantomime tasks. She suggests that both orders may derive from more fundamental cognitive principles, for example that information that is cognitively more basic precedes more complex and abstract information. Christensen et al. (2016) account for the difference between the two types of events in terms of structural iconicity, namely that word order reflects the temporal relations between the action and the patient argument. Such principles and explanations are not incompatible with

Jackendoff's (2002) two principles of Agent-first and Focus-last, characteristic of the Basic Variety utterances.

None of these explanations account for our findings. All the events in our elicitation material are extensional, not intensional. Therefore the affinity between the object argument and the verb should hold irrespective of whether the argument is human or inanimate. If the humanness of the object results in a clear difference in word order (as claimed by Meir, Lifshitz et al., 2010; Meir, Sandler et al., 2010; Gibson et al., 2013), we might expect to find one dominant order in clauses with an inanimate object, and another dominant order in clauses with a human object. But what we find is not different orders for the two conditions, but rather different types of patterns: dominant order when the object is inanimate, and no clear-cut dominant order when the object is human (for most groups). The challenge is to explain this differential patterning.

We also need to take into account a possible confounding factor, namely the influence of a second linguistic system on the word order used by some participants. This is especially likely with the hearing gesturers, all of whom are speakers of their mother tongue. Although all the studies mentioned above that involved elicited pantomime did not find an effect of the mother tongue on gesture order, our results show that such influence should not be ruled out altogether. In clauses with a human object, language group has an effect. The responses of the Turkish speakers, for example, showed much more prevalent use of the SOV order (the dominant word order in Turkish) than any of the other groups. Hebrew speakers showed extensive use of SVO (the dominant word order in Hebrew) in their responses to clauses with human objects.[20] Deaf signers may also be influenced by the word order of the spoken language used in their community if they are exposed to that language in school, as we will argue below.

Fortunately, our study is unique in involving three groups who have had minimal influence from another linguistic system. These are the signers of KQSL, the older group of ABSL signers, and the nonliterate older signers of ISL. What the signers of all three groups have in common is that they are monolingual in their sign language, they did not attend school on a regular basis and so were not exposed routinely to a spoken language, and the sign language they use was in its first or second generation when they were in their childhood. Their signing represents the clearest case of the initial stages of a language that it is possible to find, with the least interference from other languages.[21]

Upon examination of the productions of these three groups, an interesting similarity surfaces: in clauses with human objects, but not in clauses with inanimate objects, a common word order

alongside SOV is OSV. This is particularly intriguing. OSV is the rarest dominant word order among languages of the world, rarer than the other two orders in which O precedes S: in the WALS sample of 1377 languages, 25 are VOS, 11 are OVS, and only 4 are OSV. It also constitutes a counterexample to the explanation of Goldin-Meadow et al. and Langus and Nespor, that SOV is cognitively more basic. It is consistent with Hall et al.'s production-based explanation. Yet Hall et al.'s role-conflict account cannot explain why SOV is still not uncommon in clauses with human objects as well, because it predicts that O and V will rarely appear next to one another.[22] We have found that both SOV and OSV are common in clauses with human objects in these groups, something that none of the suggested explanations can account for.

Why is OSV common in these three groups when O is human but not when O is inanimate? We propose an explanation along entirely different lines from any of the previous accounts: what drives the choice of a particular order is not the need to distinguish the semantic/syntactic roles of the participants at all. Rather, the following rule is at play[23]:

(a) **Human first:** Human entities are introduced before inanimate entities

The 'human first' rule suggests that the order of introduction of the arguments when producing a transitive clause is determined simply by whether they are human or inanimate, irrespective of their semantic/syntactic role. This rule is new to the discussion of word order in novel communication systems, but it is not at all new to the extensive literature on sentence production. It has been pointed out that human entities in an event are conceptually more accessible than non-human entities. Conceptual accessibility refers to the ease of retrieval of a referent from memory. According to Bock and Warren (1985), for example, more accessible material is more easily retrieved from memory, and is therefore expected to be associated with early word order positions in clause production. Animacy/humanness is one of the features that have been found to contribute to conceptual accessibility, presumably because of the centrality of conspecifics to human communication (as is argued e.g. by Dahl, 2008).[24] In their paper on the order of conjuncts in conjunction phrases, Cooper and Ross (1975) suggest the 'Me first' principle, namely, that conjuncts denoting properties that are most closely linked to the prototypical speaker occur first. Other studies (e.g. McDonald, Bock, & Kelly, 1993; Tanaka, Branigan, McLean, & Pickering, 2011) bring corroborative evidence for the tendency to produce human constituents before inanimate ones. We suggest then, that word order is determined by the relative salience of the referents; humans are more salient than inanimates, and are therefore more likely to occupy early sentence positions. This salience is not merely linguistic. Gelman and Spelke (1981) demonstrated that very young children can distinguish between animate and inanimate objects. Underlying this ability is what biologists call 'species recognition' or 'species isolation' (Mayr, 1963). The salience of humans to each other, which lies behind the 'human first' rule, is thus driven by much deeper forces than language or cognition.[25]

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[20] The results of some of the other studies mentioned above seem to suggest the possibility of some influence of the participants' mother tongue on their productions. For example, Futrell et al. (2015) notice that verb-initial responses were present only in the responses of Irish and Tagalog speakers (both VSO languages) and never in the responses of English and Russian speakers (both SVO languages). Hall et al. (2014) found similar tendencies for increased use of SOV in certain conditions and SVO in other conditions in both Turkish and English speakers, but the actual percentage of SOV is much higher for Turkish speakers in all conditions, and SVO is much more wide-spread in responses of English speakers (see Figs. 1 and 2 in their paper).

[21] It might be claimed that, since the communities that use these sign languages include many hearing members, who are native users of a spoken language, their language influences the structure of the emergent sign language. While this is a valid suggestion, our results indicate the contrary: the signed productions of older users of these languages are the least influenced by the surrounding spoken language structure, and we find no clear indications of interference from the spoken language in their signing. Furthermore, the results of the laboratory studies that we mentioned in this paper indicate that, when hearing people use gesture to communicate, their productions do not mirror the structure of their language in the inanimate object condition. Therefore we think that the assumption we make is valid, namely, that the signing of the older members of the three sign languages actually represents a language in its infancy, with as little interference from another linguistic system as one might get.

[22] Hall et al.'s (2013) results are different from ours. We found SOV to be quite common in clauses with a human object, though it is not the most prevalent order in these clauses. In Hall et al.'s results, SOV are much rarer in clauses with a human object. We have no explanation for this difference.

[23] We use the term 'rule' here to emphasize the superficial nature of the observation, though we believe that its etiology is much more fundamental.

[24] For a survey of other properties linked to conceptual accessibility, see Jaeger and Norcliffe (2009) and references cited there.

[25] Dahl (2008) argues that our ability to recognize conspecifics as individuals serves as an organizing principle for grammar and discourse, on which animate and inanimate reference is built on.

The precedence of humans over inanimates in terms of their salience is reminiscent of the animacy hierarchy, first formalized by Silverstein (1976). The hierarchy involves several dimensions: person distinctions, pronouns vs. nouns, and animacy distinctions in nouns. The hierarchy is intended to capture the involvement of different types of pronouns and nouns in various grammatical processes and constructions. We refer here only to one dimension, animacy, and only to two points on this hierarchy – humans vs. inanimates. We do not refer here to animate non-humans as our elicitation materials did not include events with such referents.[26] We leave it to future research to see whether such referents support our predictions.

Regarding word order, there is a large literature on the effect of the animacy hierarchy on word order and none of it contradicts one central finding: that people tend to come first in linear order, with concommitant syntactic effects. In English, for example, the marked passive construction *John was bitten by the dog* is "better" than *The dog bit John* in most contexts because *John* is higher on the animacy hierarchy than *the dog*, while *Louis bit John* is fine, because both John and Louis refer to people. Some languages have grammaticalized this principle. Cooper and Ross (1975, 96) point out that in Navajo, the first NP in a clause must be higher in animacy than the second. In Turkana, the basic word order is VSO, but VOS is used under various conditions, one of which is when the object is animate and the subject inanimate (Dimmendaal, 1985). In Tojolabal, a Mayan language, there is an interesting interaction between word order and the relative animacy of the arguments in a clause (Brody, 1984). See Jaeger and Norcliffe (2009) for a survey of studies showing that animacy affects word order irrespective of the grammatical roles assumed by the referents.

Word order in sentence production has also been linked to grammatical roles such as subject and object (e.g. Bock, Loebell, & Morey, 1992) and thematic roles such as semantic agent and semantic patient (Byrne & Davidson, 1985): there is a general tendency for subjects to precede objects and for semantic agents to precede semantic patients. Since there is a strong affinity between humanness, agenthood and subjecthood (see e.g. Primus (2012), who argues that agentivity properties entail or strongly correlate with animacy, and that animacy is often interpreted as a cue for agentivity), the question arises as to which properties (syntactic or semantic roles or humanness) actually determine word order. Tanaka et al. (2011) found that, in Japanese sentence production, participants were more likely to produce animate entities (which, in the examples they provide, are also human) before inanimate entities, irrespective of their grammatical roles. They also found that participants were more likely to assign the subject role to animate than to inanimate entities. They conclude that conceptual accessibility (as manifested by the humanness or inanimacy of the referent) is involved in both the order of sentence constituents and grammatical role assignment.

Our results point clearly in one direction: word order in novel communication systems and new languages is determined by the conceptual accessibility of the referents. Human/animate referents are more accessible than inanimates (as suggested by the experimental evidence mentioned above). This observation can capture both the prevalence of SOV order in clauses with inanimate objects and the fact that both SOV and OSV are common in clauses with human objects in the three groups of participants with least exposure from another linguistic system. In events with inanimate objects, one entity in the action is human, the other inanimate. Typically (and across the board in our elicitation materials as well as in those used by all others studies mentioned here), the human

participant is acting on the inanimate object, hence the human participant is associated with the subject role and the inanimate object with the object role. According to our main claim, the human entity is introduced first, regardless of the roles of the two entities, simply because this entity is human. Since this entity is the agent/subject in such clauses, the resulting order can indeed be described in terms of semantic/syntactic roles as SOV. However, we claim that this description, though accurate, is beside the point. The order is in fact Human-Inanimate-Action, because humans come first, all else being equal. The apparent SOV order is an artifact of the fact that, in events in the world that involve a human and an inanimate entity, the normal case is that the human entity acts on the inanimate entity.

In clauses with a human object, both entities are human; therefore, each of them qualifies to be introduced first. Having another human being as a potential first-argument automatically reduces the probability of SOV from ~100% to ~50%.[27] And indeed this is what we find: if the agent human entity is introduced first, the resulting order is SOV. If the patient human entity is introduced first, then the order is OSV. That is, in clauses with human objects both orders are equally expected, because they both satisfy the human effect principle. In both cases, the order is Human-Human-Action.

If this explanation is on the right track, the use of word order to encode semantic/syntactic relations may not be a basic strategy in human languages but rather a derived one, and SOV is no more basic conceptually than other orders, though it may be historically prior. The basic conceptual strategy is to introduce human entities in an event before inanimate entities in the same event because of the salience of human entities to human communication (the 'Me first' principle). SOV results from the association between the humanness or inanimacy of an entity and the semantic/syntactic roles it is likely to perform, depending on whether it is human or inanimate.

Three caveats are in order here, though. First, the human effect principle addresses only the relative order of signs denoting entities (the apparent S and O). It does not say anything about the position of the verb in the clause. Accounts of the prevalence of SOV suggest that verbs are more likely to occupy final position because of a separate tendency to introduce entities before the relation. Goldin-Meadow et al. (2008) propose that entities are more salient than relations and therefore are introduced first. In a similar vein, Gentner and Boroditsky (2001) suggest that relational terms, such as verbs and prepositions, require the presence of the entities they link, which are expressed by nouns. Such accounts would then need to explain word orders in which the verb is not in final position, such as SVO and VSO. Other forces, such as the distinction between extensional and intensional events (Schouwstra & de Swart, 2014) may come into play here. Our analysis does not make any direct claims about the relative position of the verb, and we rely on the accounts in the works mentioned above regarding this issue.

Notice, however, that the observations referred to above, and our suggestion regarding the 'Human first' effect, are in fact linked, and can be regarded as different manifestations of a broad principle, namely that word order is largely determined by conceptual accessibility. The relative order of humans vs. inanimates, entities vs. relational terms and objects of extensional vs. intensional is determined by the difference in conceptual accessibility of the elements involved.[28]

The second caveat is that, in order to fully demonstrate that it is humanness rather than agency that drives word order in these

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[26] This holds of most of the other studies mentioned here, which looked only at humans vs. inanimates, though many refer to an animacy (rather than humanness) distinction.

[27] We thank Matt Hall for this point.

[28] We thank an anonymous reviewer for this point.

systems, we should look at events with inanimate agents (or forces) and human patients. Such events were not included in the present study. We leave further investigation of this issue for future research.

Third, the 'human first' rule does not address the omission of explicit mention of arguments which we find in responses in our data set (see Footnote 19 above). Sometimes signers mention only one of the arguments (e.g. BALL ROLL for a clip showing a woman rolling a ball, or FEMALE DRAG for a girl dragging a shopping cart). It seems that information structure considerations (what the participant views as new or important information, or which argument is represented by the handshape of the verb and hence need not be mentioned overtly) may play a role in explaining which arguments are mentioned and which are not. The interaction of information structure constraints and the accessibility of the arguments is beyond the scope of this study.

A number of questions remain: (1) What is the source of the SVO order found in many of the responses? (2) How does word order become a grammatical means for encoding grammatical roles in the world's languages? (3) Why is OSV so rare in languages of the world if it is not an uncommon order in young or novel communication systems? We address these points below.

4.2. Explaining the SVO responses

The SVO order appeared in the responses of participants from several groups, most noticeably Hebrew speaking gesturers and older literate ISL signers, and to a lesser degree in the groups of Arabic speakers and young ABSL signers. We suggest that in most cases in our data this order may be attributed to interference from another language. This is likely for the Hebrew speakers, whose language is quite regularly SVO. They used SVO in 67% of their responses to events with a human patient. Interference from Hebrew can also explain the prevalence of SVO in the responses of the literate older ISL signers (73% of the responses to events with human patients and 49% of the responses to clauses with inanimate patients). Signers from this group had a very strong oral education, with emphasis on learning the spoken language and suppressing the use of sign language. These signers often mouth their sentences in Hebrew and accompany their mouthing with signs. With such strong emphasis on Hebrew, it is not surprising that SVO appeared to be the dominant order in their responses.

Young ISL signers are bilingual in ISL and Hebrew. When they went to school, the strong oral tradition of the earlier days had waned somewhat, and signing in school became legitimate. The teachers often used a communication system called Signed Hebrew, in which the speaker speaks Hebrew and accompanies the spoken language with signs from ISL. In this system, the word order is that of the spoken language, Hebrew. The students are exposed to signed clauses that follow the Hebrew word order, SVO. However, this age group also includes native signers, who were exposed to ISL from birth at home. Moreover, ISL began to be acknowledged as a language when the members of this group were growing up. Therefore young ISL signers, although exposed to Hebrew and to Signed Hebrew, seem to be able to draw a distinction between ISL and Hebrew much more than the literate signers of the older age group. We still see prevalent use of SVO in depictions of events with human patients, but not in depictions of events with inanimate patients. Furthermore, in this group another word order is quite widespread in our data, SVOV (which is one of the word orders coded as XXXV here), in which the same verb occurs twice, occurring in 30% of their responses. Though we do not have a definitive explanation for the emergence of this order, we suspect that it might be a compromise

or combination between the SVO order of Hebrew, and the verb-final tendency of ISL. This word order is attested in other established sign languages, e.g. ASL, (Fischer & Janis, 1990; Matsuoka, 1999).[29]

Four of the young adult ABSL signers were also exposed to Hebrew and to Signed Hebrew in the educational system,[30] and accordingly had extensive exposure to SVO. The other four members of this group attended deaf classes in an Arab school. Though the basic word order of the spoken dialect is SVO, Standard Arabic, used for reading and writing, is VSO. Because of this complicated linguistic situation, it may be that these children were exposed to a less consistent word order in the spoken language, and exhibit less interference from it, thus explaining our findings that in this group SOV, SVO and OSV were used almost equally in reversible clauses.[31]

Further support for the suggestion that SVO in our data is the result of interference from another linguistic system comes from the scarcity of this word order in the responses of Turkish gesturers, who used it only in 5% of their responses to both types of clauses, that is with both human and inanimate objects. Turkish is an SOV language, but all other orders are attested in Turkish as well. Word order in Turkish encodes pragmatic or discourse factors such as topichood, new information and backgrounded information (Kornfilt, 1994)[32] or marks the entity that is the center of attention in the hearer's mind (Hoffman, 1997). Although OSV, SVO, and OVS are found in natural productions, the two verb-medial orders, SVO and OVS are usually used to background the postverbal argument. Since our task elicited clauses in isolation, it might be that there was not enough context to motivate backgrounding of constituents, and therefore SVO was less likely to be used in the responses of Turkish gesturers. If the use of SVO order in the responses was driven by general factors that are cognitive or communicative in nature and not language specific, we would not expect Turkish gesturers to differ from Hebrew and Arabic gesturers on precisely this measure.

Examining the entire set of data, we find that the groups with the least use of SVO in their responses did not have extensive exposure to an SVO language: Turkish gesturers and the three groups of older signers: KQSL, ABSL older adults and ISL older nonliterate signers. These findings support our claim that SVO order in our study may be attributed mainly to interference. Yet one question still remains regarding the use of SVO, namely, why is it used much more in clauses with human objects than in clauses with inanimate objects? In Hebrew and spoken Arabic, SVO is the basic order regardless of the animacy properties of the object. If interference from Hebrew or Arabic is the main reason for the SVO responses in our study, it should have affected both types of clauses equally, yet this is not what we find. Even in the group that used SVO the most, the older literate ISL signers, SVO was stronger in clauses with a human object (73%) than in clauses with an inanimate object (49%).

There are two possible ways to explain this state of affairs. One is rooted in the fact that the signer/gesturer does not have one straightforward order in which to introduce the arguments in clauses with a human object, since both arguments are

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[29] In the ASL literature, this order is often referred to as 'verb sandwich', and in many cases, the second verb contains more inflectional material (aspectual inflection or a classifier morpheme) than the first verb. This was attested in our data as well, but a full analysis of the construction has not been carried out yet.

[30] Until 1992, deaf Arab children in the southern region of Israel went to a school for deaf children in Beer-Sheva, where the language of instruction was Hebrew, accompanied by signs from ISL (Kisch, 2012).

[31] We have no direct observational basis for this conjecture.

[32] According to Kornfilt (1994, 171), "Topicalized constituents are sentence initial; back-grounded constituents are postverbal; new information or focused constituents are in immediately preverbal position."

human. The lack of a straightforward strategy leads some signers/gesturers to rely on well-established strategies they use in another communication system, namely their mother tongue or the spoken language they have been educated in. Conversely, it is possible that in clauses with an inanimate object the order of introducing the arguments is clear-cut; the tendency to introduce a human argument before an inanimate argument is so entrenched that it overcomes interference from other languages. The strong tendency to use SOV order in clauses with inanimate objects leads to the scarcity of SVO responses in these clauses. And the lack of a clear ordering strategy in clauses with a human object allows the participant to fall back on other communicative systems, which, if characterized by SVO order (as is the case of the Hebrew and Arabic speakers, but not the Turkish speakers), leads to increased use of this particular order. These two explanations are not mutually exclusive. On the contrary; they may both be at play, resulting in the distribution of SVO vs. SOV that we find in our results.

Though we think that language interference can explain the use of SVO order in our data, it may very well be that other factors promote the use of SVO in the earlier stages of emerging linguistic systems. For example, SVO may be easier for comprehension (as suggested by Langus and Nespor (2010) for spoken linguistic input and by Hall, Danbi Ahn, Mayberry, and Ferreira (2015) and Hall et al. (2011) for gestured input), especially when a language does not have other means, such as case marking, to distinguish between subjects and objects (Hall et al., 2013). Communication pressures may also play a role here, such as immediate feedback and spontaneous negotiation of structure between interlocutors (Christensen et al., 2016) or whether or not the interlocutors have a shared and constant vocabulary (Hall et al., 2014; Marno et al., 2015). SVO might be more resilient to noise, as suggested by the noisy channel model of word order variation (Gibson et al., 2013; Futrell et al., 2015). Another line of explanation is that SVO is a preferred order for describing specific types of event, such as intensional events (Schouwstra, 2012; Schouwstra & de Swart, 2014; Christensen et al., 2016). In such cases, the use of SVO can be attributed to two general principles: human entities are introduced first, and more complex information (the intensional object) occurs last. Role conflict, as suggested by Hall et al. (2013) may also favor SVO to SOV in gestural communication systems when both referents are human. The principle of 'Agent first', suggested e.g. by Klein and Perdue (1997) and Jackendoff (2002) may also play a role, explaining why SVO is favored over OSV or OVS. Taken together, these explanations may suggest that various principles and forces influence word order in early stages of a linguistic system, prior to the emergence of a grammatical word order.

4.3. The grammaticization of word order: a frequency effect

We return now to the second question raised above: how did word order become a grammatical means for encoding grammatical roles in the world's languages? Our main claim is that word order in novel communication systems and in the earliest stages of the emergence of a language is driven by non-grammatical features of the entities involved in the event to be communicated (e.g. whether or not they are human, as we argued above) and is not a device to encode semantic/syntactic roles. Yet in many languages of the world word order is a primary means for encoding grammatical roles. How does the transition from a non-grammatical system to a grammatical system occur?

This transition may be driven by the frequency of association between properties of the entities and the semantic/syntactic role they assume. In general, the most prototypical transitive

event is one where a human agent acts on a non-human patient. For example, Dahl (2000) found that in spoken Swedish discourse 93% of the transitive subjects were human and 89% of the direct objects were inanimate. Similarly, in a corpus of conversational Hebrew containing 446 verb tokens, Polak-Yitzhaki (manuscript in preparation) found 142 clauses containing both a subject and an object. Of these, in 132 clauses (97%) the subject was human, while the object was human in only 21 clauses (15%). In 5 clauses the object was animate but not human, and in 116 clauses (82%) the object was inanimate. 18 clauses were di-transitive, containing a [human] indirect object and an [inanimate] direct object.

In clauses depicting events where a human agent acts on an inanimate patient, there is a very strong association between the [+/− human] properties of the entities and the semantic/syntactic roles they assume: almost always, the human entity is the agent and the inanimate the patient. The particular order of signs is determined by their denotative properties ('human first'). But since these properties are closely related to their semantic/syntactic roles, an association is formed between word order and semantic/syntactic roles. This strong association may eventually lead to a reinterpretation of the word order pattern from salience-driven to grammar-driven: the order Human-Inanimate-Action is reinterpreted as Agent-Patient-Action or its syntactic instantiation, SOV.

The scenario presented here explains how word order may have developed into a grammatical mechanism for encoding arguments and their roles. Furthermore, it attributes the emergence and prevalence of SOV in human languages to the frequency of transitive events involving a human agent and an inanimate patient.[33] This explanation is compatible with the claims made by e.g. Givón (1979), Newmeyer (2000) and Gell-Mann and Ruhlen (2011), namely that SOV was the word order of the hypothetical ancestral human language.[34] It is also compatible with the very strong tendency observed in the word orders found in languages of the world for subjects to precede objects. And it ties in with the third question we raised, namely why OSV is a vanishingly rare word order in languages of the world.

4.4. Explaining the scarcity of OSV

OSV order appears in our data mainly in clauses with two human arguments. In such clauses both arguments can equally occur in clause-initial-position, and therefore there is an equal chance that the non-agent argument will occur first, resulting in an OSV order. However, such clauses are not at all common in actual discourse (as the data from spoken Swedish and Hebrew corpora mentioned earlier suggest), and therefore the association of the non-agentive argument with the clause initial position is weak. OSV order, then, is not likely to emerge as the dominant word order in young languages because it does not occur frequently enough to form a consistent recurring pattern in the language.

Notice that this line of argumentation explains only why OSV is not a frequent word order in early stages of the development of a language. It does not explain the actual distribution of word orders among languages of the world today, with respect to any of the word orders. For instance, it does not explain the historical shift from SOV to SVO in many languages. It might very well be that

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[33] For frequency effects in grammatical structures, see Bybee and Hopper (2001), Haspelmath (2008), Hudson Kam and Newport (2005, 2009).

[34] This is in line with our findings on ABSL (Sandler et al., 2005), that SOV is the predominant order in the signing of second-generation ABSL signers, which instigated much of the subsequent research. However, our interpretation of these results now differs from what we suggested there.

such a shift resulted from different kinds of factors simultaneously at play, such as intensionality, role conflict, confusability and the role of comprehension and communicational pressures, as we pointed out above. Also, as languages persist, they develop grammatical elements, such as function words and case and agreement morphemes. Such elements serve inter alia to mark grammatical relations, and they may interact with word order in interesting ways. It is also possible that once word order becomes a grammatical device, the strong association between human-agent-subject on the one hand and inanimate-patient-object on the other leads to preference of word orders in which S precedes O.[35] Notice, however, that OSV is quite common as a **marked** word order in many languages (via topicalization, for example). That is, the placement of the inanimate-patient-object argument before the human-agent-subject argument, a marked choice of order, is used to encode clauses as marked, another incidence of the effect of structural iconicity.[36] However, it is important to stress that OSV can become a marked word order in a language only after a language has acquired **a basic grammatical word order**. In our data set, OSV is not a marked order yet, as these communication systems have not as yet developed a basic grammatical word order. Rather, the word orders that we found are side effects of more basic cognitive principles, such as 'human first'.

5. Conclusions

Results from production tasks in both novel gestural systems (elicited pantomime) and young sign languages present us with a puzzle: in clauses with both a human subject and a human object, word order is more varied than in clauses with an inanimate object. This is puzzling because clauses with a human subject and a human object are potentially ambiguous, and require a special mechanism for signaling and differentiating the subject from the object. If word order is such a mechanism, we would expect to find consistent word order when ambiguity is likely to occur. Yet we find the reverse: more consistent word order is found when the referents differ in humanness and the message is therefore unambiguous. We take these puzzling results as an indication that an account in terms of grammatical roles is not satisfactory. Based on the productions of three groups of signers with the least interference from another linguistic system, we argue that the main factor at work here is the conceptual salience of the participants: salient entities are introduced before less salient entities. As explained in Section 4.1, the humanness of an entity is directly related to its salience: entities that are more similar to the human addresser are more salient. Therefore, human entities are much more likely to be introduced into the discourse before inanimate entities than vice versa. This account explains both the overwhelming prevalence of SOV order in clauses with an inanimate object and the variation in word order found in clauses with a human subject and a human object.

Our study corroborates other studies showing that animacy (more specifically humanness) is an important factor in determining word order in sentence production. It adds to other studies of the evolutionary dimension, as it examines sentence production in novel communication systems and young sign languages. Our account has an advantage over previous ones in that we do not assume, as for example Newmeyer (2000) does, a single history for human language, that begins with one word order and progresses to another. In that sense, our work does not contribute directly to the standard problem of language evolution (Hurford, 2014). Rather, we show that, whenever a dominant word order arises in the emergence of any human language, this order is rooted in a basic distinction between humans and objects. Word order can thus emerge whenever the moment is right. The scenario that guides our understanding of the data is that in early stages of language emergence, the factors governing word order in language production are conceptual at best and not linguistic or even communicative except in a very basic sense. Neither grammatical notions like subject and object nor semantic notions like agent and patient are fundamental to the emergence of conventional word order in a language. The simple biological distinction between humans and inanimate entities suffices to set the wheels of word order in motion.

Appendix A

Elicitation sentences, divided between mono-transitive and di-transitive events

Non-reversible	Reversible
Mono-transitive	
1. A woman puts a box on a table	1. A woman looks at a man
2. A girl drags a shopping cart	2. A girl pulls a man
3. A woman rolls a ball	3. A woman pushes a girl
4. A man taps on a watermelon	4. A girl combs a woman
5. A girl tears a sheet of paper	5. A man taps a girl (on the shoulder)
6. A man washes dishes	
7. A man puts a book on a shelf	
Di-transitive	
	1. A woman gives a shirt to a man
	2. A woman takes a pair of scissors from a girl
	3. A man shows a picture to a woman
	4. A man throws a ball to a girl
	5. A girl feeds a woman yogurt

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[35] This strong association between animacy, word order and syntactic roles has been the focus of numerous studies on sentence production, as we pointed out above. For a survey of these studies, see Jaeger and Norcliffe (2009) and Tanaka et al. (2011). Bornkessel-Schlesewsky and Schlesewsky (2009) provide evidence for the important role that animacy and specificity play in comprehension of transitive constructions.

[36] Of the three possible arrangements of V and O with respect to S, the one in which V and O are separated by S (VSO and OSV) is the least common, regardless of the order of S and O. This may support the idea, discussed above, that V and O are more likely to form a constituent, which in turn may be a factor leading to the infrequency or markedness of VSO and OSV. Of the two, OSV also violates the observation that S usually precedes O in basic word orders, putting two strikes against it and making it most suitable for an alternative word order in all languages.

Appendix B

A screenshot of the clip 'a woman gives a shirt to a man', and the answer page with three possible answers: one of the three pictures correctly depicted the action and entities involved (bottom picture), another has a different agent entity but the same action (upper picture), and the third shows the same agent entity performing a different action from that shown in the video (middle picture).

Clip	Answer sheet

Appendix C

Complete table of values of all five word orders and their relative rankings for inanimate and human objects in all six groups

Group	Inanimate object					Human object				
	SOV (%)	SVO (%)	OSV (%)	XXXV (%)	Other (%)	SOV (%)	SVO (%)	OSV (%)	XXXV (%)	Other (%)
ISL (n = 31)	54 ± 10	21 ± 10	3 ± 2	19 ± 6	3 ± 3	21 ± 8	37 ± 12	17 ± 9	23 ± 9	2 ± 3
ABSL (n = 26)	60 ± 11	14 ± 7	8 ± 5	12 ± 7	7 ± 6	32 ± 11	23 ± 13	33 ± 10	4 ± 4	5 ± 5
KQSL (n = 6)	69 ± 19	19 ± 13	5 ± 7	8 ± 7	0 ± 0	46 ± 22	18 ± 14	28 ± 20	8 ± 16	0 ± 0
Hebrew (n = 32)	69 ± 9	21 ± 8	6 ± 4	4 ± 5	1 ± 1	22 ± 9	66 ± 13	8 ± 6	1 ± 1	0 ± 1
Turkish (n = 29)	86 ± 6	6 ± 10	5 ± 10	2 ± 7	1 ± 5	58 ± 9	6 ± 4	22 ± 7	14 ± 7	0 ± 1
Arabic (n = 11)	56 ± 21	20 ± 13	7 ± 9	13 ± 13	4 ± 6	38 ± 14	36 ± 18	19 ± 12	4 ± 4	3 ± 7

Appendix D

Number of occurrences of word orders that contained both a human/animate object (A) and an inanimate object (I) according to groups

	ISL	ABSL	KQSL	Arabic	Turkish	Hebrew
SAIV	3	3	2	2	7	1
SAIV	3	2	1	3	2	4
SAVI	0	3	0	0	0	0
SIAV	4	0	0	0	1	0
SIVA	9	9	3	3	1	21
SIVAV	2	0	0	0	0	0
SVAI	8	1	0	0	0	2
SVAIV	6	0	1	0	0	0
SVAVI	1	0	0	0	0	0
SVIA	11	3	0	4	0	9
SVIAV	1	0	0	0	0	0
SVIVA	2	0	0	0	0	0
AISV	0	1	1	1	0	3
AIVS	0	0	0	1	0	0
ASIV	5	3	5	0	2	2
ASVI	0	1	0	0	1	0
ASVIV	1	0	0	2	0	0
IASV	0	0	0	2	0	0
ISAV	0	1	2	0	1	0
ISVA	0	0	0	0	0	2
ISVA	0	0	0	1	0	0
IVAS	0	0	1	0	0	0
Total	56	27	16	19	15	44

Appendix E

Number of occurrences of word orders that were collapsed as XXXV according to object type in the different groups:

	ISL	ABSL	KQSL	Arabic	Turkish	Hebrew
Human object						
SVOV	33	5	2	4	0	1
OSVS	0	0	1	0	0	0
OVSV	0	0	2	0	1	0
SOSV	3	0	2	0	12	0
OSOV	1	0	0	0	5	0
OSSV	0	0	0	0	16	0
Inanimate object						
SVOV	40	11	2	6	2	8
SOVOV	0	0	1	0	0	0
OVSV	0	0	2	0	0	0
SOSV	1	0	0	0	1	0
OSOV	0	0	0	1	0	0

References

Al-Fityani, Kinda, & Padden, Carol A. (2010). Sign languages in the Arab world. In Diane Brentari (Ed.), *Sign languages: A Cambridge language survey* (pp. 433–450). New York, NY: Cambridge University Press.

Arends, Jacques, Muysken, Pieter, & Smith, Norval (1994). *Pidgins and creoles: An introduction.* Amsterdam/Philadelphia, PA: John Benjamins.

Bakker, Peter (2008). Pidgins versus creoles and pidgincreoles. In Silvia Kouwenberg & John Victor Singler (Eds.), *The handbook of pidgin and creole studies* (pp. 130–157). Walden, MA: Wiley-Blackwell.

Bickerton, Derek (1981). *Roots of language.* Ann Arbor, MI: Karoma.

Bock, J. Kathryn, Loebell, Helga, & Morey, Randal (1992). From conceptual roles to structural relations: Bridging the syntactic cleft. *Psychological Review, 99*(1), 150–171.

Bock, J. Kathryn, & Warren, Richard K. (1985). Conceptual accessibility and syntactic structure in sentence formulation. *Cognition, 21*(1), 47–67.

Bornkessel-Schlesewsky, Ina, & Schlesewsky, Matthias (2009). The role of prominence information in the real-time comprehension of transitive constructions: A cross-linguistic approach. *Language and Linguistics Compass, 3*(1), 19–58. http://dx.doi.org/10.1111/j.1749-818X.2008.00099.x.

Brody, Jill (1984). Some problems with the concept of basic word order. *Linguistics, 22*, 711–736.

Bybee, Joan L., & Hopper, Paul (Eds.). (2001). *Frequency and the emergence of linguistic structure.* Amsterdam: John Benjamins.

Byrne, Brian, & Davidson, Elizabeth (1985). On putting the horse before the cart: Exploring conceptual bases of word order via acquisition of a miniature artificial language. *Journal of Memory and Language, 24*(4), 377–389. http://dx.doi.org/10.1016/0749-596X(85)90035-X.

Christensen, Peer, Fusaroli, Riccardo, & Tylén, Kristian (2016). Environmental constraints shaping constituent order in emerging communication systems: Structural iconicity, interactive alignment and conventionalization. *Cognition, 146*, 67–80. http://dx.doi.org/10.1016/j.cognition.2015.09.004.

Cooper, William E., & Ross, John Robert. (1975). World order. In Robin E. Grossman, L. James San, & Timothy J. Vance (Eds.), *Papers from the parasession on functionalism* (pp. 63–111). Chicago, IL: Chicago Linguistic Society.

Cumming, Geoff (2012). *Understanding the New Statistics: Effect Sizes, Confidence Intervals, and Meta-Analysis.* New York, NY: Routledge, Taylor & Francis Group.

Guerra Currie, Anne-Marie P., Meier, Richard P., & Walters, Keith (2002). A crosslinguistic examination of the lexicons of four signed languages. In Richard P. Meier, Kearsy Cormier, & David. Quinto-Pozos (Eds.), *Modality and structure in signed and spoken language* (pp. 224–237). Cambridge: Cambridge University Press.

Dahl, Östen (2000). Egophoricity in discourse and syntax. *Functions of Language, 7*, 33–77.

Dahl, Östen (2008). Animacy and egophoricity: Grammar, ontology and phylogeny. *Lingua, 118*(2), 141–150.

de Saussure, Ferdinand (1959). *Course in general linguistics. Translated, with an introduction and notes by Wade Baskin.* New York, NY: McGraw-Hill.

de Vos, Connie, & Pfau, Roland (2015). Sign language typology: The contribution of rural sign languages. *Annual Review of Linguistics, 1*, 265–288. Access provided by 109.64.43.6 on 03/17/15 <www.annualreviews.org>.

de Vos, Connie, & Zeshan, Ulrike (2012). Introduction: Demographic, sociocultural and linguistic variation across rural signing communities. In Ulrike Zeshan & Connie de Vos (Eds.), *Sign languages in village communities: Anthropological and linguistic insights* (pp. 2–26). Berlin & Nijmegen: Mouton de Gruyter & Ishara Press.

Dimmendaal, Gerrit J. (1985). Prominence hierarchies and Turkana syntax. In Gerrit J. Dimmendaal (Ed.), *Current approaches to African linguistics* (pp. 127–148). Dordrecht: Foris.

Dittmar, Miriam, Abbot-Smith, Kirsten, Lieven, Elena, & Tomasello, Michael (2008). German children's comprehension of word order and case marking in causative sentences. *Child Development, 79*(4), 1152–1167.

Dryer, Matthew S. (2013a). Order of subject, object and verb. In Matthew S. Dryer & Martin Haspelmath (Eds.), *The world atlas of language structures online.* Leipzig: Max Planck Institute for Evolutionary Anthropology. Accessed on 2015-03-17 <http://wals.info/chapter/81>.

Dryer, Matthew S. (2013b). Determining dominant word order. In Matthew S. Dryer & Martin Haspelmath (Eds.), *The world atlas of language structures online.* Leipzig: Max Planck Institute for Evolutionary Anthropology. Accessed on 2015-03-17 <http://wals.info/chapter/s6>.

Ferguson, Charles A. (1959). Diglossia. *Word, 15*, 325–340.

Fischer, Susan, & Janis, Wynne (1990). Verb sandwiches in American Sign Language. In Siegmund Prillwitz & Tomas Vollhaber (Eds.). *Current trends in European sign language research* (Vol. 9, pp. 279–293). Hamburg: Signum Verlag.

Futrell, Richard, Hickey, Tina, Lee, Aldrin, Lim, Eunice, Luchkina, Elena, & Gibson, Edward (2015). Cross-linguistic gestures reflect typological universals: A subject-initial, verb-final bias in speakers of diverse languages. *Cognition, 136*, 215–221. http://dx.doi.org/10.1016/j.cognition.2014.11.022.

Gell-Mann, Murray, & Ruhlen, Merritt (2011). The origin and evolution of word order. *Proceedings of the National Academy of Sciences of the United States of America, 108*(42), 17290–17295. http://dx.doi.org/10.1073/pnas.1113716108.

Gelman, Rochelle, & Spelke, Elizabeth (1981). The development of thoughts about animate and inanimate objects: Implications for research on social cognition. In John H. Flavell & Lee Ross (Eds.), *Social cognitive development* (pp. 43–66). Cambridge: Cambridge University Press.

Gentner, Dedre, & Boroditsky, Lera (2001). Individuation, relativity, and early word learning. In Melissa Bowerman & Stephen Levinson (Eds.), *Language acquisition and conceptual development* (pp. 215–256). Cambridge: Cambridge University Press.

Gibson, Edward, Piantadosi, Steven T, Brink, Kimberly, Bergen, Leon, Lim, Eunice, & Saxe, Rebecca (2013). A noisy-channel account of crosslinguistic word-order variation. *Psychological Science, 24*(7), 1079–1088. http://dx.doi.org/10.1177/0956797612463705.

Givón, Talmy (1979). *On understanding grammar.* New York, NY: Academic Press.

Goldin-Meadow, Susan (2003). *The resilience of language: What gesture creation in deaf children can tell us about how all children learn language.* New York, NY: Psychology Press.

Goldin-Meadow, Susan, So, Wing Chee, Özyürek, Aslı, & Mylander, Carolyn (2008). The natural order of events: How speakers of different languages represent events nonverbally. *Proceedings of the National Academy of Sciences of the United States of America, 105*(27), 9163–9168. http://dx.doi.org/10.1073/pnas.0710060105.

Grice, H Paul. (1975). Logic and conversation. In Peter Cole & Jerry L. Morgan (Eds.). *Syntax and semantics* (Vol. 3, pp. 41–58). New York, NY: Academic Press.

Hall, Matthew L., Ahn, Y. Danbi, Mayberry, Rachel I., & Ferreira, Victor S. (2015). Production and comprehension show divergent constituent order preferences: Evidence from elicited pantomime. *Journal of Memory and Language, 81*, 16–33. http://dx.doi.org/10.1016/j.jml.2014.12.003.

Hall, Matthew L., Ferreira, Victor S., & Mayberry, Rachel I. (2011). Producers SOV use. Perceivers like SVO. In *Poster presented at the 52nd annual meeting of the psychonomic society.* .

Hall, Matthew L., Ferreira, Victor S., & Mayberry, Rachel I. (2014). Investigating constituent order change with elicited pantomime: A functional account of SVO emergence. *Cognitive Science, 38*(5), 943–972. http://dx.doi.org/10.1111/cogs.12105.

Hall, Matthew L., Mayberry, Rachel I., & Ferreira, Victor S. (2013). Cognitive constraints on constituent order: Evidence from elicited pantomime. *Cognition, 129*(1), 1–17. http://dx.doi.org/10.1016/j.cognition.2013.05.004. Elsevier B.V..

Haspelmath, Martin (2008). Parametric versus functional explanations of syntactic universals. In Theresa Biberauer (Ed.), *The limits of syntactic variation* (pp. 75–107). Amsterdam: John Benjamins.

Hoffman, Beryl (1997). Word order, information structure and centering in Turkish. In Marilyn Walker, Ellen Prince, & Aravind Joshi (Eds.), *Centering in discourse* (pp. 253–271). Oxford: Oxford University Press.

Holes, Clive. (2004). *Modern Arabic: Structures, functions, and varieties.* Washington, DC: Georgetown University Press.

Huber, Magnus the APiCS Consortium. (2013). Order of subject, object, and verb. In Susanne Maria Michaelis, Philippe Maurer, Martin Haspelmath, & Magnus Huber (Eds.), *Atlas of pidgin and creole language structures online.* Leipzig: Max Planck Institute for Evolutionary Anthropology.

Hudson Kam, Carla L., & Newport, Elissa L. (2005). Regularizing unpredictable variation: The roles of adult and child learners in language formation and change. *Language Learning and Development, 1*(2), 151–195.

Hudson Kam, Carla L., & Newport, Elissa L. (2009). Getting it right by getting it wrong: When learners change languages. *Cognitive Psychology, 59*(1), 30–66. http://dx.doi.org/10.1016/j.cogpsych.2009.01.001. Elsevier Inc.

Hurford, James (2014). *The origins of language: A slim guide.* Oxford: Oxford University Press.

Jackendoff, Ray (2002). *Foundations of language: Brain, meaning, grammar, evolution.* New York, NY: Oxford University Press.

Jaeger, T. Florian, & Norcliffe, Elisabeth J. (2009). The cross-linguistic study of sentence production. *Language and Linguistics Compass, 3*(4), 866–887. http://dx.doi.org/10.1111/j.1749-818X.2009.00147.x.

Kastner, Itamar, Meir, Irit, Sandler, Wendy, & Dachkovsky, Svetlana (2014). The emergence of embedded structure: Insights from Kafr Qasem Sign Language. *Frontiers in Psychology, 5*(525). http://dx.doi.org/10.3389/fpsyg.2014.00525.

Kimmelman, Vadim (2016). Transitivity in RSL: A corpus-based account. In Eleni Efthimiou, Stavroula-Evita Fotinea, Thomas Hanke, Julie Hochgesang, Jette Kristoffersen, & Johanna Mesch (Eds.), *Proceedings of the 7th workshop on the representation and processing of sign languages: Corpus mining* (pp. 117–120). Paris: European Language Resources Association (ELRA).

Kisch, Shifra (2008). "Deaf discourse": The social construction of deafness in a Bedouin community. *Medical Anthropology, 27*(3), 283–313. http://dx.doi.org/10.1080/01459740802222807.

Kisch, Shifra (2012). Demarcating generations of signers in the dynamic sociolinguistic landscape of a shared sign language: The case of the Al-Sayyid Bedouin. In Ulrike Zeshan & Connie de Vos (Eds.), *Sign languages in village communities: Anthropological and linguistic insights* (pp. 87–126). Berlin & Nijmegen: Mouton de Gruyter & Ishara Press.

Klein, Wolfgang, & Perdue, Clive (1997). The basic variety (or: Couldn't natural languages be much simpler?). *Second Language Research, 13*(4), 301–347.

Kornfilt, Jaklin (1994). Some remarks on the interaction of case and word order in Turkish: Implications for acquisition. In *Syntactic theory and first language acquisition: Cross-linguistic perspectives.* In Barbara Lust, Margarita Suñer, John Whitman, & Gabriella Hermon (Eds.). *Heads, projections and learnability* (Vol. 1, pp. 171–199). Hillsdale, NJ: Lawrence Erlbaum.

Kratzer, Angelika. (1996). Severing the external argument from its verb. In Johan Rooryck & Laurie Zaring (Eds.), *Phrase structure and the lexicon. Studies in natural language and linguistic theory* (Vol. 33, pp. 109–137). Dordrecht: Kluwer. http://dx.doi.org/10.1007/978-94-015-8617-7_5.

Labov, William (1963). The social motivation of a sound change. *Word, 18*, 1–42.

Labov, William (1994). *Principles of linguistic change. Internal factors* (Vol. I) Oxford: Blackwell.

Labov, William (2001). *Principles of linguistic change. Social factors* (Vol. Ii) Oxford: Blackwell.

Langus, Alan, & Nespor, Marina (2010). Cognitive systems struggling for word order. *Cognitive Psychology, 60*(4), 291–318. http://dx.doi.org/10.1016/j.cogpsych.2010.01.004. Elsevier Inc.

Marantz, Alec P. (1984). *On the nature of grammatical relations.* Cambridge, MA: MIT Press.

Marno, Hanna, Langus, Alan, Omidbeigi, Mahmoud, Asaadi, Sina, Seyed-Allaei, Shima, & Nespor, Marina (2015). A new perspective on word order preferences: The availability of a lexicon triggers the use of SVO word order. *Frontiers in Psychology, 6*(August), 1–8. http://dx.doi.org/10.3389/fpsyg.2015.01183.

Marsaja, I. Gede (2008). *Desa Kolok – A deaf village and its sign language in Bali, Indonesia.* Nijmegen: Ishara Press.

Matsuoka, Kazumi (1999). The lexical verb sandwich in American Sign Language and the hybrid feature. In Rebecca Daly & Anastasia Riehl (Eds.), *ESCOL'99* (pp. 142–148). Storrs: Cornell University.

Mayr, Ernst (1963). *Animal species and evolution.* Cambridge, MA: The Belknap Press of Harvard University Press.

McDonald, Janet L., Bock, J. Kathryn, & Kelly, Michael H. (1993). Word and world order: Semantic, phonological, and metrical determinants of serial position. *Cognitive Psychology, 25*, 188–230.

McWhorter, John (2001). The world's simplest grammars are creole grammars. *Linguistic Typology, 5*, 125–166.

Meir, Irit (2010). The emergence of argument structure in two new sign languages. In Malka Rappaport Hovav, Edit Doron, & Ivy Sichel (Eds.), *Syntax, lexical semantics and event structure* (pp. 101–123). Oxford: Oxford University Press.

Meir, Irit, Lifshitz, Adi, Ilkbasaran, Deniz, & Padden, Carol A. (2010). The interaction of animacy and word order in human languages: A study of strategies in a novel communication task. In Andrew D. M. Smith, Marieke Schouwstra, Bart de Boer, & Kenny Smith (Eds.), *The evolution of language. Proceedings of the 8th international conference (EvoLang8)* (pp. 455–456). Singapore: World Scientific Publishing.

Meir, Irit, & Sandler, Wendy (2008). *A language in space: The story of Israeli sign language.* New York, NY & London: Lawrence Erlbaum Associates.

Meir, Irit, Sandler, Wendy, Padden, Carol A., & Aronoff, Mark (2010). Emerging sign languages. In Mark Marschark & Patricia Elizabeth Spencer (Eds.), *The Oxford handbook of deaf studies, language and education* (pp. 267–280). Oxford: Oxford University Press.

Napoli, Donna Jo, & Sutton-Spence, Rachel (2014). Order of the major constituents in sign languages: Implication for all language. *Frontiers in Psychology, 5*(525). http://dx.doi.org/10.3389/fpsyg.2014.00376.

Newmeyer, Frederick J. (2000). On the reconstruction of "Proto-World" word order. In Chris Knight, Michael Studdert-Kennedy, & James Hurford (Eds.), *The evolutionary emergence of language* (pp. 372–388). New York, NY: Cambridge University Press.

Polak-Yitzhaki, Hilla (manuscript in preparation). Argument structure in spoken Hebrew discourse.

Primus, Beatrice (2012). Animacy, generalized semantic roles, and differential object marking. In Monique Lamers & Peter De Swart (Eds.), *Case, word order and prominence* (pp. 65–90). Netherlands: Springer.

Sandler, Wendy, Meir, Irit, Padden, Carol A., & Aronoff, Mark (2005). The emergence of grammar: Systematic structure in a new language. *Proceedings of the National Academy of Sciences of the United States of America, 102*(7), 2661–2665. http://dx.doi.org/10.1073/pnas.0405448102.

Schouwstra, Marieke (2012). *Semantic structures, communicative strategies and the emergence of language.* Utrecht: LOT.

Schouwstra, Marieke, & de Swart, Henriëtte (2014). The semantic origins of word order. *Cognition, 131*(3), 431–436. http://dx.doi.org/10.1016/j.cognition.2014.03.004. Elsevier B.V..

Seuren, Pieter A. M. (1998). *Western linguistics. A historical introduction.* Oxford: Blackwell.

Shawarba, Musa (2007). *The Bedouin dialect of the Tiyaha in the Negev: Phonology, morphology and selected topics in syntax* PhD dissertation. Jerusalem, Israel: Hebrew University.

Silverstein, Michael (1976). Hierarchy of features and ergativity. In Robert M. W. Dixon (Ed.), *Grammatical categories in Australian languages* (pp. 112–171). Canberra: Australian Institute of Aboriginal Studies.

Slobin, Dan I., & Bever, Thomas G. (1982). Children use canonical sentence schemas: A crosslinguistic study of word order and inflections. *Cognition, 12*, 229–265. http://dx.doi.org/10.1016/0010-0277(82)90033-6.

Tanaka, Mikihiro N., Branigan, Holly P., McLean, Janet F., & Pickering, Martin J. (2011). Conceptual influences on word order and voice in sentence production: Evidence from Japanese. *Journal of Memory and Language, 65*(3), 318–330. http://dx.doi.org/10.1016/j.jml.2011.04.009. Elsevier Inc..

Vennemann, Theo (1974). Topics, subjects and word order: From SXV to SVX via TVX. In John M. Anderson & Charles Jones (Eds.), *Historical linguistics. Syntax morphology internal and comparative reconstruction* (Vol. 1, pp. 339–376). Amsterdam: North-Holland.

Vennemann, Theo (1975). An explanation of drift. In Charles N. Li (Ed.), *Word order and word order change* (pp. 269–305). Austin, TX: University of Texas Press.

Washabaugh, William (1986). *Five fingers for survival.* Ann Arbor, MI: Karoma.