

# The grammar of space in two new sign languages\*

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Sign languages use space because they can.<sup>1</sup> In previous work on verb agreement in sign languages, we have discussed “the ability of a language produced in space to represent certain spatial and visual concepts iconically” (Aronoff, Meir, & Sandler, 2005). We resolved in that work what we called “the paradox of sign language morphology.” Although all sign languages that had been well studied up to that point showed a particular form of complex simultaneous non-affixal verb agreement that has no simple parallel in the morphology of spoken languages, they did not show much ‘run of the mill’ sequential affixal morphology. Why should a language acquire complex morphology before it acquires simple morphology, why sign languages, and why this particular sort of morphology? We argued that the agreement morphology of sign languages is based on an iconic use of space, which sign languages

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<sup>1</sup> We thank Yoav Moriah for this seminal thought.

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accommodate readily, and that this iconicity is what leads to the quick development of the system. Linear affixal morphology, by contrast, is much slower to emerge and much more varied, precisely because it is not iconic.

In this paper, we will focus a much finer lens on the iconically based grammatical use of space in sign languages. Specifically, we will look at the actual production of verb forms where we expect space to be used. We will compare forms produced across two or three generations of signers of two young sign languages, Al-Sayyid Bedouin Sign Language (ABSL) and Israeli Sign Language (ISL). ABSL is a village sign language that has emerged in a socially insular community in the last seventy years and which we have been documenting for several years (Aronoff, Meir, Padden, & Sandler, 2008; Sandler, Meir, Padden, & Aronoff, 2005). ISL has a similarly short history but it is widely used by many Deaf people in Israel of different language backgrounds. To our own surprise, the use of space in the utterances we elicited diverges quite dramatically from what we had always taken to be the norm among sign languages, in ways that we will discuss in detail below. We also found interesting differences between the two languages and also generational differences within each language.

We learn from this study that not even a highly motivated grammatical system like agreement in sign languages emerges overnight, but rather that it may unfold gradually over generations and may take different courses of development. This is not to say that the use of space in ABSL and ISL is unsystematic. To the contrary, we find systematicity in the use of space at all stages, but not in the same way that we had previously found in certain other well-studied sign languages. We propose that early systematicity in a new sign language is powerfully influenced by the signer's own body. Specifically, the signer exploits the iconicity of his or her own body in the

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structure of verb forms in the new sign language. Both ISL and ABSL use this iconicity, but they differ from one another in how they balance the iconicity of the signer's body against other "competing iconicities," notably spatial directional movement, also emerging in the sign language. These differences may help us to understand how the emergence of a language in a village differs from the way a language develops in a less homogeneous community.

### **Background**

Broadly, verb forms in many established sign languages divide between those that move in space in front of the signer's body (agreement and spatial verbs) and those that do not, but instead are anchored to the body (plain verbs). Plain verbs lack the complex morpho-syntactic marking that characterizes verbs involving movement in space, though they do inflect for aspect. Semantically, plain verbs are typically cognitive, emotional or stative in nature. Verbs that exploit space are further divided between those that mark for person and number of the subject and object (agreement verbs), and those that do not (spatial verbs) (Liddell, 1977; Padden, 1988). The distinction between the two verb classes is grounded in their semantics: agreement verbs denote transfer events, whereas spatial verbs denote the motion of an entity in space (Meir, 2002). In a recent study, Thompson, Emmorey & Kluender (2006) used an eye-tracking device to locate signers' eye gaze during the production of verbs. They identified distinctive eye gaze behavior for each of the three classes of verbs, supporting the view that no two classes can be collapsed into one archetype.

Padden (1988) and Liddell (2003) treat agreement and spatial verbs as distinct subtypes because of different grammatical behavior. For example, person marking on agreement verbs in ASL is not specifically indexical but "in the general direction of",

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resulting in more gross indexical differences between first person and second and third in agreement verbs. In comparison, spatial verbs have more fine or “gradient” locative distinctions in space. The two subtypes also differ with respect to number inflection. Multiple plural inflection adds a sweeping movement at the end point of agreement verbs but spatial verbs cannot employ this form. Because spatial verbs do not mark person and number inflections, they are ostensibly more free to exploit space in front of the signer’s body, having more distinctive locations and movements available to them.

The two types also differ in that there are apparently no “backwards” spatial verbs. In backwards agreement verbs like TAKE, COPY, CATCH, RECEIVE and STEAL, the direction of the verb is reversed: the subject is goal rather than source as is the case with regular agreement verbs, and consequently the verb's path moves from the object’s referential location in space, or the R-locus, to that associated with the subject, the recipient of the transfer event (Meir, 2002; Padden, 1988). Because spatial verbs do not involve “transfer,” they also do not have recipients. The spatial verb MOVE can have directional movement inward toward the body, but it does not change the thematic role of the subject from agent to recipient, only the referential interpretation of the source and goal. MOVE with an inward movement toward the signer’s body can mean ‘to move near my location (as opposed to another more distant location).’

Morphology aside, agreement and spatial verbs can look very much alike. Both agreement and spatial verbs have directional movement from source to goal.<sup>2</sup> In ASL as well as other sign languages, there are pairs of verbs such as GIVE (agreement) and CARRY-BY-HAND (spatial) that are formationally identical and become distinct

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<sup>2</sup> Indeed, Fischer and Gough (1978) refer to the two types of verbs as “directional verbs.”

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only when inflections are added. In a psycholinguistic experiment, Cormier (1998) performed detailed measurements of signers' movements and hand placements when producing agreement and spatial verbs and found less distinctiveness in the referential interpretation of their initial and final points than their grammatical analysis would suggest.

Another grammatical system of sign languages that exploits space and iconicity is the system of classifier constructions. While these constructions share many characteristics with spatial verbs (Padden 1988, Sandler and Lillo-Martin 2006), they have subcategories and properties of their own and we will not be dealing with them in any detail here.

### **Spatial morphology in new sign languages**

The divide between spatial and non-spatial verbs, and more specifically the system of Plain-Agreement-Spatial verbs, is widely found in sign languages of the world (Sandler & Lillo-Martin, 2006). The existence of such a system in sign languages outside Europe and North America, such as Japan (Fischer & Osugi, 2000) and Taiwan (Smith, 1990), supports the idea that the system is general across sign languages, rather than being a typological feature of a set of historically related sign languages.

As mentioned earlier, we have argued that the tripartite system of verbs is pervasive in sign languages because it is motivated by their visuo-spatial properties (Aronoff et al., 2005). At the same time, we showed that sign language verb agreement is a constrained grammatical system, so the question of how it originates and develops is not a trivial one. In this paper we examine to what extent the division into two types

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of verbs that exploit space can be found in a new sign language. Three hypotheses arise quite naturally:

1. All three classes are present from the beginning of any sign language.
2. Spatial verbs develop early because they are more iconic than agreement verbs and do not involve abstract grammatical categories like person, number, and syntactic role.
3. Grammatical use of space in sign language develops gradually.

The strong cross-linguistic similarity of verb systems across sign languages, and the semantic basis of the tripartite classification, seems to lend support to Hypothesis 1. The different verb classes are related to fundamental semantic, and perhaps cognitive, categories, such as motion, location, transfer and states. Since these categories are expressed by all sign languages that have been linguistically analyzed to date, and since the iconicity of sign languages can reflect the relevant semantic distinctions among the classes, it seems reasonable to expect that any visual language will have all three classes from the initial stage. They come with the territory.

Other observations, however, suggest otherwise. While spatial verbs encode locations and motions, agreement verbs encode grammatical arguments and their syntactic roles. Agreement verbs inflect for person and number, while spatial verbs do not. These similarities and differences support Hypothesis 2, that spatial verbs develop early in the history of a language, before agreement verbs, since spatial verbs involve analogous spatial mapping, but no morpho-syntactic categories. Spatial verbs can also be regarded as more iconic, and therefore can be expected to arise very early in the development of the language.

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While Hypotheses 1 and 2 are mutually exclusive, the third hypothesis, that grammatical use of space in sign languages develops gradually, is compatible with Hypothesis 2. Both agreement verbs and spatial verbs may be absent in the early stages of a language, but when a language starts developing grammatical use of space, spatial verbs could still develop before agreement verbs. The third hypothesis relies on two assumptions. First, languages in the visual modality will use space to organize their grammars. This assumption is reasonable, since a variety of sign languages report spatial organization for verbs and for classifier constructions, as we have said. Second, studies of gestural use that is not systematized, such as home sign (Goldin-Meadow, 2003), cospeech gesture (Iverson & Goldin-Meadow, 1998; McNeill, 2000), and the signing of deaf children exposed only to Manually Coded English (S. Supalla, 1990) all describe use of space to represent relations among participants in an event.

Hypothesis 3 rests on the assumption that linguistic systems take time to develop. This view is supported by our comparative studies of the morphology of ASL and ISL (Aronoff, Meir, Padden, & Sandler, 2003; Aronoff, Meir, Padden, & Sandler, 2004), and our work on ABSL (Aronoff et al., 2004; Meir, Padden, Aronoff, & Sandler, 2007). In the first set of studies, we examined three categories of classifiers commonly found in sign languages: size-and-shape specifiers, handling classifiers and what Schembri (2003) calls entity classifiers. We found that while both ASL and ISL make full use of the size-and-shape specifiers and handling classifiers, the classifier system of ASL includes more abstract entity classifiers, such as UPRIGHT-OBJECT and VEHICLE than ISL, which relies more on size-and-shape specifiers and handling classifiers. These entity classifiers are less iconic and tend to be determined more by

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semantic category (T. Supalla, 1985) than by physical appearance of the object. We also found that ISL signers are more likely to use the whole body as a referent projection (Engberg-Pedersen, 1993), in which they take on the characteristics of the participant in the event in contexts in which ASL signers will use lexically specified classifiers on the hands. In both cases, the older language is using more abstract and arbitrary forms, a tendency we attributed to language age (Aronoff et al., 2003).

Another feature we attributed to language age was the relative dearth of sequential affixation, as we mentioned briefly at the beginning of this paper. Sequential affixation comes about through grammaticalization, often involving function words that become affixes on content words, such as the –ZERO negative suffix in ASL (Aronoff et al., 2005). Such processes are documented for ASL and ISL, but they are very sparse in both languages. As in spoken languages, grammaticalization takes time, and even ASL is young for such processes to arise. This view of things assigns a role to language age in the development of grammatical means.

What we did not expect when we first began to study ABSL is that even morphology that exploits visuo-spatial cognition takes time to develop, a finding we report in Aronoff, Meir, Padden and Sandler (2004) and recently in Meir, Padden, Aronoff and Sandler (2007). In the latter study, we find that ABSL signers strongly prefer the Z axis (in a straight center axis away from or towards the body) for verbs of transfer. In these forms, ABSL signers do not vary the axis of the directional movement. Specifically they do not produce a path movement that moves to either side or from side to side for third person subject or object as is often found in established sign languages such as ASL and other European and Asian sign languages. Instead,



signers direct movement outward or inward from the signer's body. On the basis of these data, we concluded that ABSL does not have the category of person, at least not in its verb system. Grammatical subject, on the other hand, is clearly evident in ABSL, first with respect to word order (Sandler et al., 2005), which is consistently subject first, and second, in the strong preference for the body to represent properties of the grammatical subject (Meir et al., 2007).

In the present study, we conduct a much more fine-grained assessment of spatial morphology and evaluate in greater detail the idea that time is a factor as Hypothesis 3 predicts.

### **Two new sign languages**

Al-Sayyid Bedouin Sign Language (ABSL) arose in a small, insular and endogamous community with a high incidence of nonsyndromic recessive deafness (Scott et al., 1995). The Al-Sayyid Bedouins settled about 200 years ago in present-day southern Israel, and after five generations (about 75 years ago), four deaf siblings were born into the community. In the next two generations, deafness appeared in a number of other families resulting in what today is estimated at about 125 deaf adults, teenagers and children.<sup>3</sup> The data we describe in this paper are based on deaf signers of the second and third generation as all signers from the first generation are deceased. As described elsewhere (Kisch, 2000, 2004), ABSL is used widely in the community by both deaf and hearing members, and is seen as another language of the village in addition to spoken Arabic. The prevalent use of ABSL in the village has led to

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<sup>3</sup> In our other publications about ABSL, we have used estimates of the number of deaf people based on the work of other researchers. We are now working with members of the village to create a map of all deaf people in the community, to help us arrive at a more precise figure.

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widespread exposure to the language by deaf signers and many of their hearing siblings and relatives from birth or a very young age.

The nine ABSL signers included in this study are divided into two groups: five are from the second generation, ranging in age from about 28 to 45 years, and four are of the third generation, ranging in age from about 16 to 25 years. As is common in the village, the signers in the second generation do not have deaf parents, but have deaf siblings and have had interaction in sign language from early childhood, with relatives such as aunts, uncles and cousins.<sup>4</sup> In the third generation, three of the four younger adults have a deaf mother as well as deaf siblings, and the fourth has one deaf sibling. All of the younger adults interact with deaf signers of the second generation, including those in this study.

Israeli Sign language (ISL) is likewise a comparatively young sign language, which evolved along with the Israeli Deaf community about 75 years ago, but unlike ABSL, ISL developed in a pidgin-like situation. The members of the first generation of the Deaf community came from different backgrounds, both in terms of their country of origin, and in terms of their language. A small number of the first generation were born in Israel, and some of them went to the school for the deaf in Jerusalem that was founded in 1932. But the majority were immigrants who came to Israel from Europe (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 signing, or used some kind of home sign.<sup>5</sup>

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<sup>4</sup> As far as we know, only one of the first generation deaf signers had deaf children. However, the deaf children from that family did not participate in the study reported here.

<sup>5</sup> For a description of the history of the Deaf community in Israel and the development of ISL, see Meir & Sandler (2008).

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Today, four generations of signers exist simultaneously within the Deaf community, which numbers about 10,000 members: the very first generation, which contributed to the earliest stages of the formation and development of the language, to the fourth generation, that has acquired and further developed the modern language as a full linguistic system.

For the purpose of this study, ISL signers were divided into three age groups.

**Older signers:** eleven signers aged 65 years and older.<sup>6</sup> People from this age group acquired ISL when it was still in its inception. They were not exposed to a unified linguistic system, but rather they created this system through interaction with each other. Some of the young members of this group (people in their late 60s and early 70s) were exposed to the linguistic system of ISL when they joined the community, but the language was very much in its initial stages, with great individual variation. Members of this group came from a variety of linguistic backgrounds. There are no ISL native signers among them, as the language was too young to acquire native users then, but seven of the eleven group 1 signers had deaf older siblings or other family members. Therefore, some have used a sign language or some sort of a signing system from an early age.

**Younger signers:** nine signers aged 45-65. Members of this group can be considered second generation signers, since they had linguistic models when they joined the Deaf community. Those who were born in Israel or immigrated to Israel at an early age and had at least several years of schooling with other deaf children. The daily interaction with other deaf children over a

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<sup>6</sup> The oldest subject is 91 years old and the first member of the Association of the Deaf in Israel.

long period gave most members of this age group the opportunity to use signing from childhood. Three of the signers in this group have deaf siblings.<sup>7</sup>

**Youngest signers:** four signers aged 30-40. Members of this age group were exposed to an already unified linguistic system. All of them had formal schooling, where they learned Hebrew. Hence, all members of this group can be considered bilingual. Three of the four are native ISL signers, and the fourth signer was exposed to ISL from early childhood (age 2-3).

## **Method**

### **Language elicitation task**

As part of our study of language production in ABSL and ISL, we asked signers to view 30 short video clips. Each clip depicts a single action of either a human or inanimate entity by itself or involving another entity. To check for comprehension, each signer is paired with another signer who views the signed production and then is asked to identify one of three pictures best corresponding to the action just described. One of the three pictures correctly depicts the action and entities involved, the second has a different subject but the same action, and the third shows the same subject performing a different action from that shown in the video. If the viewer chooses an incorrect picture, the signer is asked to repeat the description.

For our investigation into verb forms in new languages, we selected a subset of 14 video clips which involved an action in a straight motion across space. Five of these were actions of transfer between two human entities: giving, showing, taking, feeding and throwing (Figure 1a). Nine other clips depicted also movement in a straight motion, but were not acts of transfer between two people. One set involved either a

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human or inanimate object in motion: a ball rolling, a woman rolling a ball, a man putting a book on a shelf, a woman running, and a woman walking (Figure 1b, 1c). A second set involved humans with another object or human in motion: a girl pulling a man, a girl pulling a suitcase, a woman pushing a girl, and a woman putting a box on a table. We excluded the remaining video clips from the present analysis as they do not involve straight motion in space, e.g. a girl crying, a girl running in a circle, a man washing a plate.

INSERT FIGURE 1A

INSERT FIGURE 1B

INSERT FIGURE 1C

A total of 169 verb tokens were elicited from ABSL signers with the 14 clips, 68 from the younger adults and 101 from the older adults. The total number of responses for ISL was 412: 212 from the older group (age 65-90 years old), 140 from the younger (45-65), and 60 from the youngest adults (30-40).

The signers' responses were transcribed in glosses with a notation identifying the direction of the verb sign movement, if any, representing the main action in the clip. If the movement of the verb sign was from the signer's body straight outward or inward, it was coded as along the sagittal or Z axis. If the movement was parallel to the front of the signer's body, from one side to the other, and not involving the center axis (toward or away from the body), it was coded as on the horizontal or X axis. This is the axis observed for the description of transitive actions involving two third person referents in many well studied sign languages like ASL. If the movement was from the signer's body diagonally outward to the right or to the left, it was coded Z+X. In a few cases, the sign was produced with no horizontal path movement, and these were

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coded as None. Examples of movements along the three axes appear in Figure 2. Two transcribers independently reviewed the coding of the signers included in the study.

INSERT FIGURE 2

## **Results**

### **ABSL signers**

What is striking about ABSL signers is that they strongly favor path movement along the Z axis, outward from the signer's body, for spatial as well as transfer verbs. This preference for the Z axis holds despite the fact that, in all video clips depicting actions, the individual or the object moves horizontally from one side of the screen to the other. But as Figure 3 below shows, when verbs are produced, ABSL signers strongly prefer to orient the movement relative to their own body. Of 169 verbs coded, 109 or 65% moved along the Z axis. The X axis accounted for 26% (44) and Z+X movement diagonally from the body to one side or the other was the smallest set, at 9% (16) of total forms produced by ABSL signers. In our work (Meir, Padden, Aronoff, & Sandler 2007), we refer to this pattern as “body as subject”, a concept we explain in more detail in the Discussion.

INSERT FIGURE 3 ABOUT HERE

When we compare younger to older signers, we see a lessening in preference for the Z axis. Younger signers use the X axis 50% more often than older signers. But the overall pattern of younger and older signers remains similar: a preference for the Z axis over all directions. Interestingly, signers overall do not appear to use the Z+X diagonal line. It is used less often than the two axes for both groups of signers.

INSERT FIGURE 4 ABOUT HERE

When we examine older adult signers' verb productions by verb type, we find little difference between spatial verbs and verbs of transfer with respect to use of the X axis. Overall, older signers use the X axis and the Z+X line very seldom, preferring the Z axis by over 68% for both types of verbs, as shown in Figure 5.

INSERT FIGURE 5 ABOUT HERE

Among younger adults, we see more variation in verb forms with respect to axis, reflecting what would seem to be greater use of space (Figure 6). Though younger adults still prefer the Z axis for spatial verbs, they show use of the X axis to a greater degree than older adults, almost three times more. Furthermore, they show greater use of the X axis in spatial verbs than in transfer verbs, a pattern which favors Hypothesis 2, that spatial verbs develop earlier than verbs of transfer. The Z+X line is preferred for transfer verbs (19%) over spatial verbs (7%), which could be seen as a means of continuing to use the body as subject regardless of person, but to use points in space to mark objects.

INSERT FIGURE 6 ABOUT HERE

In ASL, it is common, but not obligatory, to establish third-person referents in sentences with verbs of transfer. Typically such structures begin with establishing R-loci (such as by pointing to specific locations in space) of the subject and the object in third person space (on either side of the signer's body), followed by a path movement between these two R-loci. These are the clearest cases of agreement, where the loci of nominals is the same as that of the loci of agreement markers.

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In 65 sentences with verbs of transfer, neither younger nor older ABSL signers established referential loci 71% of the time ( $n=46$ ). Of the remaining 29% of sentences where they did establish referential loci ( $n=19$ ), sixteen sentences contained what could be termed single (object only) or double (subject and object) agreement as the path movement in the verb form corresponded to the loci of referents. In 8 cases, the loci of the referents were established along the Z axis, as was the verb form itself. In the cases with transitive actions involving two referents, the subject R-locus was located near the signer's body, and the object R-locus was placed further out along the same axis. If this small number of cases can be interpreted as "emergent agreement," It would seem that ABSL signers resolve the potential conflict between third person referents and the preferred body-out axis of verb movement by establishing referential loci for third person subject and object along the Z axis.

The choice of either Z or X axis for movement in ABSL verbs reveals interesting differences across age groups with respect to whether the event involved an animate subject or not. Two video clips differed in terms of whether the action was instigated by a human or involved action by an inanimate entity alone: a woman rolling a ball, or a ball rolling. In contrast to the older signers who used the Z axis to depict both types of rolling, two of the younger signers produced 'a ball rolling' along the X or Z+X diagonal, suggesting a human-inanimate subject difference. The body remains subject in 'a woman rolling a ball,' but younger signers can sign 'a ball rolling' along the X axis, in effect, moving off the body, in order to show motion of inanimate entities with an unknown cause.

Older signers, however, use another means to show the human-inanimate subject distinction: handshake. For 'a woman rolling a ball,' they used a cupped hand to show



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a human holding a ball, then releasing it. For the inanimate version, all of the older signers used instead a tracing handshape, either with an index finger or a flat palm rotated to the side, indicating the direction in which the ball rolled. This suggests that ABSL signers of different age groups recognize animacy differences, but encode them in different ways. Younger signers build on the handshape distinction between human-inanimate subjects, but also add the spatial distinction described above.

Taken together, we see a noticeable shift in younger signers' choices of axis with respect to the forms of verbs involving directional movement. Where older signers strongly favor the Z axis, younger signers show more flexibility and a tendency to use the signing space broadly. Disengaging from the body and using verb forms that move from side point to side point is somewhat more evident in spatial verbs than in verbs of transfer. Still, both younger and older signers favor the Z axis, the latter group by twice as much.

### **ISL signers**

#### **Use of space**

As with ABSL signers, the overall preference of ISL signers is to use the Z axis when depicting straight path motion and transfer events. The Z axis was used in 54% of the responses, while the X (horizontal) axis was used in only 28% of the responses. The diagonal line was used in 14% of the responses, and in 4% no line was used at all.

These results are presented in Figure 7:

INSERT FIGURE 7 ABOUT HERE

However, when comparing the use of the different axes across the three groups of signers, we find interesting differences between them (Figure 8). Let us compare the

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two older groups first. These two groups look very much alike in terms of the use of the Z and the X axes (and very similar to ABSL signers): the Z axis is used in almost 60% of the responses, and the X axis in less than 30% of the responses. That is, the Z axis is used twice as much as the X axis in both groups. But a main difference between these groups is in the use of the diagonal: the older group (age 65-90) uses it in only 8% of the responses, while it appears in 16% of the younger (age 45-65) group's responses. Additionally, the younger group hardly ever uses verb forms with no directional movement at all, while the older signers had such forms in 6% of their responses. The 45-65 year old subjects, then, show a slightly more varied use of space than the signers of the oldest group, but the basic pattern of use of axes is very similar.

The youngest ISL signers, 30-40 years old, show a very different pattern of axis use: the Z axis is the least used one (25%), the X axis is used extensively (42%), and the Z+X diagonal also becomes quite prevalent (32%).

INSERT FIGURE 8 ABOUT HERE

When looking at the use of axes in different types of verbs – spatial vs. transfer – we again find that the two older groups exhibit a very similar pattern, while the youngest group differs markedly. In the older and younger groups (Figures 9 and 10 respectively) there is a slight preference for using the Z axis in transfer verbs over spatial verbs, and a slight dispreference for using the X axis in transfer verbs compared to spatial verbs. The main difference between the two groups is that in the younger group verbs of transfer employ the diagonal axis three times as much as in older (21% vs. 7% respectively). The diagonal is used more than the X axis in the younger group's verbs of transfer.

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As shown in Figure 11, the youngest group presents a very different pattern of axis use: in spatial verbs, all three lines are used almost to the same extent. In transfer verbs, in contrast, there is a strong preference for the X axis: it is used in 50% of the responses. The diagonal is used in 35% of the responses, and the Z axis only in 15%. (One form, which constitutes 5% of the responses, was signed with an upward movement, and was coded as having no directed path movement). This group differs, then, from the two older groups in two respects: first, the Z axis is not the most preferred axis. Secondly, there is a noteworthy difference in the use of the axes between the two verb types (verbs of transfer and spatial verbs) in the youngest group, but not in the two older groups.

INSERT FIGURE 9 ABOUT HERE

INSERT FIGURE 10 ABOUT HERE

INSERT FIGURE 11 ABOUT HERE

### **Agreement inflection**

Since the youngest group shows a marked distinction between spatial verbs and transfer verbs, the question of whether ISL has developed verb agreement by its third generation naturally arises. Five of the clips that involve a directed movement denote an event of transfer. The responses for these clips were analyzed according to whether the verb forms indicate agreement with one argument, agreement with two arguments, or no agreement at all. A verb was coded as agreeing if a referential locus was set in the signing space, and the path of the verb moved with respect to that locus. The results are summarized in Figure 12:

INSERT FIGURE 12 ABOUT HERE

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Once again, we find that the youngest group shows a very different pattern from those of the two older groups. In the youngest group, almost half of the responses had double agreement forms. In these sentences, the two 3<sup>rd</sup> person referents were set up in a location in space, and the verb forms moved between these two forms.

Additionally, 24% of the responses marked agreement with one argument. In other words, almost 75% of the verb forms produced by signers in this group mark agreement. In the two older groups, more than half of the forms do not inflect at all, and there are very few forms that mark double agreement (2 tokens in each group). Interestingly, older signers used more single agreement forms than the younger signers. This is somewhat unexpected, since we hypothesized that developing verb agreement in a language takes time, and a reasonable prediction is that younger generations produce more forms inflected for agreement and not fewer. A closer inspection of the single agreement forms produced by the older signers reveals that most of these forms (34 out of 42 forms) were produced by three signers. The other 8 forms were produced by the eight remaining signers. The three signers who produced these forms used a special technique for encoding argument structure in some of the clips. They overtly identified themselves with the subject argument of the event, then they localized the recipient argument right in front of them, sometimes explicitly identifying that referent with the addressee, and then moved the verb path from their own body to that second person location. In other words, instead of establishing abstract referential loci in space, they use their own body and that of the addressee as loci for the participants in the event to be described.

For example, in a response to a clip showing a man throwing a ball to a girl, one signer signed: I MAN I, YOU FEMALE CHILD<sub>2</sub>, I THROW. Interestingly, this technique was used almost exclusively by these three signers. Two other ISL signers

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(one from the older group, one from the younger group) identified themselves with the subject, but did not localize the other argument in space, and therefore these forms were not counted as agreement forms. This strategy was never used by any ABSL signer. Such verb forms do inflect for agreement, according to our definition, but look more like agreement forms with first and second person rather than with two third person referents. If the responses to the transfer clips of these signers are not included in the count, the picture is quite different: there are 8 single argument agreement forms (16%), 2 double agreement forms (4%) and 40 non-agreeing forms (80%). These results are presented in Figure 13.

INSERT FIGURE 13 ABOUT HERE

As the results show, the use of space in ISL, both for verb agreement and for spatial verbs, does not emerge spontaneously from very early stages of the language, but rather takes time to develop. Verb forms inflected for both subject and object are very rare in the two older groups. Verb forms that inflect for one argument are more common, but still, most of the verbs denoting transfer are not inflected. Spatial verbs also show a marked preference for using the Z axis. Despite the fact that the signing space is three dimensional, and despite the iconicity of the path movement in such verbs, signers show preference for using the less iconic form along the center-out/in axis, rather than selecting points in space and exploiting the three dimensionality available to them.

The youngest signers show a very different pattern for these parameters. These signers do not confine themselves to one axis, but rather make use of a much richer inventory of lines in the signing space. They use forms inflected for agreement in

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almost 75% of the transfer verb forms. And they favor double agreement forms, forms which are almost entirely missing in the two older groups.

These results show that it takes at least two to three generations for a sign language to develop a productive and consistent verb agreement system. The developmental process, though, is not linear; there is a very minor difference between the first two groups, and then a great leap forward in the youngest group. It might be that it takes time for a language to converge on one particular mechanism, but once such a mechanism is singled out, it spreads quickly in the community.

But the fact that even the youngest signers use double agreement, single agreement and no agreement forms in verbs of transfer indicates that in ISL, at least, marking of verbs for agreement is less robust than agreement systems usually found in spoken languages. In spoken languages, if a language has verb agreement, then marking these forms for agreement is obligatory; the use of the agreement morpheme is not optional. An uninflected form in a context that requires an inflected form is ungrammatical. In ISL, in contrast, verbs of transfer can be inflected for agreement, but a non-inflected form is also possible, and both single agreement and double agreement forms are acceptable.

## **Discussion**

The results obtained from signers of the two new sign languages show that the body is a central reference point for all types of verbs. Signers prefer to move the path movement component of verbs from or towards the body, rather than from one side of the signing space to the other, whether they describe motion in space or a transfer event. From this perspective, all verb types behave like plain verbs, since they do not vary according to person of the subject or object. We developed elsewhere (Meir et

al., 2007) the notion of "body as subject," as a basic lexicalization pattern in sign language plain verbs.

We argue that in iconic or partially iconic verbs articulated on the body, the so called 'body-anchored verbs', the signer's body is not merely a formal location for the articulation of signs, but rather is associated with a particular meaning or a particular function: the body represents the subject argument. Take, for example, verbs such as EAT or DRINK. In various sign languages, the location of these signs is the mouth of the signer. This is no accident, though: the mouth, constituting one of the formational components of the sign, also represents one particular argument in the event, the agent. Other plain verbs show the same pattern. Verbs of mental activities, such as THINK, KNOW, REMEMBER, LEARN are often signed on the temple or the forehead, which represents the site of the mental activity of the experiencer argument. Verbs of saying, e.g., SAY, ASK, ANSWER, TELL, EXPLAIN, are signed near the mouth, which corresponds to the mouth of the agent argument. Many psych verbs, such as HAPPY, LOVE, SUFFER, UPSET are signed on the chest, which corresponds to the metaphorical location of emotions of the experiencer or patient argument.

As the above list shows, the argument represented by the body and corresponding to specific features of the body can be associated with a variety of thematic roles: agent, patient, experiencer, recipient. However, the choice of the particular argument to be represented by the signer's body is not random. In case of a one place predicate, the body naturally is associated with the sole argument of the predicate, the subject. In case of transitive events, we find that the argument associated with body features is the highest ranking argument: the agent in <agent, patient> verbs (e.g., EAT, DRINK,

LOOK) or <agent, patient, recipient> verbs (such as ASK, INFORM, EXPLAIN), and the experiencer or perceiver in <experiencer, theme> verbs (e.g., SEE, HEAR, LOVE). According to general principles of mapping between thematic structure and syntactic structure (Falk, 2006; Fillmore, 1968; Grimshaw, 1990; Jackendoff, 1990), the argument associated with the highest ranking thematic role is the subject argument. The correct generalization, then, is that the body is associated with the subject argument of the verb rather than with a particular thematic role. An implication of our analysis is that the basic lexicalization pattern when representing a state of affairs in sign languages is body as subject.

It is useful to think about the development of verb systems in signed languages in terms of competing iconicities. The two iconicities that compete in sign language verb systems are that of the body as animate subject and that of the spatial location of the entities involved in a scene. Contrary to our previous expectations (Aronoff et al., 2005), that verb agreement emerges quickly in sign languages, we find here that the iconicity of the body as subject appears first and full-blown in the history of the languages under investigation, while the iconicity of spatial location required for verb agreement unfolds much more gradually.<sup>8</sup>

We have discussed the iconicity of the body as subject at some length above and more extensively in Meir, Padden, Aronoff and Sandler (2007). For the moment, what the reader must keep in mind about this iconicity is that it identifies one pole of the Z axis (the speaker's body) with the grammatical subject of a sentence. Discussion of the

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<sup>8</sup> The overall theory developed in Aronoff, Meir, & Sandler 2005 is still valid: that sign languages typically develop 'simultaneous' morphology motivated by visuo-spatial cognition early in their histories, while affixal morphology that arises through grammaticalization is language-particular and takes much longer to develop. What the present study teaches us is that even the sign-language-typical and motivated morphology develops gradually.



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iconicity of space has a much longer history in sign language linguistics but we would like to conceptualize it in a somewhat new way: in terms of the classic dramatic notion of scene, defined as “a division in a classical Roman or French drama in which there is no change of persons . . .” (*Webster's Third New International Dictionary, Unabridged*. Merriam-Webster, 2002. <http://unabridged.merriam-webster.com> (16 Sep. 2007)). A scene in these terms consists of actors on a stage participating in a sequence of actions. The difference between language and drama is that the primary actors in a language scene are the signer/speaker and the addressee. These two have fixed places (or loci) in any scene: the speaker's place is his or her own body, while the addressee's place is directly opposite the signer/speaker's body. The signer/speaker (first person) and addressee (second person) thus occupy the poles of the Z axis, while the other actors in the scene (third persons) are placed in the two-dimensional space defined by the Z and X axes together. What is grammaticalized in the iconicity of two-dimensional space in sign languages is thus not just reference (in the form of referential loci) but just as importantly, grammatical person.

This depiction of the iconicity of space reveals immediately what the competition is between the two iconicities: both use the body pole of the Z axis, but to represent distinct grammatical notions: subject and first person. Thus, the iconicity of space can function grammatically with all persons only at the expense of the iconicity of the body as subject, by moving the subject off the body.

The iconic use of the body as subject emerges very early in the life of a sign language and remains a significant factor in the signing of plain verbs (Meir et al., 2007). For spatial and transfer verbs, this iconicity pervades the responses of all the ABSL signers in our study as well as in those of the two older groups of ISL signers (Figures

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3, 4, 7 and 8). These four (out of five) groups show a strong preference for using the Z axis (which originates at the body) in representing all spatial and transfer actions, even in representing movement along the horizontal X axis (such as a ball rolling from one side of the screen to the other).

By contrast, the iconic use of space to represent location and movement appears to emerge much more slowly, and it emerges first in cases where the competition from the body is not strong. We thus see the very beginnings of space being used by younger ABSL signers, not for transfer verbs but only to represent the spatial movement of inanimate entities and then only when the movement involves no human intervention (a ball rolling vs. a woman rolling a ball). Why not in the latter cases? Because in WOMAN BALL ROLL there is a competition between using the body to represent the animate subject (WOMAN) and using space to locate the actual position of this same animate subject along the horizontal X axis. The WOMAN argument cannot be represented simultaneously on the body and at the locus of the referent on the X plane. In the case of BALL ROLL, because the subject is not animate, the iconicity of the body as subject is not as powerful, permitting space to win out, so that the locus of the ball can lie on the X axis.

Thus, between the older and younger ABSL signers, verb signs become somewhat displaced from the body: a progression from no use of space in verb forms to a limited use of space, mostly for spatial verbs. Similarly, the younger group of ISL signers exploit the horizontal X axis more than the older group, specifically in their use of the Z + X diagonal, which appears in twice as many responses for the younger group, though still in a limited fashion.

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The youngest group of ISL signers is very different from all other groups. This is the first group to use both the Z and the X axis fully, showing verb agreement in more than 70% of their responses, in contrast to 25% for the middle group and 20% for the older group. For the youngest group only, the subject has moved off the body, thus allowing for the beginnings of a full-blown agreement system of the sort that we are used to in older and more established sign languages.

The results obtained from the responses to the clips indicate that older signers of both languages hardly use space at the sentence level, when describing a single event. But it is important to point out that they *do* use space at the discourse level. A common use of space in both languages is for contrast and comparison between two discourse topics, e.g., when talking about events that happened in another town and events that took place at home; or when talking about two people, or two groups of people.

ABSL signers often use space to refer to specific people; they direct pointing signs to the real world location of the house of a particular person, and this location serves to identify that person. In addition, signers of both languages often also localize referents, by signing verbs such as SIT or STAND in a specific locus in space.

However, they often do not incorporate these locations in the forms of the verbs of transfer. For example, when describing a video clip showing a woman giving a shirt to a man, some signers (in both languages) localize the man as standing on one side and the woman as standing on the opposite side; but the verb's path movement is not from one locus to the other, but rather on the Z axis, from the signer's body outwards.<sup>9</sup> Such constructions show that, although the language might utilize space

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<sup>9</sup> This pattern of setting up both referents in space, but then moving the verb straight out from the body, along the Z-axis, is quite common among hearing people who are asked to describe events without using speech (Coppola & Newport, 2005).

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for various purposes from early on, the incorporation of space into the grammar takes time.

## Conclusion

To a great extent, language is determined by our physiology: phonological features are determined by our articulatory system (features become grammaticalized within a phonetic space) and the way we conceptualize events is determined by our body. The body is an important resource that new languages can rely on. But they may use it in different ways (for example, ABSL doesn't seem to have role shift, but ISL does).

Leaving the body and developing grammatical categories in the verb system takes time. The fact that, even after a language has developed such a system (ISL), the signer can still fall back on the body point of view, highlights the centrality of the body in sign language linguistic systems, and maybe in other cognitive systems as well.

Studying new sign languages provides novel evidence for a richer view of grammar than can be obtained from the investigation of spoken languages alone, as the latter are all old or descended from old languages. The gradual emergence of a verb agreement system, one that is a robust phenomenon among the youngest group of ISL signers studied here, but yet still not fully consistent among them, requires us to understand language fundamentally as a social system, characterized by the establishment and spread of a linguistic convention through interaction, both inter- and intra-generational, within a community.

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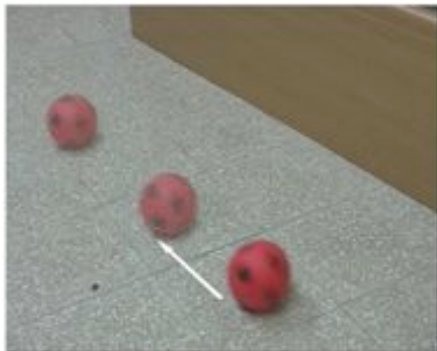
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**Figure 1a.** Frame from video clip showing a woman giving a man a shirt.



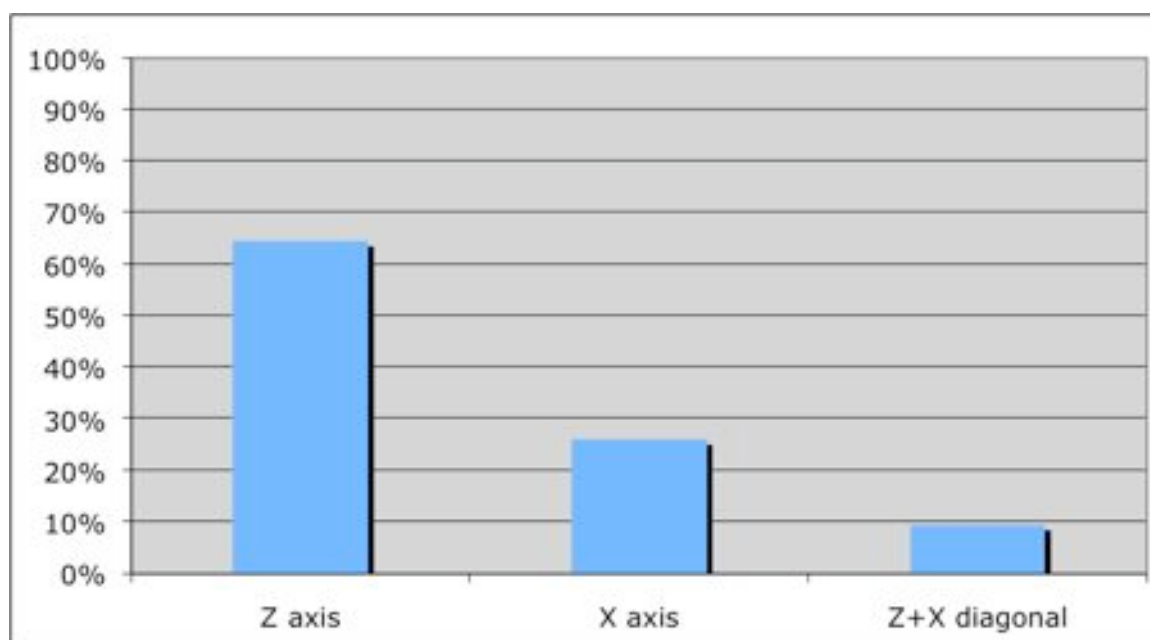
**Figure 1b.** Frame from video clip showing a ball rolling.



**Figure 1c.** Frame from video clip showing a woman rolling a ball.

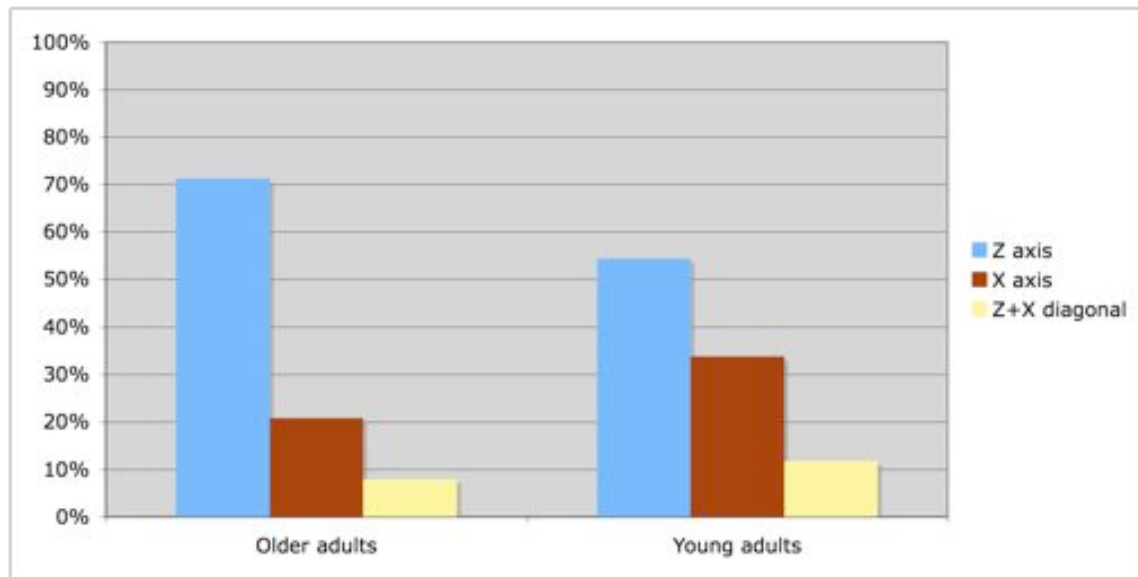


**Figure 2.** Types of path movement.

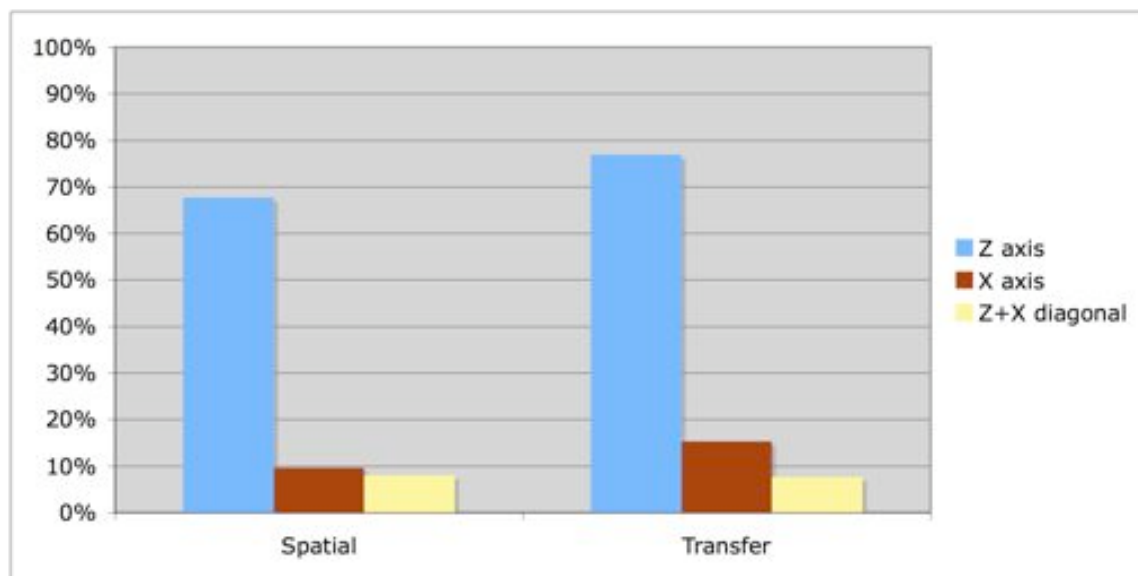


**Figure 3.** Path movement direction in ABSL verbs as a percent of total number of verbs.

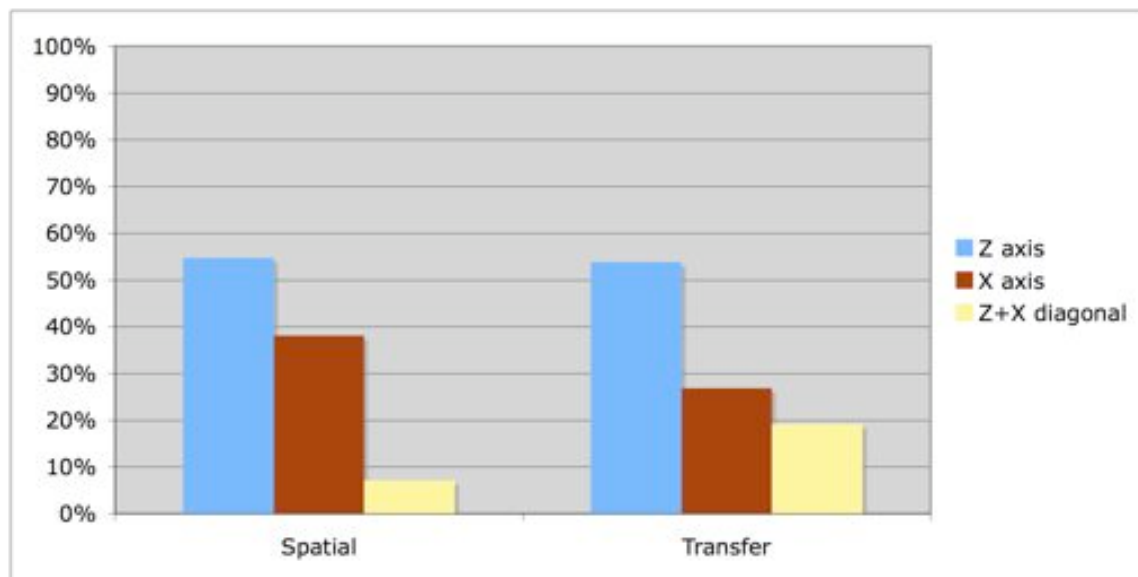




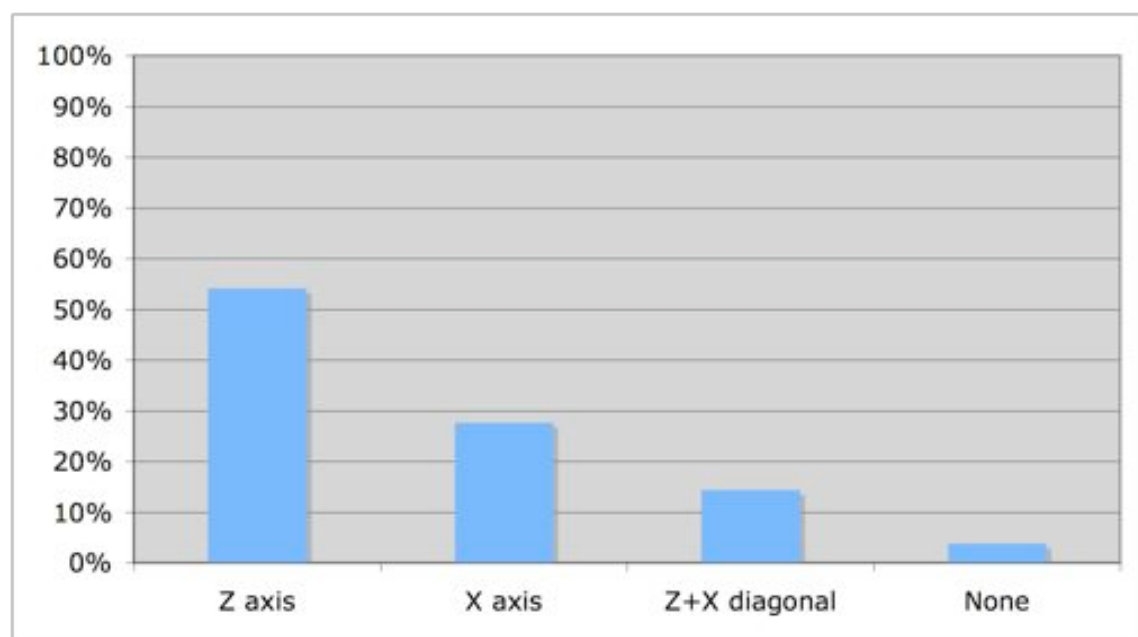
**Figure 4.** Percent use of path movement direction by age group of ABSL signers.



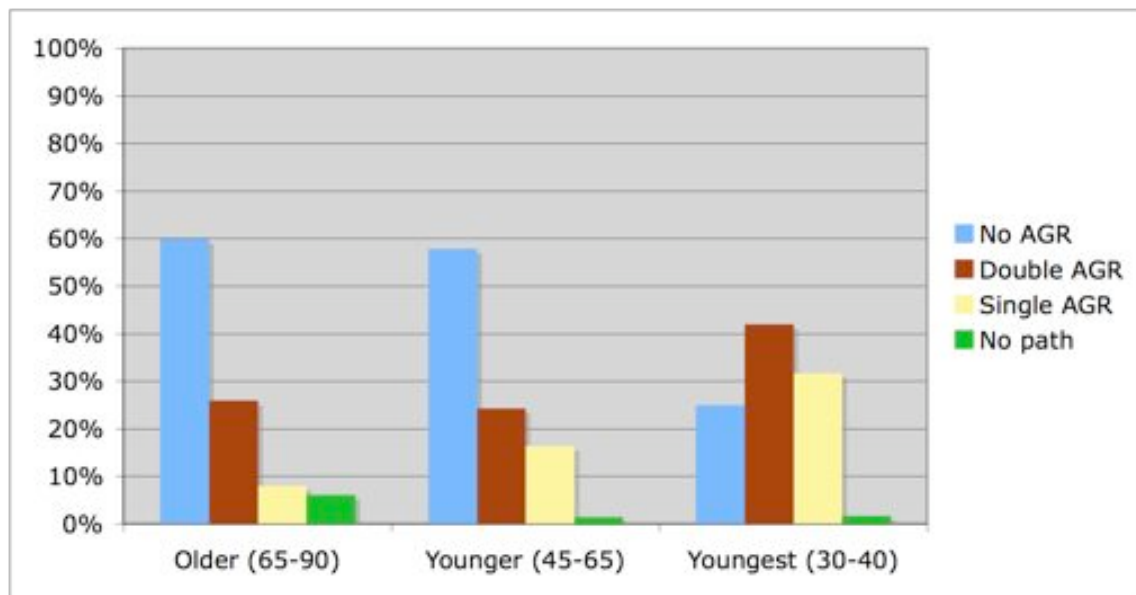
**Figure 5.** Percent use of path movement direction by verb type in older adult ABSL signers.



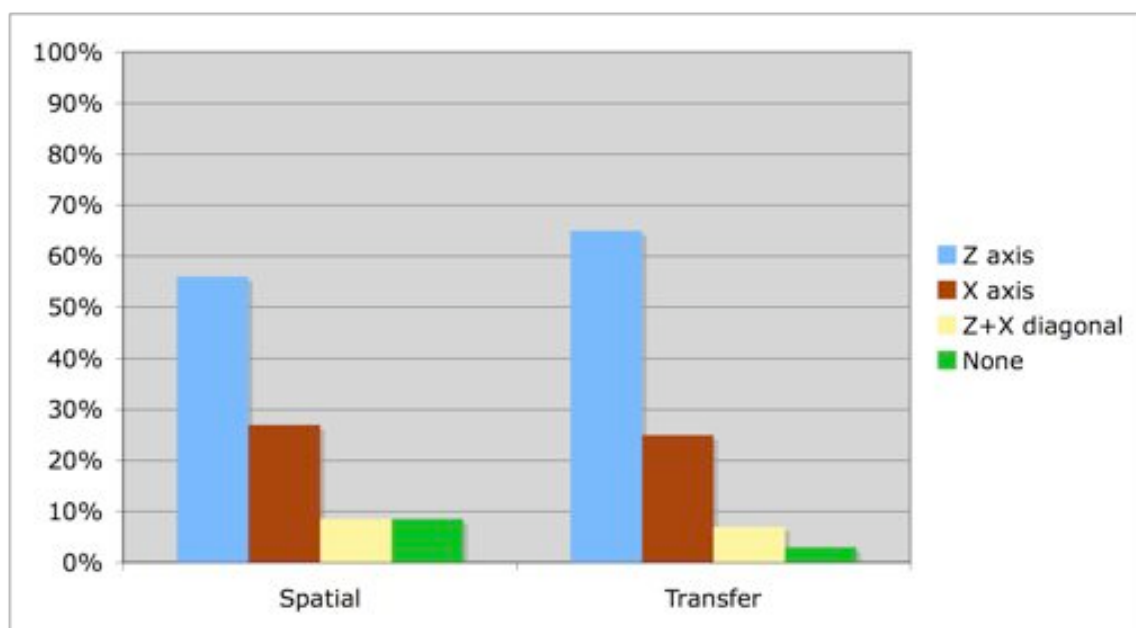
**Figure 6.** Percent use of different axes by verb type in young adult ABSL signers.



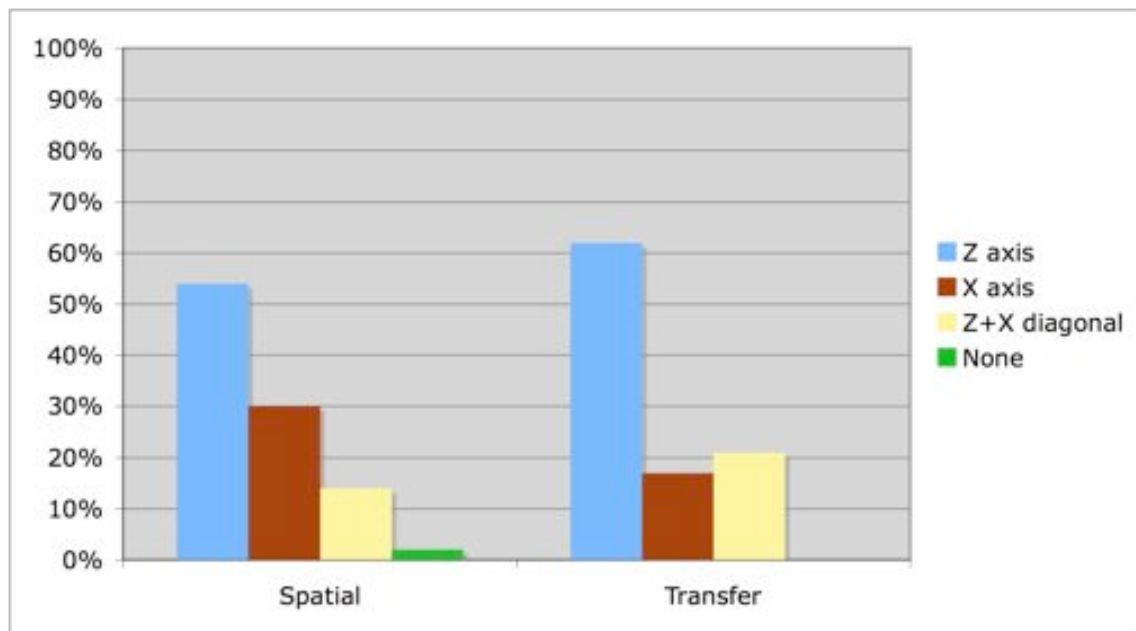
**Figure 7.** Path movement direction in ISL verbs as a percent of total number of verbs.



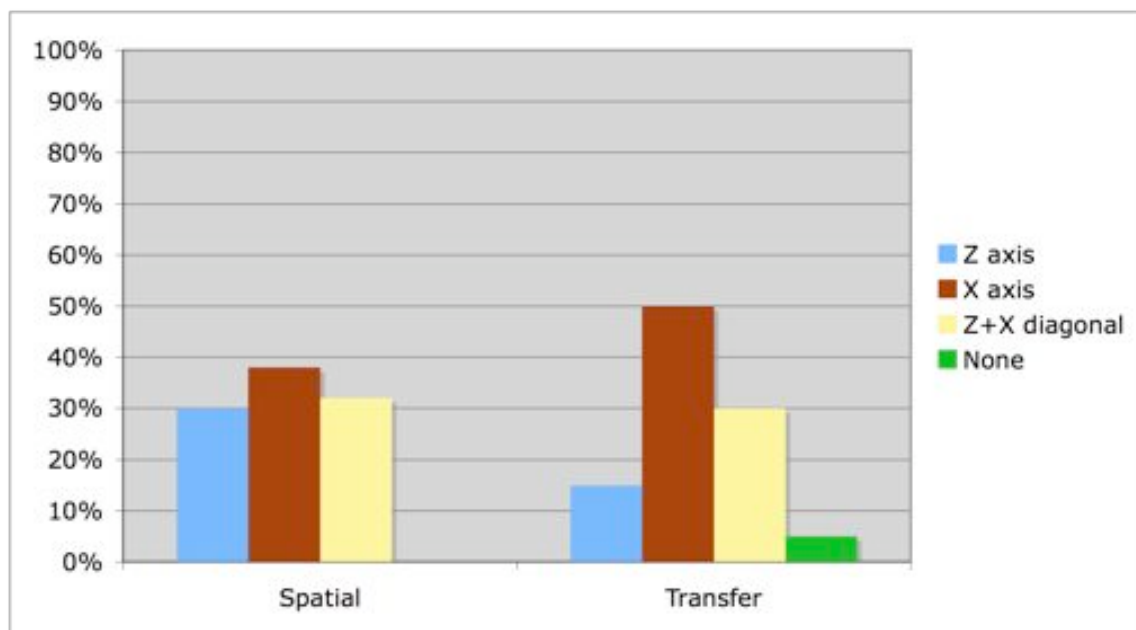
**Figure 8.** Percent use of verb agreement type in three ISL age groups.



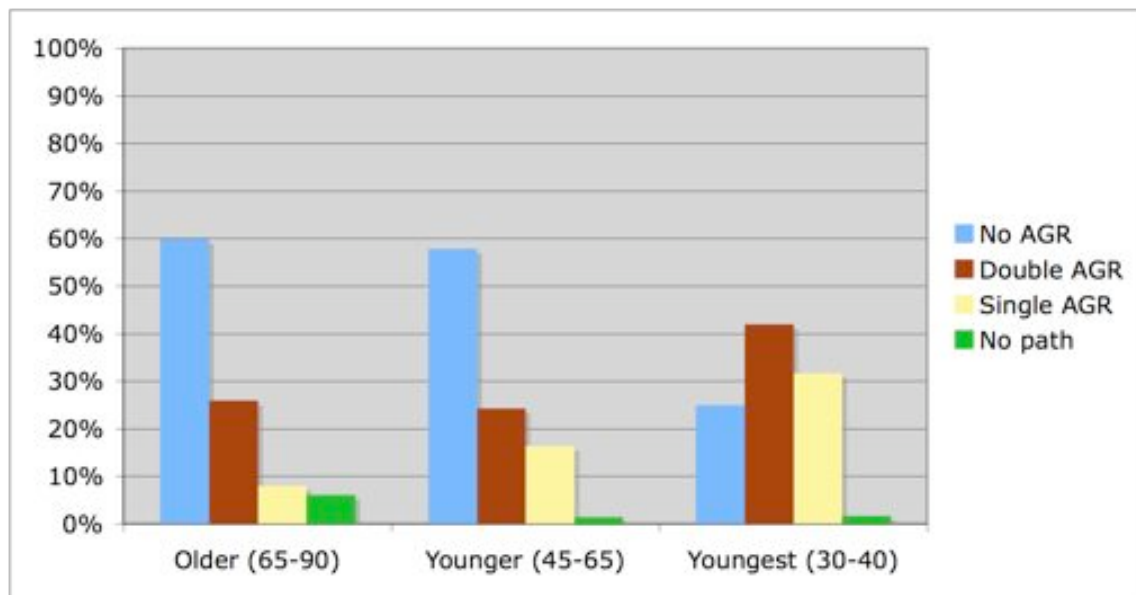
**Figure 9.** ISL older signers' percent use of path movement direction by verb type.



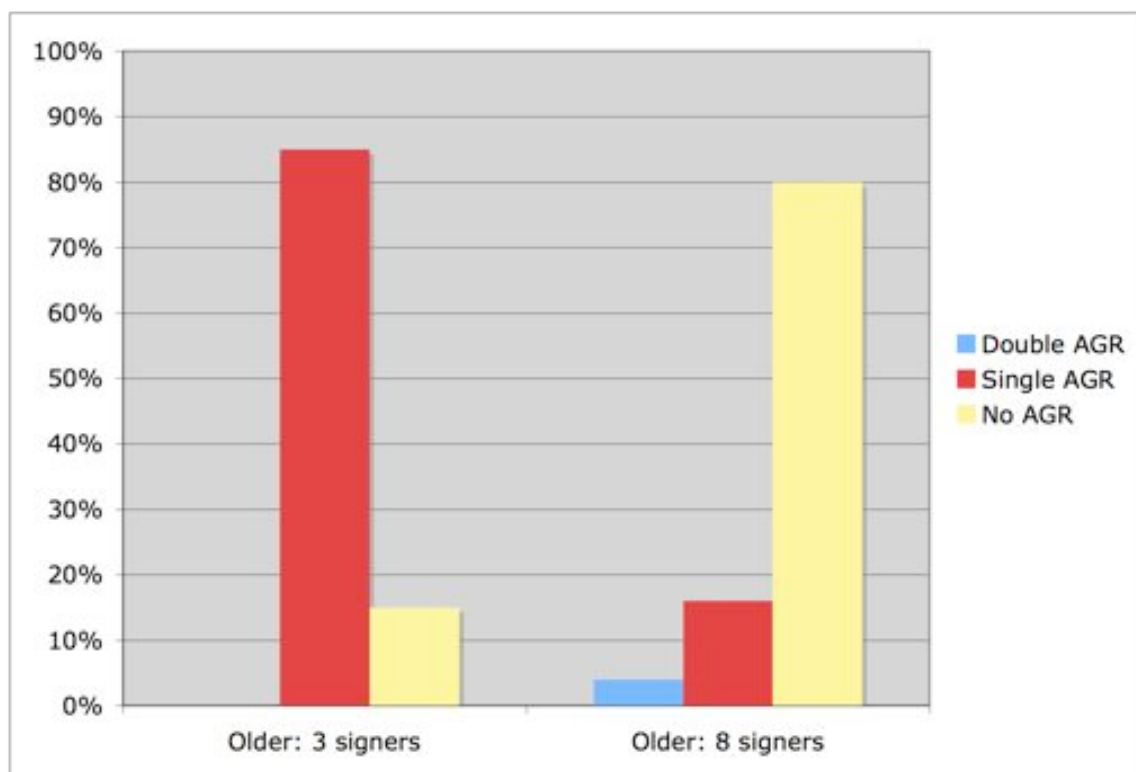
**Figure 10.** ISL younger signers' percent use of path movement direction by verb type.



**Figure 11.** ISL youngest signers' percent use of path movement direction by verb type.



**Figure 12.** Percent use of verb agreement type in three ISL groups.



**Figure 13.** Variation in use of verb agreement among ISL older signers