Poznań Studies in Contemporary Linguistics 46(4), 2010, pp. 367–390

doi:10.2478/v10010-010-0019-1

DESCRIBING MOTION EVENTS IN SIGN LANGUAGES

ENGIN ARIK

Okan University, Istanbul
engin.arik@okan.edu.tr

ABSTRACT

Research has shown that sign languages represent space by using the body and the signing space in front of the signers. To date, it is largely unknown to what extent sign languages differ from one another in their linguistic use of space. The present study addressed this question by conducting an experimental study on basic motion event descriptions in historically unrelated sign languages: American, Croatian, Austrian, and Turkish Sign Languages. It was found that these sign languages are similar to one another in the use of classifiers to encode location, orientation, and movement of objects, and that they are similar in using path-only and path+manner descriptions, while leaving out manner-only descriptions. However, these sign languages differ from one another in their lexical signs, in choosing a particular set of classifiers, in responding to the manipulations of objects in space, and in the ratio of path-only constructions with respect to path+ manner constructions for the same events. Overall, this study contributes to our knowledge of how motion events are encoded in natural human language. Future research will compare the current findings with those from spoken languages to further explore the properties of the language of motion events.

KEYWORDS: Iconicity; sign language; spatial language and cognition.

1. Introduction

Research has shown that sign languages appear to encode spatial properties of events iconically, the form of signs conveys the meaning of words, for example, the shape of articulators, hands, can be similar to the shape of the intended referent. They construct spatial relations gradiently rather than categorically in the signing space in front of the signers (Emmorey and Herzig 2003). They seem to iconically map the real space onto the signed spatial language (e.g. Supalla 1986; Engberg-Pedersen 1993; Taub 2001; Emmorey 2002; Sallandre and Cuxac 2002; Liddell 2003; Talmy 2006; Perniss 2007).

Iconicity is also reflected in the sign grammar. Shepard-Kegl (1985) argued that syntax, semantics, and morphology of American Sign Language consist of locational and motional constituents. Grose, Wilbur, and Schalber (2007) also argued that event characteristics such as states, as well as dynamic events and their transitions are phonologically and morphologically visible in the formation of signs in sign languages. Research has already shown that by studying locative expressions in Turkish Sign Language, which is a relatively old signed language unrelated to other sign languages, there can be language-specific structures even if signers encode space iconically (Özyürek et al. 2010). To date, however, little is known how sign languages differ from one another in their spatial language. The present study addresses this question by investigating the way sign languages (American Sign Language – ASL; Croatian Sign Language – HZJ; Austrian Sign Language – ÖGS; and Turkish Sign Language – TID) describe basic motion events.

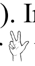
There is a growing interest in the spatial language of sign languages since signers use their bodies and the three dimensional space in front of them to talk about space (Sandler and Lillo-Martin 2006; Emmorey 1996). The signing space can be divided into multiple horizontal and vertical planes: left-right, front-back, and up-down. Interestingly, it appears that sign languages use a special class of predicates called classifiers to encode location, orientation, and motion of entities and their inherent properties such as frontness, flatness, length, and so on (see Supalla 1986; Engberg-Pedersen 1993). It appears that classifiers represent entities such as humans, animals, vehicles, plants, and so on, in a spatial relation. Crucially, classifiers make a direct relationship between linguistic form and corresponding meaning; therefore, iconic. For example, in (1), the ASL signer describes a picture in which two trucks are located on the lateral axis (seen from the body of the signer) and face opposite directions (Figure 1). In her description, the signer fingerspelled *truck* and subsequently used the classifier  with both hands, also called 'VEHICLE' in the ASL literature. The latter signs encode the relative locations of each of the two trucks with both hands on the lateral axis. The fingertips of each hand encode the orientations of the trucks, facing in opposite directions. Because her hands are not moving, the description indicated that the two trucks are stationary. (Transcription conventions: RH = right hand, LH = left hand, # = fingerspelling, ____ = continuous sign, $_{\text{static}}$ = stationary/not moving, $_{\text{move to …}}$ = in motion.)

Figure 1. Two trucks are on a lateral axis and facing opposite directions.

(1) ASL

RH: #TRUCK  static
LH:  static

'Two trucks are located on the lateral axis [one is on the left and the other one is on the right] and are facing in opposite directions.'

Once signers establish the referents such as figure and ground in a spatial relation by using the signing space and classifiers, they can modify the expressions. For example, suppose that the ASL signer in (1) moves her left hand to her left while her right hand remains stationary. This expression indicates that while the truck on the right, facing right, was stationary, the other truck on the left moves toward the left. Suppose also that the signer in (1) orients the fingertips of her hands toward each other then moves her hands toward each other. Then, as soon as the fingertips are in contact, she bends them. This expression indicates that the truck on the left and the other truck on the right move toward each other and crush.

Given these observations, it is interesting to ask whether and how sign languages differ from each other in representing space. In a previous study, I addressed this question by focusing on the descriptions of static situations in sign languages (Arik, submitted). In that study, signers of Turkish, Croatian, American, and Austrian Sign Languages (TID, HZJ, ASL, and ÖGS, respectively) were asked to describe pictures in which the locations and orientations of objects were manipulated. The results showed that the four language groups of signers did not use the same set of classifiers. For example, in describing Figure 1, while ASL signers use the classifier  (as in (1)), TID and HZJ signers use the classifier  as in (2), which also specifies the location and orientation of objects. In (2), the TID signer's description indicates that one of the trucks is on the left and the other one is on the right. They are facing each other since the fingertips of the classifier  indicate the front of the referred entities, the trucks. The signer also moves his hands away from each other indicating that the two trucks are in motion, although the trucks in the picture are stationary.

The results also showed that the direct mappings of the locations and orientations of the objects varied in the way these four sign languages convey spatial information: the ASL, HZJ, and ÖGS static situation descriptions carried significantly more direct map-

(2) TID

(...) 

RH: ______________________________ move to right
LH: ______________________________ move to left

'(Two trucks) one is on the left and the other one is on the right, facing in opposite directions, and going away from each other.'

pings of the locations and orientations of the objects than the TID static situation descriptions did. For example, in describing Figure 1, the ASL signers use the left-right axis of their signing space only as in (1). In contrast, the TID signers use not only the left-right axis (2) but also the front-back axis (3) of their signing space.

(3) TID

(...) 

RH: ______________ static
LH: ______________ static

'(Two trucks) one is on the proximal and the other one is on the distal region, facing in opposite directions.'

The findings further demonstrated that only orientational information, but not axial, locational, and situational information from real space, was mapped directly one-to-one onto the signing space in the four sign languages. For example, although the picture in Figure 1 is stationary, the TID signer in (2) moves his hands indicating that the two trucks are moving away from each other. Therefore, in his description, the static situation was not exactly mapped onto the signing space.

In sum, the previous study (Arik, submitted) showed that the four unrelated sign languages (ASL, HZJ, ÖGS, and TID) differ from each other in the signed descriptions of the static situations. Do sign languages differ from each other in describing basic motion events? The present study addresses this question.

2. Present study

In order to show how sign languages differ from one another in talking about motion events, I follow Talmy's proposal (Talmy 1983, 2000: 241). He proposed that the uses of spatial relationals for a particular spatial configuration are affected by several factors. These factors are the following: (1) Assigning a figure and a ground, geometries of the figure and the ground; (2) (A)symmetrical relation between the figure and the ground; (3) Orientation of the figure with respect to the ground; (4) Presence/absence of contact of the figure with the ground; (5) Presence/absence of further reference objects; (6) Further embeddings of one figure-ground configuration within another; (7) Adoption of a perspective point from which to regard the configuration; and (8) Change in a location of a figure or perspective point through time (motion). In the current study, then, I examine how these factors influence the way ASL, HZJ, ÖGS, and TID signers describe simple motion events. In particular, I pay attention to the following factors: the use of classifiers; the effects of spatial properties of the motion events, i.e. axes, location, orientation, and motion type; and the manner and path encodings of the motion events.

3. Method

3.1. Participants

Ten ASL, eight HZJ, eight ÖGS, and eight TID signers participated in this study (age > 18). The majority of the ASL signers were Deaf native signers. The TID, HZJ, and ÖGS signers were native signers or in other words, at least, second generation signers (signers who learned their sign language from deaf parents from birth). To avoid possible dialectical differences, the participants were selected from the same regions: ASL from the Indianapolis area, HZJ from Zagreb, ÖGS from Vienna, and TID from Izmir. All of the signers attended schools for the deaf in their countries and were active members of their Deaf communities.

3.2. Materials

In order to elicit data on the descriptions of spatial situations, I created movies in which small toys (dolls and animals) were in various spatial arrangements. The background color was white-gray or blue. The background and shadows of the objects were kept to give a 3-D impression. The illusion of motion was created by stop-motion animation techniques. Each movie consisted of more than five frames taken from approximately 30 degrees. In each frame, the position of the "moving" object changed. Then, the frames were put together in iMovie to create a motion picture. The end result was a movie about 2 seconds long. Before I collected data, I showed these movies to speakers and signers of various languages, who did not participate in this study, to make sure that the movies looked like motion events. Moreover, the participants' feedback indicated that the stimuli were successfully created.

The objects in the movie clips were put either on a lateral (left–right) or sagittal (proximal–distal) axis. Figure 2 illustrates the manipulations of the object locations.

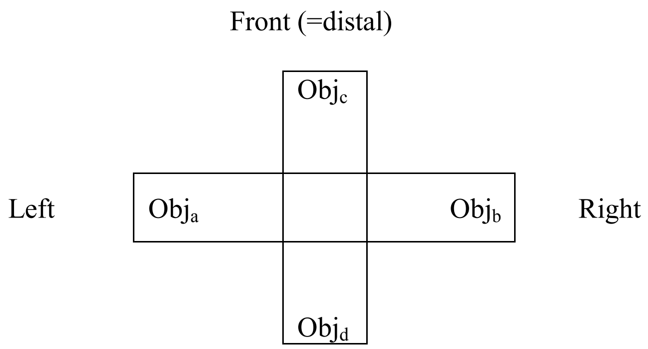


Figure 2. Object locations and axes from a bird's eye perspective.

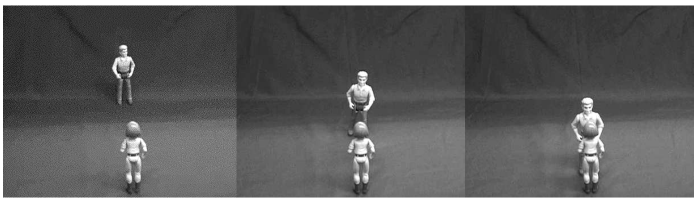
The objects were either facing the same direction or each other. Additionally, one of the objects moved toward the other object then either stopped in the middle of the screen (*toward*-event) or stopped right before the other object (*to*-event). Table 1 gives a list of descriptions of the movies for the testing items.

An illustration of the testing item #6 is given in Figure 3. In Figure 3, there are two dolls (a male and a female) located on the sagittal axis. The two dolls are facing each other. The male doll in the distal region moves to the female doll and stops in the proximal region right before the female doll (Figure 3c; *to*-event).

All descriptions were video-recorded for analysis by using a JVC mini DV digital camcorder, which was set next to the addressee. The height of the tripod was almost the same as the addressee's height, who was sitting in a chair. The movies were presented

Table 1. The descriptions of the testing items.

Order	Location	Orientation	Motion	Description
16	Lateral	Same	To	The woman on the right walks to the man on the left, stops right behind him.
29	Lateral	Same	Toward	The pig on the right walks toward the cow on the left, stops in the middle of the screen. Both face left.
18	Lateral	Each other	To	The woman on the right walks to the man on the left. They are facing each other. She stops right in front of him.
5	Lateral	Each other	Toward	The cow on the left walks toward the pig, stops in the middle of the screen. Both are facing each other.
19	Sagittal	Same	To	The woman in the proximal region walks to the man in the distal region, stops right behind him.
12	Sagittal	Same	Toward	The pig in the proximal region walks to the cow in the distal region, stops in the middle of the screen. They are facing the same direction.
6	Sagittal	Each other	To	The man in the distal region walks to the woman in the proximal region, stops in front of her. They are facing each other.
1	Sagittal	Each other	Toward	The cow in the distal region walks toward the pig in the proximal region. They are facing each other. The cow stops in the middle of the screen.



3a 3b 3c

Figure 3. Still frames of the testing item #6.

using a laptop with either a 13-inch screen or a 15-inch screen. The video-recordings were exported to an Apple computer using iMovie then exported to Cleaner 6 software for compression (DVD-high quality compression). The testing items can be found under the Dissertation link of my website at <https://sites.google.com/site/enginarikweb>.

3.3. Procedure

The participants were asked to describe the movies to another physically present native signer. The experimenter gave the directions and showed the movies to the participants. The participants were told that their descriptions should be "understood" by the addressee who was a native signer and did not see the stimuli before or during the sessions. They sat face-to-face. The participant was told that there was no right or wrong description for the situations in the pictures and movies and the tasks were not about memory or intelligence. When asked, the stimulus was shown more than once, up to three times, which rarely happened. The entire data collection session, including two warm-up movies, lasted less than ten minutes.

3.4. Design

In this exploratory study, a total of thirty-three short movies were used, in which the locations, orientations, and motions of two objects were manipulated. The initial two movies were practice items to acclimatize the participants to the nature of the experiment. Therefore, they were not analyzed. Additionally, there were eight testing items and twenty-three fillers. While the order of the testing items and fillers was random, each participant received the items in the same order. This decision was due to small sample size and crosslinguistic nature of the study.

3.5. Coding and analysis

Elicited descriptions were later evaluated by native signers of each language and recognized as grammatical and acceptable linguistic expressions. They also helped coding the data. An independent rater coded 23% of the data to establish consistency among raters. An inter-rater reliability analysis showed that the ratings were consistent ($r = .84$).

For the qualitative analysis, the signed descriptions were coded according to the use of the classifiers. The descriptions were also coded according to whether the path and manner of the motion were encoded linguistically.

For the quantitative analysis, there were four measures: *axial*, *locational*, *orientational*, and *motion type*. The signing space, which is the space in front of signers, was divided into two: left-right plane vs. front-back plane. "Axial" referred to whether signed description directly and exactly corresponded to the lateral/sagittal information in the movies. "Locational" referred to whether signed description matched the locations of the objects in the movies. "Orientational" referred to whether signed description carried the exact orientations and directions of the objects in the movies. "Motion type" referred to whether signed description involved linguistic events exactly corresponding to "To" and "Toward" events in the movies. For each measure, the description of the motion event was compared to the stimulus according to one-to-one correspondence. When the participants correctly gave information on the four measures, they scored 4, which might indicate one-to-one mapping. Suppose that an English speaker said, "The boy walked to the girl" for Figure 3. This description got a score of 1, since it only gave the motion type information correctly. The rest was linguistically unspecified.

An example is given here to demonstrate the coding procedure. Consider Figure 3, in which the male doll in the distal region moves to the female doll and stops in the proximal region right before the female doll. The ASL signer in (4) described that movie.

(4) ASL

RH: WOMAN ______________________ static
LH: MAN ______ move to proximal

'The woman is standing in the proximal region and the man is standing in the distal region. While they are facing each other, the man approaches the woman and stops right before her.'

In this example, the ASL signer established the referents: she signed the lexical items WOMAN and MAN and immediately after she used the corresponding classifier for each referent. This classifier produced by the right hand encoded that in the signing space, WOMAN was an upright position since the index finger was vertical with respect to the signer's body, located on the proximal region of the signing space, facing the distal region because the ventral of the index finger of the classifier encoded the front of the referent, WOMAN, and stationary because the right hand remained stationary after the referents were established. Similarly, the classifier produced by the left hand encoded that MAN was an upright position, located in the distal region of the signing space, and facing the proximal region because the ventral of the index finger of the classifier  encoded the front of MAN. Then, the ASL signer moved her left hand from the distal to the proximal region of her signing space then stopped right before her right hand indicating that MAN walked to WOMAN and stopped in front of her. The fact that axis (proximal–distal), location (woman in the proximal region; male in the distal region), orientation (woman facing to the distal region; male facing to the proximal region), and motion (woman stationary; man moving to woman) matched exactly those spatial features in the movie resulted in a score of 4.

4. Results

4.1. Classifiers

The data analysis revealed that, as expected, participants used classifiers to encode the locations, orientations, and movements of the objects. These classifiers consisted of the handshapes , , , , , , , and . Table 2 summarizes these observations. A strong advocate of one-to-one mapping might expect to see the use of the same set of these "iconic" classifier handshapes across conditions and across languages. However, this was not the case. As Table 2 shows, none of the classifiers were used across conditions and languages. The classifiers observed across the ASL, HZJ, ÖGS, and TID descriptions were  and , which are the classifier handshapes used in signs meaning such as *look*, *walk*, and *stand*. These observations indicate both a common strategy and a variation: In referring to motion events, sign languages use classifiers, but the set of these classifier constructions varies across sign languages.

Table 2. The classifiers across the sign language descriptions.

Classifier	ASL	HZJ	ÖGS	TID
	√		√	√
	√	√	√	√
	√	√	√	√
	√	√		
	√			
	√			√
	√			
	√		√	

I now give examples for these observations. The predicate can be used in ASL, HZJ, ÖGS, and TID when describing Figure 3 in which a male and a female located on the sagittal axis face each other and the male doll in the distal region moves to the female doll in the proximal region. Although the lexical signs MAN and WOMAN varied across the sign languages, the form and meaning of the classifier was the same as explained for the ASL example in (4). The examples that follow are given from HZJ in (5), ÖGS in (6), and TID in (7). In these examples, the ASL, HZJ, ÖGS, and TID signers used the predicate to encode the locations, orientations, and movements of the dolls in the signing space. Since these descriptions exactly and correctly matched the spatial information in the movie, they received a score of 4.

(5) HZJ

RH: MAN ________________________ move to proximal
LH: WOMAN ____________ static

'The man is standing in the distal region and the woman is standing in the proximal region. They are facing each other. The man approaches the woman and stops right before her.'

(6) ÖGS

RH: WOMAN ________________________ static
LH: MAN ____________ move to proximal

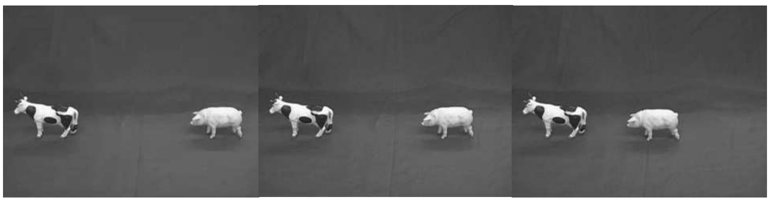
'The woman is standing in the proximal region and the man is standing in the distal region. While they are facing each other, the man approaches the woman and stops right before her.'

(7) TID

RH: MAN ________________ static
LH: WOMAN ____ move to proximal

> 'The woman standing in the proximal region and the man standing in the distal region are facing each other. The man moves to and stops right before the woman.'

Although the sign languages encoded axial, locational, orientational, and motional information iconically by using classifiers, the signers used a variety of classifiers depending on the sign language (as can be seen in Table 2). Now consider Figure 4. For this motion event, the signers used a variety of predicates. In referring to the locations, orientations, and movements of the animals in Figure 4, the ÖGS signer in (8) used the classifier . but the classifier was neither produced nor grammatical/acceptable in the other sign languages. Instead, for example, the HZJ signer in (9) used the classifier .



4a 4b 4c

Figure 4. Still frames of the testing item #29 in which a cow and a pig are located on the lateral axis, facing left. The pig moves toward the cow and stops in the middle.

In (8), the OGS signer used the lexical signs COW and PIG and produced the classifier to locate the cow on her left hand side and the pig on her right hand side. Thus, axial and locational information directly and exactly matched one-to-one to the movie. The

(8) ÖGS

RH: COW PIG ________ move to left

LH: COW ________________ static

‘The cow is on the left and facing left. The pig is on the right and facing left. The pig goes to and stops right before the cow.’

ventral of classifier encoded the front of the cow and pig so that they were facing left. Therefore, orientational information also matched to that in the movie. The fact that her right hand (PIG) moved to her left hand (COW) encoded that the pig went to the cow and stopped just behind it. Thus, motion type did not exactly match since the pig stopped in the middle of the image in the movie. In (9), below, the HZJ signer used a similar construction by using the classifier . The dorsal of the index and middle fingers in the classifier indicated the fronts of the pig and the cow. Notice also that, as expected, the lexical signs corresponding to PIG and COW were also different.

(9) HZJ

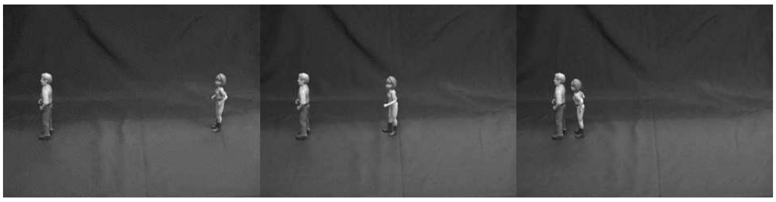
LH: COW ________________ static

RH: PIG ________ move to left

‘The cow is on the left and facing left. The pig is on the right and facing left. The pig goes to and stops right before the cow.’

4.2. Mappings and strategies

Careful examination of the data reveals the patterns and strategies. First, I observed that spatial information in most of the descriptions exactly matched one-to-one to spatial information in the movies. Consider Figure 5 and its descriptions in ASL in (10), HZJ in (11), ÖGS in (12), and TID in (13). In these examples, as expected, the signers produced different lexical signs (MAN and WOMAN) depending on their language. However, they used the classifier or , or both. More importantly, they located the classifiers referring to MAN on the left side and to WOMAN on the right hand side of their signing space. The ventral of the index finger in the classifier and the dorsal of the index and middle fingers in the classifier , referring to the legs of an animate being, indicated that both MAN and WOMAN were facing left. The signers also moved their right hand (WOMAN) to the left and stopped right before the left hand (MAN). Therefore, their descriptions mapped the axial, locational, orientational, and motion type information from the motion event directly one-to-one to the linguistic signing space.



5a 5b 5c

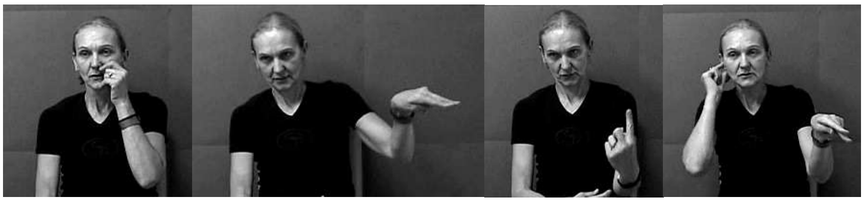
Figure 5. Still frames of the testing item #16. The female and male dolls are located on the lateral axis, facing the same direction. The female doll moves to the male.

(10) ASL

RH: MAN WOMAN ______________ move to left
LH: ______________________________________ static

'The man on the left is standing and looking to the left. The woman on the right is walking next to him.'

(11) HZJ



RH: WOMAN
LH: MAN ______

RH: ______ ______ move to left static
LH: ______ static static

'The man on the left is looking to the left and standing. The woman on the right is walking next to the man.'

(12) ÖGS

RH: TWO DOLL MAN OTHER
LH: ______

RH: WOMAN ______ move to left
LH: ______ static

'There are two dolls. The man on the left is standing and facing left. The other one on the right is walking next to him.'

(13) TID

RH: MAN BACK GIRL ______ move to left
LH: ______ static ______ static

'The man, his back, is looking to the left and the woman is going to him from his back.'

Second, information on the axis may not be directly mapped onto the signing space. For example, the TID signer in (14) described the same movie, illustrated in Figure 5. He located the dolls on the sagittal axis of his signing space. The female in the proximal region moved to the distal region up to the male's location. His descriptions show that information on axes in the real space does not have to be mapped directly and precisely.

(14) TID-P4

RH: MAN BACK ______ static
LH: ______ move to distal static

'The man, his back, is away and facing away. The other one is walking next to him from behind.'

Third, locational information may not be directly mapped onto the signing space either. For example, in (15) the ASL signer located the dolls on the lateral axis of her signing space. However, the movement was not from right to left but left to right: the female on the left moved to the right up to the male's location.

(15) ASL

RH: MAN ______________________________ static
LH: WOMAN ______________ move to right

'The man is on the right and the woman is on the left. Both are facing left. The woman goes to and stops right before the man.'

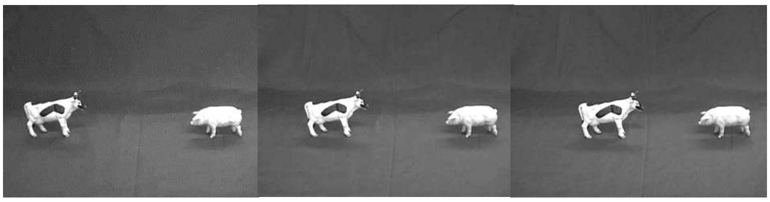
Fourth, orientational information may not be directly mapped onto the signing space either. In (16), the HZJ signer mapped the axial, locational, and motional information directly. But, the fact that the ventral of the index fingers in the classifier were facing each other indicated that the dolls were face-to-face instead of facing left. Therefore, orientational information in (16) did not match one-to-one to that in the movie.

(16) HZJ

RH: WOMAN ______________ move to left
LH: MAN ______________________________ static

'The man is on the left and the woman is on the right. While they are facing each other, the woman approaches and stops right before the man.'

Fifth, motion type information may not be directly mapped onto the signing space either. Consider Figure 6. The ÖGS signer description for this motion event is given in (17). Even though the cow stops in the middle of the screen, according to the ÖGS signer in (17) it stops right before the pig.



6a 6b 6c

Figure 6. Still frames for the testing item #5 in which the cow and the pig were located on the lateral axis, facing each other. The cow on the left moved toward the pig on the right and stopped in the middle of the screen.

(17) ÖGS

RH: PIG ______________________________ static
LH: COW ______________ move to right

> ‘The pig is on the right and facing left. The cow on the left and facing right is walking to the pig.’

These observations, so far, suggest that, in ASL, HZJ, ÖGS, and TID, there is more than one mapping strategy for the axes, locations, orientations, and motional characteristics of the objects from the real space to the linguistic signing space. These strategies lead to variations in representing motion events in sign languages.

I now turn to the results from the quantitative analysis to investigate whether one-to-one mappings vary across the ASL, HZJ, ÖGS, and TID motion event descriptions. A 4 (language: ASL versus HZJ versus ÖGS versus TID) × 2 (axis: lateral versus saggital)

× 2 (orientation: objects facing each other versus facing away from each other) × 2 (motion: motion of the Figure towards versus to the Reference object), repeated measures ANOVA was carried out with axis, orientation and motion as within participant factors and language as a between-participant factor.

The analysis for the between-participant effects revealed that the main effect of language was not significant, $F(3, 30) = 2.23$, $p > .05$, indicating that the cumulative scores did not vary with respect to language. Therefore, there was no difference among these four sign languages in terms of overall one-to-one direct correspondence between the signed descriptions and the spatial information in the movies. The analysis for the within-participant effects showed that the main effects of location, $F(1, 30) = .33$, $p > .05$, orientation, $F(1, 30) = 1.21$, $p > .05$, and motion type, $F(1, 30) = 3.50$, $p > .05$, were not significant, either. However, there were significant interactions: location × language, $F(3, 30) = 6.84$, $p < .05$, location × motion type, $F(1, 30) = 4.29$, $p < .05$, and location × orientation × motion type, $F(1, 30) = 4.52$, $p < .05$. These findings indicated that iconicity not only differs per language for one particular factor, but for a set of factors.

Given these findings, one might ask whether the manipulations in the movies have any effects on the signed productions per language. To address this question, I analyzed the data from each language separately by conducting a 2 (axis: lateral versus saggital) × 2 (orientation: objects facing each other versus facing away from each other) × 2 (motion: motion of the Figure towards versus to the Reference object), repeated measures ANOVA with axis, orientation and motion as within participant factors.

The analysis of the ASL scores revealed that the effect of motion type (*to* $M = 3.75$ $SE = 0.14$ vs. *toward* $M = 3.35$ $SE = 0.16$, $F(1, 9) = 16.00$, $p < .05$) was significant. There was no other significant difference. These findings suggest that if the effects of location and orientation are ignored, the ASL descriptions for motion type *to* have more spatial information than those for *toward*.

In HZJ, a significant main effect was observed for location (lateral $M = 3.96$ $SE = 0.18$ vs. sagittal $M = 3.65$ $SE = 0.15$, $F(1, 7) = 6.48$, $p < .05$). There was no other significant effect. These findings suggest that if the effects of facing and motion type are ignored, the HZJ descriptions for the lateral positioning of the objects have more spatial information than those for sagittal positioning of the objects.

The analysis for the ÖGS scores confirmed that there was no significant difference. However, in TID, a significant main effect was found for location (lateral $M = 3.18$ $SE = 0.18$ vs. sagittal $M = 3.68$ $SE = 0.15$, $F(1, 7) = 14.00$, $p < .05$). There was no other significant effect. These findings suggest that if the effects of facing and motion type are ignored, the TID descriptions for sagittal positioning of the objects involve significantly more spatial information than those for lateral positioning of the objects.

In sum, the results confirmed that the signed descriptions contained information about the axis and location as well as the orientation and the motion type, indicating that there were mapping strategies and patterns in the data. Nonetheless, the amount of spatial information for one-to-one mapping did not vary across the ASL, HZJ, ÖGS, and TID data. However, the effects of particular manipulations on the descriptions of motion events varied across sign languages: the ASL scores were significantly varied when the motion type was manipulated (*to* > *toward*); the TID and HZJ scores were significantly varied when the positionings of the objects were altered. But, in TID, the scores were higher when the objects were located sagittally whereas, in HZJ, the scores were higher when the objects were located laterally. In contrast, the ÖGS scores were not affected by the manipulations. In the next section, path and manner encodings are explored.

4.3. Path and Manner

The signed descriptions gave information about the path and manner of the motion events. All of the descriptions encoded the path information of the motion. But none of the descriptions encoded only the manner of the motion. Path-only and path+manner encodings varied across sign languages. The TID data included path-only descriptions more than the data from the other sign languages; whereas, the HZJ data included path+manner encodings more than the data from the other sign languages. Table 3 summarizes these findings.

Table 3. Percentages of path and manner encoding strategies.

	ASL	HZJ	OGS	TID
Path only	53.75	36.61	43.75	65.63
Path+Manner	46.25	63.39	56.25	34.37
Total	100	100	100	100

I now illustrate these observations by giving examples. The HZJ signer in (18) and the TID signer in (19) described the motion event given in Figure 6 above, in which the cow and the pig were located on the lateral axis, facing each other. The cow on the left moved toward the pig on the right and stopped in the middle of the screen. In (18), the HZJ signer used the classifier  where the index and middle fingers represented the legs of the animals. Also, the dorsal of the index and middle fingers encoded the orientations of the pig and the cow and movement of the cow toward the pig. While moving her left hand (COW), she also moved her index and middle finger back and forth indicating the manner of the action – the legs of the animals were moving, a walking action. The movement of the left hand from left to right encoded the path of the motion while the movement of the index and middle fingers of the left hand encoded the manner of the motion. This construction can be roughly translated as 'go+walking'. Therefore, the HZJ description in (18) encoded path and manner together in a single classifier construction.

(18) HZJ

(…) 

(…) RH: ______________________ static
LH: ______________________ move to right

‘(The cow is on the left and the pig is on the right. They are facing each other). The cow is walking toward the pig.’

In contrast, the TID signer in (19) used the classifier where the fingertip of the index finger represented the orientations of the cow and the pig; thus, they were facing each other. The TID signer then moved his left hand (COW) straightly toward his right hand (PIG) indicating that the cow moved toward the pig. Therefore, his description carried path information of the movement of the pig. However, he did not move his finger indicating that the manner of the motion was not encoded. Therefore, the classifier construction in (19) encoded path only.

(19) TID

(…) 

(…) RH: ______________________ static
LH: ______________________ move to right

‘(The cow is on the left and the pig is on the right. They are facing each other). The cow goes toward the pig.’

These examples have illustrated that the signers can encode path and manner in a single classifier construction. However, some of the classifier constructions omit the manner of motion events. Moreover, none of the classifier constructions carry only manner information. This preliminary study also shows that the sign languages vary in the way they use path-only and path+manner constructions.

5. Conclusion

Two questions guided this research: How do signers describe motion events? To what extent do sign languages differ from one another in their linguistic structures employed in those descriptions? This preliminary study reported findings from an experimental study conducted on basic motion event descriptions in four unrelated sign languages: ASL, HZJ, ÖGS, and TID. In the experiment, the locations, orientations, and motion types of the objects were manipulated. The data analysis of the signed descriptions of these manipulations revealed variations and patterns in ASL, HZJ, ÖGS, and TID.

The data shed light on the variations and similarities among sign languages. As suggested in previous works such as Emmorey (2002) and Talmy (2006), the results indicated that ASL, HZJ, ÖGS, and TID use classifiers, which give information about the location, orientation, and movement of the objects in the motion event. Nonetheless, these languages do not use the same set of classifiers. For example, in the present study, the classifier  was found only in the ASL descriptions; whereas, the classifier  was found only in the ÖGS descriptions. The previous study (Arik, submitted) also found similar results in the descriptions of spatial static situations. This finding suggests that while encoding spatial motional information in classifier constructions is common among sign languages, choosing particular constructions is most likely governed by the linguistic principles of each language. Therefore, future research will examine the semantics and syntax of these constructions.

The results also indicated that the ASL, HZJ, ÖGS, and TID motion event descriptions carry the same amount of spatial information (axial, locational, orientational, and motion type). Nevertheless, the manipulations of the object locations, orientations, and motion type (*to* vs. *toward*) cause different effects in these sign languages: the ASL scores were significantly varied when the motion type was manipulated (*to* > *toward*); the TID and HZJ scores were significantly varied when the locations of the objects were altered. But, in TID, the scores were higher when the objects were located sagittally than laterally whereas, in HZJ, the scores were higher when the objects were located laterally than sagittally. In contrast, the ÖGS scores were not affected by the manipulations. This finding suggests that despite the fact that signers use the signing space to represent the real space, they use a variety of mapping strategies. Crucially, these mapping strategies are not the same across sign languages.

The previous study (Arik, submitted) found that the ASL, HZJ, and ÖGS static situation descriptions carry significantly more direct mappings of the locations and orientations of the objects than the TID static situation descriptions. Additionally, the effects of the manipulations varied across sign languages. While the ASL and ÖGS descriptions gave the same amount of spatial information regardless of the manipulations, the TID and HZJ descriptions were altered. These findings together with the present findings suggest that the mapping strategies can vary across the static situation descriptions and the motion event descriptions as well as among sign languages.

Further analysis of data showed that none of the signers only signed for manner of motion. Instead, they either encoded path or path+manner of the motion. This finding suggests further investigation in other sign languages. Nonetheless, path-only and path+manner encodings varied across sign languages. The TID data included path-only descriptions more than the data from the other sign languages, whereas the HZJ data included path+manner encodings more than the data from the other sign languages. Whether the typology is correct needs to be extended is another – additional – research question, which is not addressed in the current contribution but will be addressed in the future research.

Sign languages carry more spatial information than spoken languages do (Talmy 2006). This study shows that, in their encoding for basic motion events, the sign languages studied are similar to each other (1) in using classifiers of location, orientation, and movement, (2) in the amount of spatial information directly mapped from the real space to the linguistic signing space, and (3) in path-only and path+manner encodings of motion. The present study also shows differences among the sign languages studied: (4) they do not use the same set of classifiers, (5) the spatial arrangements of the objects in the real space have different effects on the mapping strategies, and (6) they have different preferences for the encodings of path-only and path+manner.

I believe that future research comparing these findings with those from spoken languages and co-speech gestures can be an important contribution for the further exploration of the properties and universal constraints of language of motion events

6. Acknowledgements

This study is based in part on my dissertation project (Arik 2009) supported in part by NSF grant (BCS-0345314) awarded to Ronnie Wilbur, the Linguistics Program at Purdue University, the Lynn Fellowship, and the Bilsland Dissertation Fellowship given by Purdue Graduate School. A theoretical approach to the findings of my dissertation project is published in Arik (2010). I thank CSP for their permission and anonymous reviewers for their comments for the present paper. I also thank the TID, HZJ, ASL, and ÖGS Deaf signers for their participation in this study. I gratefully acknowledge the help I received from the following friends: Aysel Başar, Marina Milković, Robin Shay, Katharina Schalber, Katie Watson, Robert Cloutier, Michael Covarrubias, Alyson Eggleston, Josh Iddings, Elizabeth Strong, Beril Tezeller Arik and Gemma Barberà. Of course all remaining errors are mine.

REFERENCES

Arik, E. 2009. Spatial language: Insights from sign and spoken languages. (Unpublished PhD dissertation, Purdue University.)

Arik, E. 2010. *A crosslinguistic study of the language of space: Sign and spoken languages*. Newcastle upon Tyne: Cambridge Scholars Publishing.

Arik, E. Submitted. “Left/right and front/back in sign, speech, and co-speech gestures across languages”.
Emmorey, K. 1996. “The confluence of space and language in signed languages”. In: Bloom, P., M.A. Peterson, L. Nadel and M.F. Garrett (eds.), *Language and space*. Cambridge, MA: The MIT Press. 171–209.
Emmorey, K. 2002. *Language, cognition, and the brain: Insights from sign language research*. Mahwah, NJ: Lawrence Erlbaum and Associates.
Emmorey, K. and M. Herzig. 2003. “Categorical versus gradient properties of classifier constructions in ASL”. In: Emmorey, K. (ed.), *Perspectives on classifier constructions*. Mahwah, NJ: Lawrence Erlbaum and Associates. 221–246.
Engberg-Pedersen, E. 1993. *Space in Danish Sign Language: The semantics and morphosyntax of the use of space in a visual language*. Hamburg: Signum-Verlag.
Grose, D., R.B. Wilbur and K. Schalber. 2007. “Events and telicity in classifier predicates: A reanalysis of body part classifier predicates in ASL”. *Lingua* 117(7). 1258–1284.
Liddell, S.K. 2003. *Grammar, gesture, and meaning in American Sign Language*. Cambridge: Cambridge University Press.
Özyürek, A., I. Zwitserlood and P. Perniss. 2010. “Locative expressions in signed languages: A view from Turkish Sign Language (TID)”. *Linguistics* 48(5). 1111–1145.
Perniss, P. 2007. *Space and iconicity in German Sign Language*. (MPI Series in Psycholinguistics 45.) Nijmegen: Max Planck Institute.
Sallandre, M. and C. Cuxac. 2002. “Iconicity in sign language: A theoretical and methodological point of view”. In: Wachsmuth, I. and T. Sowa (eds.), *Lecture notes in computer science 2298: Gesture and sign language in human-computer interaction*. Berlin: Springer-Verlag. 173–180.
Sandler, W. and D. Lillo-Martin. 2006. *Sign language and linguistic universals*. Cambridge: Cambridge University Press.
Shepard-Kegl, J.A. 1985. Locative relations in American Sign Language: Word formation, syntax, and discourse. (Unpublished PhD dissertation, Massachusetts Institute of Technology.)
Supalla, T. 1986. “The classifier system in American Sign Language”. In: Craig, C. (ed.), *Noun classification and categorization*. Philadelphia: John Benjamins. 81–214.
Talmy, L. 1983. “How language structures space”. In: Pick, Jr., H. L. and L.P. Acredolo (eds.), *Spatial orientation: Theory, research, and application*. New York: Plenum Press. 225–282.
Talmy, L. 2000. *Toward a cognitive semantics*. (Vol 1.) Cambridge, MA: The MIT Press.
Talmy, L. 2006. “The representation of spatial structure in spoken and signed language”. In: Hickmann, M. and S. Robert (eds.), *Space in languages: Linguistic systems and cognitive categories*. Philadelphia: John Benjamins. 207–238.
Taub, S.F. 2001. *Language from the body: Iconicity and metaphor in American Sign Language*. Cambridge: Cambridge University Press.

Address correspondence to:
Engin Arik
Okan University
Tuzla Kampusu FEF 18
Akfirat-Tuzla/Istanbul 34959
Turkey
engin.arik@okan.edu.tr