Viewpoint Preferences in Signing Children's Spatial Descriptions

Beyza Sümer, Pamela Perniss, and Aslı Özyürek

1. Introduction

Expressing viewpoint-dependent relations such as left, right, front, and behind requires speakers to choose a viewpoint, e.g., their own or that of their addressee. Research with speaking children has shown that spatial relations that do not require a viewpoint (e.g., in, on under) are acquired earlier than those that do require a viewpoint, which suggests a general trajectory of cognitive development in children (Piaget & Inhelder, 1971; Johnston & Slobin, 1979; Johnston, 1988; Bowerman & Choi, 2001; Loewenstein & Gentner, 2005). Moreover, children first learn to express their own viewpoint, then that of their addressee (Coie, Costanzo, & Farnill, 1973; Roberts & Aman, 1993). Since sign language forms operate in the visual-spatial modality, learning to express spatial viewpoint might develop differently for signing compared to what we know for speaking children. This chapter investigates how signing children master expression of spatial viewpoint.

Although sign language acquisition has been reported to parallel spoken language acquisition in general (Newport & Meier, 1985; Morgan & Woll, 2002; Chen-Pichler, 2012), spatial language, both in production and comprehension, seems to present some challenges to signing children. For example, the use of the two hands, with correct handshapes (i.e., classifiers, CL), to express the relative positioning of entities in relation to each other (see 1 below for an example) poses difficulties for signing children (Supalla, 1982; Engberg-Pedersen, 2003; Tang, Sze, & Lam, 2007). Furthermore, signing children have been found to lag behind their speaking peers in *comprehending* viewpoint-dependent spatial relations (Martin & Sera, 2006; Morgan, Herman, Barriere, & Woll, 2008). Comprehension of these spatial relations in sign languages effectively requires a 180° mental rotation, as signers generally

produce spatial descriptions from their own point of view (Pyers, Perniss, & Emmorey, 2015). For example, in order to comprehend where each entity is in (1) below, the addressee needs to interpret what is perceived on the right as being on the left and vice versa. Development of mental rotation skills takes time for signing children, and does not become adult-like till 11-12 years (Martin & Sera, 2006).

Previous studies with adult signers report that spatial descriptions are primarily expressed from the signer's viewpoint (Emmorey, 1996; Emmorey, Klima, & Hickok, 1998; Perniss, 2007; Pyers, et al., 2015). However, in American Sign Language (ASL), signers have also been reported to describe the location of objects from the viewpoint of their addressees, especially for the objects located on the sagittal axis (Emmorey, 1996) – although no explanation for such a shift was not provided. Furthermore, in her study, she did not provide any further analyses of the use of relational lexemes in addition to classifier constructions were provided. Also, we do not know whether a similar shift in viewpoint preferences exists in other sign languages and what the consequences of such a shift are for the acquisition of sign languages since there are no developmental studies with signing children in this domain.

To close this gap, the aim of the current study is to explore a) viewpoint preferences of adult signers of Turkish Sign Language (Türk İşaret Dili, TİD) in encoding spatial relations between two objects located on the lateral or sagittal axis, and b) how viewpoint preferences of TİD-acquiring children compare to those of adult signers in describing the same type of spatial relations. First, however, further information on how viewpoint is expressed in spoken and sign languages in general and in TİD, in particular, is presented below.

How speakers and signers express viewpoint in spatial descriptions

Although some early studies on the use of viewpoint in spoken spatial descriptions with adults report the primacy of adopting a (speaker's) egocentric viewpoint (Clark, 1973; Levelt, 1989), some others have found that speakers prefer to adopt the view of their addressee, and indicate them in their spatial descriptions such as "on your left/right" (Schober, 1993; Mainwaring, Tversky, Ohgishi, & Schiano, 2003).

Signers use space to express spatial relations mainly through classifier constructions, which are morphologically complex linguistic forms in which the signer's hands represent objects, for example, by referring to their size and shape (Emmorey, 2002). The position of the signer's hands in signing space represents the location and motion of the objects, primarily from the signer's viewpoint, such that there is a one-to-one correspondence between how a signer views the entities in real space and how they are represented in the signing space (Emmorey, 1996; Perniss, 2007; Pyers, et al., 2015).

(1)　(TİD, Sümer, 2015)

Although less preferred, signers can also use categorical lexical signs (i.e., relational lexemes, Arık, 2009) instead of, or in addition to, classifier constructions in a spatial description (Sümer, Perniss, Zwitserlood, & Özyürek, 2014; Sümer, 2015). As exemplified below, relational lexemes are more categorical than classifier constructions since signers categorize the signing space to refer to the location of the objects (e.g., to left and right).

(2) a.　b.　c.　d.

　　LEFT　　　RIGHT　　　FRONT　　　BEHIND
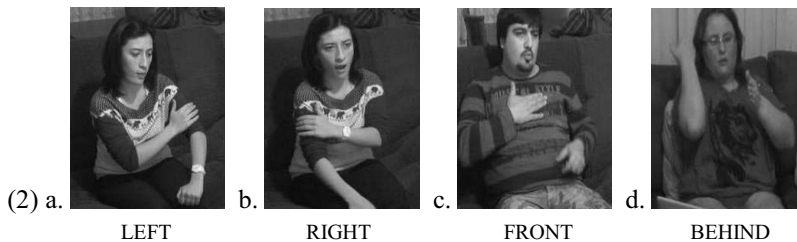
2. Present Study

Here, we first aim to describe the preferred viewpoint preferences of adult TİD signers in expressing viewpoint-dependent relations. To do so, TİD signers are presented with pictures of static objects placed on the lateral or sagittal axis. Although not systematically studied before, the axis on which objects are located might differentially influence viewpoint encoding, as reported for ASL signers (Emmorey, 1996). Secondly, we examine the use of different linguistic devices (classifiers and/or relational lexemes) used to express viewpoint in spatial descriptions in TİD. We are also interested in understanding how children learn to express viewpoint in adult-like ways both in terms of preferred viewpoint as well as the linguistic devices used.

3. Participants

Two age groups of deaf children (younger children, mean age: 5;2 years & older children, mean age: 8;3 years; N=10 in each group) participated in the current study. Their data were compared to those of deaf adults (N=10). All child and adult participants are native signers of TİD (i.e., all learned the language from their deaf parents), and reside in İstanbul, Turkey.

4. Method & Procedure

Participants were shown four pictures on a computer screen and asked to describe the target picture, indicated with a red frame, to their deaf addressee, seated opposite, who was a confederate. The addressee had the same array of four pictures (without a red frame) and was required to find the picture described by her interlocutor. Viewpoint was relevant in the task, as the signer and addressee viewed the same scenes, but crucially on different pictures (i.e. not jointly-viewed; Emmorey & Tversky 2002). There was a laptop located on a table between them, and the table was below the waist of the participants so that their hands could easily be seen.

There were 12 pictures in which two different objects are located on the lateral axis (e.g., pen left to paper) (N=6) or on the sagittal axis (e.g., ball behind a plate) (N=6) to elicit spatial descriptions with viewpoint-dependent spatial relations in TİD. The ground objects (i.e., bigger and backgrounded objects such as paper in example 1) do not have intrinsic back and fronts; none of these pictures show people acting upon objects; and all present objects in a static situation.[2]

5. Data coding and analysis

The analysis in the current study investigates viewpoint preferences of signers in their use of classifier constructions – including descriptions where signers used either classifier constructions only or classifiers with relational lexemes in the same description.

The spatial descriptions were coded for the use of classifier constructions and relational lexemes. Furthermore, the classifiers constructions were coded for the viewpoint expressed. In the current study, the signer-viewpoint refers to linguistic representations in which the position of the hands corresponds to the locations of entities in the way the signer sees the spatial configuration in the picture. For example, if you take the role of the signer as a reader and describe the spatial configuration between the pen and the paper from your viewpoint, you will place the hand representing the pen to your left (on the lateral axis) for (3a) and close to your body (on the sagittal axis) for (3b) as the signer does in each example.

---

[2] The stimuli picture sets were originally developed by Dr. Jennie Pyers to study the acquisition of spatial language by ASL-acquiring children. In the original study, the focus was on eliciting spatial descriptions that are topological, and the pictures that show objects in a viewpoint-dependent spatial relation were not designed as targets, but as fillers.

(3) a.

LH:		PEN	CL(long)₍loc₎

LH: PEN   CL(long)$_{loc}$

RH: PAPER   CL(flat)$_{loc}$ --------- HOLD ---------

  b.

LH: CL(flat)$_{loc}$ ----- HOLD -----

RH: PAPER   PEN   CL(long)$_{loc}$

The examples (4a for lateral axis) and (4b for sagittal axis) below exemplify how signers represent the relative positioning of the objects such that what the addressee sees in the sign space maps directly onto the addressee's view of the picture. In this case, the way in which signers position their hands does not match the location of the entities shown in the picture as seen by the signer, thus reflecting the addressee-viewpoint.

(4) a.

LH: CL(flat)$_{loc}$ ------------ HOLD ------------
RH: PAPER   PEN   CL(long)$_{loc}$

 b.

LH: PAPER   CL(flat)$_{loc}$ ------------ HOLD ------------
RH: PEN   CL(long)$_{loc}$

6. Results

We coded a total of 353 picture descriptions in which signers encoded viewpoint-dependent spatial relations. These descriptions exclude cases where signers/speakers provided a second description, or repeated their descriptions upon being asked by the interlocutor since this introduced uncontrolled variability.

Viewpoint preference
Subject-based mean proportions of picture descriptions where a spatial relation was encoded with a certain viewpoint were calculated out of all picture descriptions where a viewpoint was expressed by the classifier constructions only or classifier constructions with an additional relational lexeme. The effects of age, axis type, and type of viewpoint, as independent measures, were analyzed in a 3 (Between subjects, Age: adults, older children, younger children) by 2 (Within subjects, Axis type: lateral, sagittal) by 2 (Within

subjects, Viewpoint type: signer, addressee) mixed ANOVA. The results showed a main effect of axis type, $F(1,27) = 183.20$, $p < .001$, $\eta^2_p = .87$, but no main effect of age, $F(2,27) = 3.41$, $p = .05$, $\eta^2_p = .20$, and viewpoint type, $F(1,27) = 1.32$, $p = 26$, $\eta^2_p = .05$. However, axis type interacted with viewpoint type, $F(1,27) = 19.70$, $p < .001$, $\eta^2_p = .42$, and with age, $F(2,27) = 27.1$, $p < .001$, $\eta^2_p < .67$. There was no 2-way interaction between viewpoint type and age, $F(2.27) = .34$, $p = .71$, $\eta^2_p = .03$. There was a 3-way interaction among these three variables, $F(2,27) = 15.08$, $p < .001$, $\eta^2_p = .53$.

After finding a 3-way interaction, and also a main effect of axis type interacting with age and viewpoint type, we conducted one-way ANOVAs for each axis type (i.e., lateral versus sagittal). The results of the one-way ANOVA analyses for relational encodings for objects on the lateral axis revealed a main effect of viewpoint type only, $F(1, 27) = 187.19$, $p < .001$, $\eta^2_p = .87$, but not of age, $F(2,27) = .77$, $p = .47$, $\eta^2_p = .05$, without an interaction between them, $F(2,27) = 1.96$, $p = .16$, $\eta^2_p = .13$. Post-hoc analyses (Bonferroni) for the main effect of viewpoint type for the encodings on the lateral axis indicate that signers at all ages are more likely to represent the lateral axis spatial configurations from their own viewpoint than from their addressee's viewpoint ($p < .001$) (see Figure 1).
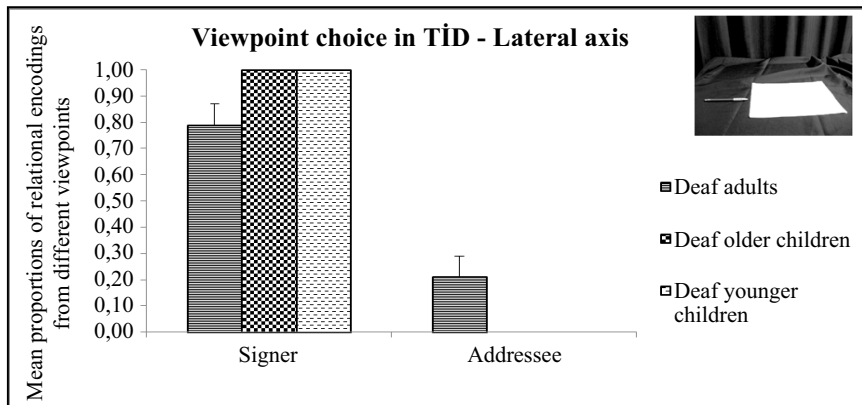

Figure 1: Mean proportions and error bars (representing SE) of descriptions with different viewpoints in relational encodings for the lateral axis in TİD across age groups.

The results of one-way ANOVA analyses for relational encodings for objects on the sagittal axis, however, revealed a different pattern. The results did not show a main effect of age, $F(2,27) = 2.18$, $p = .13$, $\eta^2_p = .14$. However, there was a main effect of viewpoint type, $F(1,27) = 47.22$, $p < .001$, $\eta^2_p = .64$, and it interacted with age, $F(2,27) = 38.38$, $p < .001$, $\eta^2_p = .74$. As a result, we further conducted separate one-way ANOVAs for each viewpoint within the relational encodings for objects on the sagittal axis. In encoding signer-viewpoint and addressee-viewpoint, signing children differed from signing adults. They

encoded sagittal spatial relations from signer-viewpoint more frequently than adults ($p < .05$). The two age groups of signing children did not differ from each other ($p > .05$) (see Figure 2).
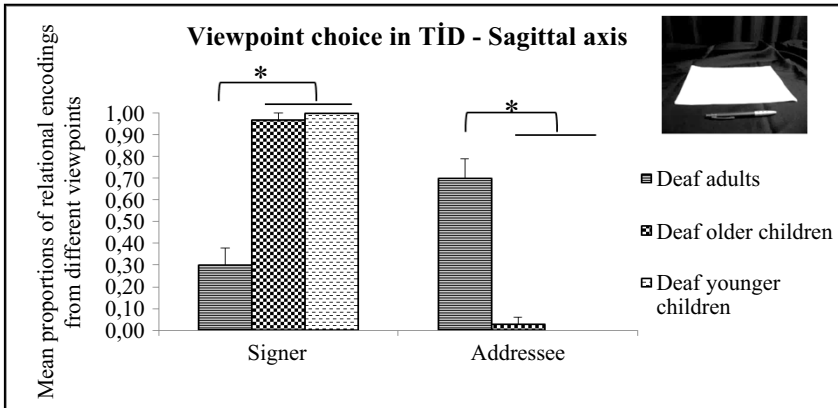

Figure 2: Mean proportions and error bars (representing SE) of descriptions with different viewpoints in relational encodings for the sagittal axis in TİD across age groups.

Linguistic devices

In order to understand if the use of classifier constructions only or their use with relational lexemes could be linked to viewpoint preferences in adults or children's spatial descriptions, we also calculated the proportions of descriptions with two linguistic devices out of all relational encodings on the lateral or sagittal axis as denominator for each age group, as presented in Table 1. We observed that signing adults used two linguistic devices more frequently when describing the location of the objects on the sagittal axis than on the lateral axis. Furthermore, unlike adults, signing children in both age groups preferred to use a single linguistic device for the relational encodings for both axis types.

Table 1: Mean proportions (SD) of the relational encodings where two linguistic devices were used by TİD signers out of all relational encodings on each axis.

Groups of TİD Signers	Lateral axis	Sagittal axis
Deaf Adults	.21(.27)	.45(.21)
Deaf Older Children	.05(.11)	.04(.13)
Deaf Younger Children	.03(.06)	.08(.13)
TOTAL	.11(.18)	.21(.24)

7. Conclusion and Discussion

Our results revealed two important insights into adult and child signers' viewpoint preferences in TİD: Firstly, adult signers preferred different viewpoints depending on the axis of objects. Secondly, children initially prefer signer-viewpoint for both axes and the choice of addressee-viewpoint (for sagittal axis descriptions) does not appear till 8-9 years. Below, we discuss findings for the adult and child patterns separately.

Adult patterns

Adult signers' choice of viewpoint in TİD varied depending on the axis of the objects located. They mostly adopted signer-viewpoint in their relational encodings for objects located on the lateral axis, but preferred addressee-viewpoint marginally over signer-viewpoint for the sagittal axis.

Adult signers often use relational lexemes in addition to (before or after) a classifier construction: nearly half the time for descriptions of objects on the sagittal axis; and one-fifth of the time for objects on the lateral axis. The reason why adult signers employ an addressee-viewpoint in TİD might be motivated by the semantics of the two types of linguistic devices in describing the locations of objects placed on the sagittal axis – even though more research is needed to support this claim. The body-anchored (i.e., tapping chest or pointing to back) nature of relational lexemes might influence how signers place classifier predicates for the Figure and the Ground in the signing space. As shown in Figure 3 below, when signers use two linguistic devices in a relational encoding, the location of classifier predicates in the signing space parallels the spatial anchoring of the relational lexemes for front and behind on the signer's body. In other words, signing space closer to the signer maps onto the behind space, while space further from the signer maps to the front space in placing the classifiers on the signing space.
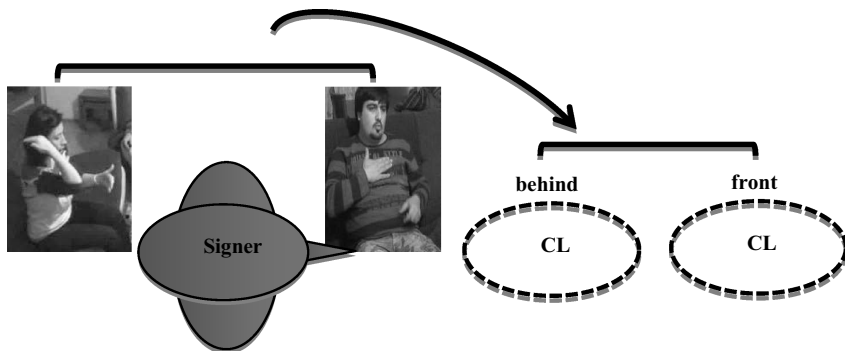

Figure 3: A schematic illustration of the spatial transposition of body-anchored relational lexemes front and behind onto signing space in the localization of classifier predicates in TİD adult system.

In order to describe the location of the ball (Figure) with respect to the bowl (Ground) in (6), an adult signer introduces the Ground by its lexical sign, and while holding it in signing space (thus localizing the Ground by direct lexical sign placement), she uses the relational lexeme meaning "in front of". Finally, she uses a classifier predicate to localize the Figure with respect to the previously localized Ground object. In doing so, she uses the front area as indicated in Figure 3 above to encode the location of the Figure with respect to the Ground.

(6)

| LH: | BOWL$_{loc}$ | ---------------- HOLD ---------------- | |
| RH: | BOWL$_{loc}$ | FRONT | BALL$_{loc}$ |

Similarly in (7), the location of the Figure (cup) is expressed by means of a relational lexeme followed by an analogue classifier construction. After introducing and localizing the Ground (box) by its lexical sign, the signer uses the relational lexeme meaning behind, produced by indicating the back of the body. Then, she also localizes the lexical sign for the Figure with respect to the Ground in a classifier construction. Note that the space that she uses to localize the Figure with respect to the Ground in this construction corresponds to the behind area shown in the Figure 3.

(7)

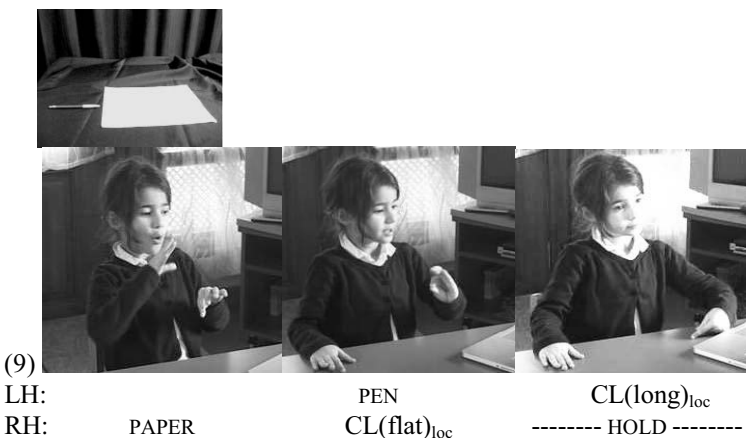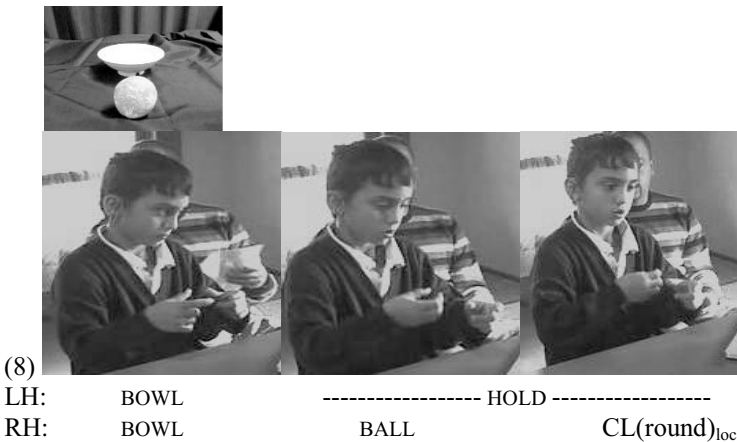|			
LH:	BOX$_{loc}$	------------- HOLD -------------	
RH:	BOX$_{loc}$	BEHIND	CUP$_{loc}$

The signers shown in 6 and 7 seem to be describing the picture from the viewpoint of their addressees in terms of the use of space in their classifier constructions, since they do not match the locations of the signs for the objects in signing space as they see them in the picture. We argue that the organization of the signing space in classifier constructions in these descriptions is affected by the semantics of the relational lexemes meaning front and behind.

This claim can be further supported by considering the viewpoint choices exhibited in descriptions that use classifier predicates with or without relational lexemes. In encodings of sagittal axis configurations, out of 27 relational encodings with two linguistic devices, 24 of them (.89) are from addressee-viewpoint, and only 3 (.11) from signer-viewpoint. On the other hand, in 28 relational encodings where signers used only classifier constructions, the proportion of the use of signer-viewpoint increases (11 cases, .39), but there is still a high preference of addressee-viewpoint (17 cases, .61). Although no statistical tests were run, these numbers seem to suggest an influence of the use of body-anchored relational lexemes with classifier constructions on the choice of viewpoint in spatial descriptions. These claims need to be tested in another sign language where the lexemes for front and behind are not body-anchored.

In encoding spatial relations for objects located on the lateral axis, adult signers do not use both linguistic devices as frequently as they do for expressing the location of the objects on the sagittal axis. This could be due to the fact that in terms of the semantics of the relational lexemes for left and right, the left side of the body corresponds to the left side of the signing space and the right side of the body to the right side of the signing space. This directly corresponds to how classifiers are placed in signing space from a signer-viewpoint – unlike what we see for addressee-viewpoint. Thus, in the case of relational encodings for the lateral axis, the semantics of the relational lexemes left and right do not interfere with the use of space with classifier constructions and thus we see a higher preference for signer-viewpoint.

Child patterns

In this study, TİD-acquiring children mainly used a single linguistic device in their relational encodings for both types of axis. As shown in the examples (8) and (9) below, signing children prefer also mainly to encode the spatial configuration from their own viewpoint, i.e. as they see it, for both axes. It is possible that these children initially might be doing more of a visual mapping of the objects they see onto the signing space. This might be an earlier developing strategy than making use of the semantics of the relational lexemes and having to change the viewpoint depending on the choice of lexemes for the sagittal axis. This also explains why TİD-acquiring children might be faster in becoming adult-like in their viewpoint preferences for the lateral axis than for the sagittal axis encodings. This pattern, then, indicates that even though signing children might be like speaking children in preferring signer-viewpoint, the visual modality of signed language might also suggest a modality-dependent development of viewpoint expression.

(8)
LH: BOWL   ----------------- HOLD -----------------
RH: BOWL   BALL   CL(round)$_{loc}$

(9)
LH: PEN   CL(long)$_{loc}$
RH: PAPER   CL(flat)$_{loc}$ -------- HOLD --------

The current study focuses on the production of spatial descriptions with different viewpoint preferences. However, research on whether and how relational lexemes are used and addressee-viewpoint is comprehended by adult signers is necessary to make further generalizations.

8. Conclusion

It seems that children, regardless of the modality of the language they acquire, prefer to express viewpoint-dependent spatial relations from own viewpoint first. This might be related to general principles of cognitive development, which are at work in learning to express viewpoint in such spatial relations (e.g., Piaget, 1972; Pillow & Flavell, 1986; Moll, Meltzoff, Merzsch, & Tomasello, 2013). It also suggests, however, that children need to go through a stage of tuning into the language-specific ways of expressing viewpoint in their own language (Bowerman & Choi, 2001). The modality/language-specific effect of spatial language seems to manifest itself in TİD-acquiring children's lack of mastery in making a differentiation in viewpoint between encoding spatial relations on the lateral and sagittal axis.

Since this is the first study that has looked into signing children's viewpoint preferences, these results should be further investigated in other sign languages (especially in those where relational lexemes are not necessarily body-anchored) to be able to understand whether this could be modality-specific or language-specific effect in the acquisition of sign language.

References

Arık, Engin (2009). *Spatial Language: Insights from signed and spoken languages*. Unpublished doctoral dissertation, Purdue University, The USA.

Bowerman, Melissa & Choi, Soonja (2001). Shaping meanings for language: Universal and language-specific in the acquisition of spatial semantic categories. In Melissa. Bowerman & Stephen C. Levinson (Eds.), *Language acquisition and conceptual development* (pp. 475-511). New York: Cambridge University Press.

Chen-Pichler, Deborah (2012). Language acquisition. In Roland Pfau, Bencie Woll, & Marcus Steinbach (Eds.), *Handbook of Linguistics and Communication Science: Sign Language* (pp. 647-686). Berlin: De Guyter.

Clark, H. Herbert (1973). Space, time, semantics, and the child. In Timothy E. Moore (Ed.), *Cognitive development and acquisition of language* (pp. 27-63). New York: Academic Press.

Coie, John D., Costanzo, Philip R., & Farnill, Douglas (1973). Specific transitions in the development of spatial perspective-taking ability. *Developmental Psychology, 9*, 167-177.

Emmorey, Karen. (1996). The confluence of space and language in signed language. In Paul Bloom, Marry A. Peterson, Lynn Nadel, & Merrill Garrett (Eds.), *Language and Space* (pp. 171-210). Cambridge, MA: MIT Press.

Emmorey, Karen., Klima, Edward, & Hickok, Gregory (1998). Mental rotation within linguistic and nonlinguistic domains in users of American Sign Language. *Cognition, 68*, 221-246.

Emmorey, Karen. (2002). *Language, cognition, and the brain: Insights from sign language research*. Mahwah, NJ: Lawrence Erlbaum Associates.

Engberg-Pedersen, Elisabeth (2003). How Composite is a Fall? Adult's and Children's Descriptions of Different Types of Falls in Danish Sign Language. In Karen Emmorey (Ed.), *Perspectives on Classifier Constructions in Sign Languages* (pp. 311-332). Mahwah, NJ: Lawrence Erlbaum Associates.

Johnston, Judith R. & Slobin, Dan I. (1979). The development of locative expressions in English, Italian, Serbo-Croatian and Turkish. *Journal of Child Language, 6*, 529-545.

Johnston. Judith R. (1988). Children's verbal representation of spatial location. In Joan Stiles-Davis, Mark Kritchevsky & Ursula Bellugi (Eds.), *Spatial Cognition: Brain bases and development* (pp. 195-205). Hillside, NJ: Lawrence Erlbaum Associates.

Levelt, Willem J. M. (1989). *Speaking: From intention to articulation*. Cambridge, MA: The MIT Press.

Loewenstein, Jeffrey & Gentner, Dedre (2005). Relational language and the development of relational mapping. *Cognitive Psychology, 50*, 315-353.

Mainwaring, Scott D., Tversky, Barbara, Ohgishi, Motoko, & Schiano, Diane J. (2003). Descriptions of simple spatial scenes in English and Japanese. *Spatial Cognition and Computation, 3*, 3-42.

Martin, Amber Joy & Sera, Maria D. (2006). The acquisition of spatial constructions in American Sign Language and English. *Journal of Deaf Studies and Deaf Education, 11 (4)*, pp. 391-402.

Moll, Henrike, Meltzoff, Andrew N., Merzsch, Katharina, & Tomasello, Michael (2013). Taking versus confronting visual perspectives in preschool children. *Developmental Psychology, 49(4)*, 646-654.

Morgan, Gary & Woll, Bencie (Eds.) (2002). *Directions in sign language acquisition*. Amsterdam: John Benjamins.

Morgan, Gary, Herman, Ros, Barriere, Isabelle, & Woll, Bencie (2008). The onset and the mastery of spatial language in children acquiring British Sign Language. *Cognitive Development, 23*, 1-19.

Newport, Ellisa L. & Meier, Richard P. (1985). Acquisition of American Sign Language. In Dan Slobin (Ed.), *The crosslinguistic study of language acquisition. Vol. 1: The data* (pp. 881-938). Hillside, NJ: Lawrence Erlbaum Associates.

Perniss, Pamela (2007). *Space and iconicity in German Sign Language (DGS)*. Unpublished doctoral dissertation, Max Planck Institute for Psycholinguistics, The Netherlands.

Piaget, Jean & Inhelder, Baerbel (1971). *The child's conceptualization of space*. New York: Norton. (Originally published in 1948).

Piaget, Jean (1972). *Judgment and reasoning in the child*. Totowa, NJ: Littlefield, Adams. (Originally published in 1928).

Pillow, Bradford H. & Flavell, John H. (1986). Young children's knowledge about visual perception: Projective size and shape. *Child Development 57*, 125-135.

Pyers, Jennie, Perniss, Pamela, & Emmorey, Karen (2015). Viewpoint in the Visual-Spatial Modality: The Coordination of Spatial Perspective. *Spatial Cognition and Computation, 15(3),* 143-169.

Roberts, Ralph J. & Aman, Christine J. (1993). Developmental differences in giving directions: Spatial frames of reference and mental rotation. *Child Development, 64*, 1258-1270.

Schober, Michael (1993). Spatial perspective taking in conversation. *Cognition, 47*, 1-24.

Supalla, Ted R. (1982). *Structure and acquisition of verbs of motion and location in American Sign "Language*. Unpublished doctoral dissertation, UCSD, The USA.

Sümer, Beyza, Perniss, Pamela M., Zwitserlood, Inge, & Özyürek, Asli (2014). Learning to express "left-right" & "front-behind" in a sign versus spoken language. In Paul Bello, Marcello Guarini, Marjorie McShane, & Brian Scassellati (Eds.), *Proceedings of the 36th Annual Meeting of the Cognitive Science Society (CogSci 2014)* (pp. 1550-1555). Austin, Tx: Cognitive Science Society.

Sümer, Beyza (2015). *Acquisition of spatial language by signing and speaking children: A comparison of Turkish Sign Language (TİD) and Turkish*. Unpublished doctoral dissertation, Max Planck Institute for Psycholinguistics, The Netherlands.

Tang, Gladys, Sze, Felix, & Lam, Scholastica (2007). Acquisition of simultaneous constructions by deaf children of Hong Kong Sign Language. In Myriam Vermeerbergen, Lorraine Leeson, & Onno Crasborn (Eds.), *Simultaneity in Signed Languages* (pp. 283-316). Amsterdam: John Benjamins.

Proceedings of the 40th annual Boston University Conference on Language Development

edited by Jennifer Scott
and Deb Waughtal

Cascadilla Press   Somerville, MA   2016