In or out? Spatial scale and enactment in narratives of native and non-native signing deaf children acquiring British Sign Language

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Cormier, K., Quinto-Pozos, D., Sevcikova, Z., & Schembri, A. (2012). Lexicalisation and de-lexicalisation processes in sign languages: Comparing depicting constructions and viewpoint gestures. *Language and Communication* 32:329-348.
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1. Introduction

Age of sign language acquisition varies enormously, with some deaf children from hearing families learning to sign when they start school, some later in childhood, some later in life, and some not at all. These highly variable and unusual language transmission patterns with sign languages provide a testing ground for notions about a critical or sensitive period for language. A range of studies have shown clear age of acquisition effects in adult signers, such that the earlier a sign language is learned, the better the linguistic performance later in life, both in production and in perception (see Mayberry, 2010 for a review).

Fewer studies have examined critical period effects in deaf children, but some differences have been found between deaf children in deaf families (henceforth, DD) and deaf children in hearing families (henceforth, DH), in both linguistic and cognitive abilities. For example, Courtin (2000) found that DD children between ages 5 and 8 acquiring French Sign Language (LSF) scored significantly higher on false belief tasks than DH children within the same age range, suggesting that theory of mind is also affected by age of sign language acquisition. Furthermore, it appears that some differences between native and non-native signers (e.g. joint attention) might begin to emerge as early as infancy, partly due to interaction with deaf versus hearing parents (Kyle et al., 1987, Waxman and Spencer, 1997).

In the current study, we investigate the use of spatial scale and enactment (via constructed action) in British Sign Language (BSL) narratives of deaf native and non-native signing children aged 8-10. Given that a wide range of age of acquisition effects that have been found at various levels in adults, and given the various differences in acquisition of

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theory of mind in native vs. non-native signing children and eyegaze patterns used by deaf and hearing parents, we expect to find some differences in the combined use of spatial scale and enactment in native vs. non-native signing children's BSL narratives.

2. Background

2.1. Spatial scale

Signers use the space in front of them in a variety of communicative ways. The most commonly discussed split is between a large scale use of space (where the signer uses the space as if he/she were interacting with people/objects on a real-world scale), and a small scale use of space (where the signer uses his/her hand to represent all or part of an entity on a small scale in front of the body). Terminology for these and other various uses of space (and related perspectives) are shown in Table 1. For the purposes of the current study, we are interested in children's use of large-scale space on the one hand (what we refer to as *character scale*) versus the use of small-scale space, pointing space and non-locative space on the other. Therefore we combine the latter three uses of space into *observer scale*.

TABLE 1 ABOUT HERE

Table 1. Overview of types of signing space as described by different researchers

Large-scale and small-scale uses of space are often described in terms of the prototypical depicting constructions that signers tend to use with each. Depicting constructions are predicates of location, motion, and/or handling and are considered to be part of the productive lexicon which consists of constructions which are highly variable and weakly lexicalised (Brennan, 1992). Small-scale space is typically associated with entity constructions which depict location and/motion of all or part of an entity, as shown in Figure

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1. Large-scale space is typically associated with handling constructions which depict

handling or manipulation of an object, as shown in Figure 2.

Figure 1. Depicting (entity) construction representing an upright entity moving from right to
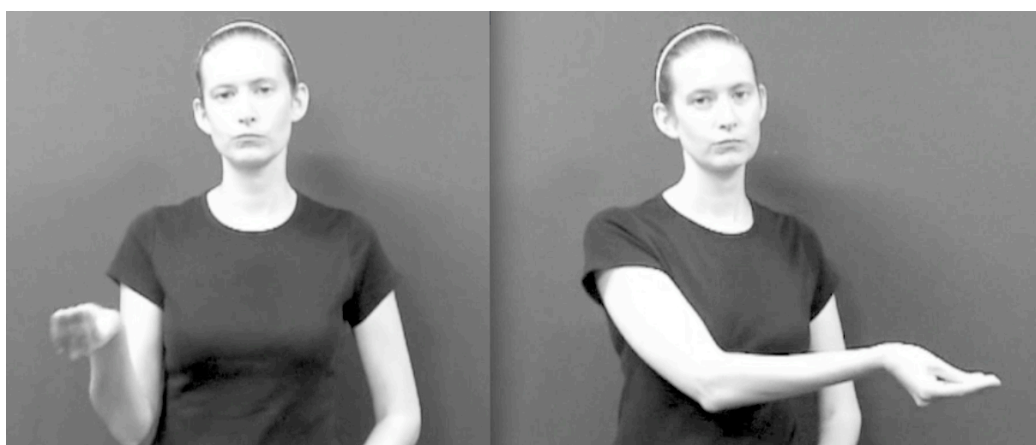
left in small-scale space

Figure 2. Depicting (handling) construction representing handling a flat object in large-scale

space

Although these patterns are prototypical, other patterns may occur as well. Entity

constructions are often used with large-scale space (e.g., Aarons and Morgan, 2003, Dudis,

2004, Perniss and Ozyurek, 2008, Quinto-Pozos, 2007) which lends to a mixing of scales,

with the signer's body representing a referent on a large scale, and the signer's hand representing the same (or a different) referent on a small scale. The opposite pattern – i.e. use of handling constructions in small-scale space – has been documented for only two sign languages (German Sign Language and Turkish Sign Language) and appears to be relatively infrequent (Perniss and Ozyurek, 2008).

Perniss and Ozyurek (2008) also describe another even less typical pattern which involves a fusion of character scale and observer scale (in their terminology, character perspective and observer perspective) – such that the signing space in front of the signer is uses two different-sized scales at the same time. Figure 3a shows a Turkish Sign Language signer describing a cartoon mouse handling a pan and flipping a pancake within the pan repeatedly (which the action occurring directly up and down at the signer's saggital axis). On an up swing, the direction of the movement then changes laterally so that the motion and location of the falling pancake is depicted as falling toward the signer's left side, and the signer looks down at her left side. From the perspective of the mouse in the cartoon, the pancake falls directly in front of him. As a viewer watching the cartoon, the mouse is on the right side of the screen, and the pancake on the left, as shown in Figure 3b. Thus the signer's head and torso are mapped onto the mouse in large scale space. However, if mapping were complete, the signer would depict the pancake falling directly in front of her, forward. Instead, the signer depicts the pancake falling to the left, which is the direction that the pancake falls from the signers' own perspective as she is watching the cartoon rather than from the perspective of the mouse. Perniss and Ozyurek note that this type of fused construction only occurred in their Turkish Sign Language data (and rarely), and did not occur at all in their German Sign Language data.

FIGURE 3A ABOUT HERE

Figure 3a. Fused character and observer perspective production in Turkish Sign Language, describing scenes shown in Figure 3b (reprinted with permission from authors Perniss & Ozyurek, 2008). <Awaiting permission from publisher>
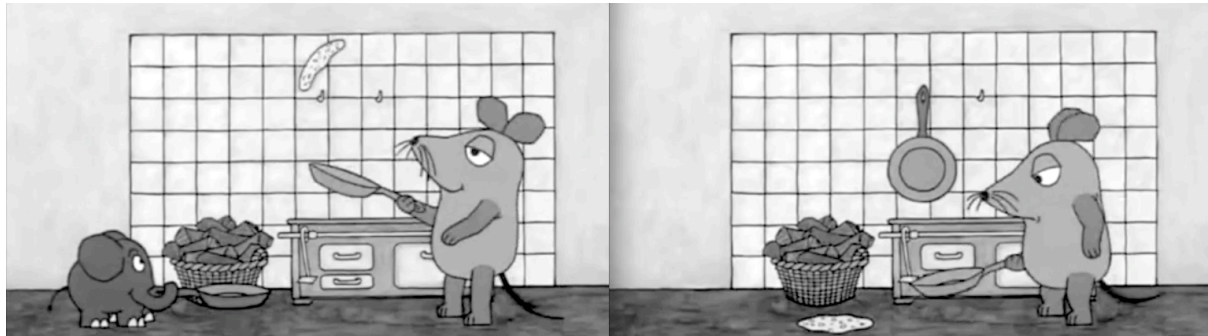

Figure 3b. Stills from stimulus for Figure 3a (from Perniss & Ozyurek, 2008) Reprinted with permission: © I. Schmitt-Menzel / Friedrich Streich, WDR mediagroup GmbH, Die Sendung mit der Maus ® WDR

2.2. Constructed action

Another feature that has been noted to be particularly common with the use of large-scale space is constructed action (Dudis, 2004, Metzger, 1995) – i.e. the use of the signer's head, face, torso, arms and/or hands to directly represent the same articulator(s) of a referent. Although large-scale space is typically associated with handling constructions, it is also possible for signers to represent the arms and/or hands of a referent without any representation of handling or manipulation of objects. For example, Figure 4 shows an example of constructed action where the signer is enacting a bear about to attack someone. This is an overt example of constructed action, where all visible articulators (head, face, arms, hands, torso) are meant to map onto the equivalent articulators of the bear.

Figure 4. Constructed action in large-scale space with no handling/manipulation (Woll et al.,

2004)

Many researchers seem to agree that a change or a break in eyegaze is the main and

obligatory marker of CA in sign languages (e.g., Loew, 1984, Padden, 1986). Although shift

in eyegaze is indeed seen by many as the most prominent marker of constructed action, some

have claimed that such shift in eyegaze is optional, and that other markers such as facial

expression and/or head/body position may mark constructed action without break in eyegaze

(Metzger, 1995, Pyers and Senghas, 2007). According to Padden (1986), both eyegaze and

facial expression determine constructed action (which she refers to as *role shifting*) with a

body position change as optional.[1]

2.3. Space rotation and perspective shift

Although Padden (1986) notes that a change in body position to mark role shift is

optional, this body shift has traditionally been considered to be a primary (and noticeable)

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[1] It has also been argued that eyegaze grammatically marks person in pronouns and in

agreement verbs (e.g., Neidle et al., 2000, Thompson et al., 2006), although there have been

no clear attempts to distinguish eyegaze as person marker from eyegaze as a marker of

constructed action.

marker of constructed action (or role shift) within sign languages, so much so that this is often taught to hearing students learning sign language (Lentz, 1986). This change in body position involves rotating the torso one direction to represent one role, and then rotating the torso the other direction to represent another role. Padden (1986) notes that this is particularly common when representing dialogue between two people. However, Janzen (2004) argues that such shifts in body position need not occur, and that a shift in perspective can be achieved (with or without constructed action) by using the signing space in a way such that the space is used (and understood) relative to the signer's body. Although Janzen (2004) notes that eyegaze and other non-manual features are used commonly (and in complex ways) throughout adult signers' narratives for the purposes of indicating a particular role, it is the use of space in a particular way, rather than the use of these non-manual features, that mark that the signer is taking on a given role: "…given… the fact that eye gaze is frequently directed toward the addressee during the articulation of these clauses, it is clear that eye gaze directed toward various loci around the space is not the sole determinant of perspective and nor therefore perspective shifts" (pg. 163).

2.4. Spatial scale, constructed action and narrative skills in deaf children

Deaf children start using large-scale space for the purposes of enactment as early as 2-3 years of age (Loew, 1984, Schick, 2006).[2] Slobin et al. (2003) report that the earliest uses of depicting constructions, including handling constructions, are used before age 3 and are heavily gestural with overt use of facial expressions and body movements. The use of entity constructions within small-scale space starts around the same age (2-3 years) but progresses slowly. Furthermore, Slobin et al. (2003) suggest that after an early phase of fairly successful

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[2] This is not limited to deaf children; hearing children also make use of large-scale space in enacting/iconic gestures, and they start doing so at a similar age (McNeill, 1992).

mastery, there is a prolonged phase of learning to use these constructions as a flexible discourse tool. Some studies have shown that by age 8, depicting constructions have not yet been fully mastered (de Beuzeville, 2006, Schick, 1987). Even by age 12, Slobin et al. (2003) claim, children still struggle with various discourse and pragmatic functions of depicting constructions in small-scale and large-scale space.

While children are developing a mastery of spatial scale, they are also developing narrative skills. Morgan (2002, 2006) studied BSL narratives of deaf children (native signers and early learners who all used BSL at home and in school) between ages 4;3 and 13;4 telling the 'frog story' (Frog Where Are You?, Mercer Mayer). Morgan observed that at the earliest stage (ages 4-6), the children had difficulty sequencing co-occurring events. They were able to use different types of constructions and different types of space, but not cohesively throughout the narrative. At the latest stage (ages 11-13), the children's narratives were not yet as complex and cohesive as adults, but they were able to combine the use of large scale and small scale space simultaneously, and they were able to "flashback" in the narrative to refer to earlier episodes and then jump back ahead, as adult signers do. At the middle stage (ages 7-10), children were able to include relevant information about both characters and to switch reference between them, but they still used primarily sequential strategies for telling the narrative.

3. Research questions

Given the documentation in the sign language literature of the use of constructed action and/or handling constructions in character scale and the use of entity constructions in observer scale in adult signers, and that the use of these two types of construction seem to be not fully developed even by late childhood, the general research question for the current study is: How do deaf children at ages 8-10 with different signing backgrounds combine

spatial scale and constructed action in BSL narratives? In particular, we compare the use of character scale (i.e. large-scale space, where the signer can be considered 'in' the story space) and observer scale (small-scale space, where the signer can be considered 'out' of the story space), as described in §2.1, and the use of constructed action in deaf children from deaf families (native signers) and deaf children from hearing families (early learners).

Given previous research, we expect that native and non-native signing children will use character scale with constructed action. Additionally we expect that native and non-native signing children will use observer scale without constructed action. As noted above, these patterns have been documented in both native and non-native signing children around ages 2-3 years. We leave open the question of whether we may find the use of small-scale space with constructed action, or large-scale space without constructed action. The former has been noted to be rare in adult signers of German Sign Language and infrequent in adult signers of Turkish Sign Language (Perniss and Ozyurek, 2008). The latter has not been explicitly documented or discussed in any detail in the sign language literature, though as noted above, Janzen (2004) does suggest that the use of character scale without constructed action is possible.

4. Method

4.1. Participants

Participants in this study include a total of 8 profoundly deaf children: 4 deaf children from deaf families and 4 deaf children from hearing families, as shown in Table 2. Four of the children are from deaf families with deaf parents (DD). All four children attended a school for the deaf with a bilingual policy – i.e. where BSL was used in the classroom alongside written English. Four of the children are from hearing families (DH) with no other deaf members of the family. Two of the children had some (minimal) signing input from their

families but attended a deaf unit within a hearing school with a bilingual policy with BSL used in the classroom so they had daily signing input at school starting from around age 5. The other two children are from single parent households but both mothers have good signing skills (one with a qualification as a BSL/English interpreter). One of the DH children attended a deaf school with a bilingual policy and the other three attended a deaf unit within a hearing school with a bilingual policy.

TABLE 2 ABOUT HERE

Table 2. Participant details

4.2. Stimulus

Narratives were elicited from the children using a Pink Panther cartoon clip called "Keep our Forests Pink". This cartoon has no spoken dialogue and contains 3 characters: a man, a dog and the Pink Panther. The current study focuses on the part of the children's narratives that covered one particular 45-second excerpt from this cartoon. Importantly, from the perspective of the viewer, all of the primary movements of the characters within the cartoon (i.e. entering and leaving the scene) are from right to left or from left to right of the screen.

4.3. Task

The children met one at a time with the researcher, Author, a Deaf native signer of BSL with many years of experience working with deaf children. The children were told they would be watching a cartoon on video so that they could explain it to the researcher and that the researcher had never seen the cartoon before. Children watched the video and were given the chance to watch the clip again. After the second viewing, each child then described the cartoon to the researcher.

4.4. Coding

All narratives were annotated by the first author (XX) using the ELAN multimedia

annotation tool (Wittenburg et al., 2006). Each child's narrative was first glossed in English

using two gloss tiers, one for the dominant hand and one for the non-dominant hand.

Additionally, narratives were coded for spatial scale and constructed action on another tier.

Figure 5 shows an example screenshot of the tiers used for coding. The narratives also coded

by two research assistants who were given the coding criteria described below and asked to

comment on any coding that they thought did not follow the coding guidelines: one research

assistant commented on all 8 child narratives, and a second research assistant independently

commented on 4 of those 8 narratives. Some annotations were changed based on these

comments; for others, disagreements were resolved.

Figure 5. ELAN tiers and annotations

4.4.1. Scale/CA tier. On the scale/CA tier, there were four different options: character scale

with constructed action, character scale without constructed action, observer scale with

constructed action, and observer scale without constructed action. We define constructed

action as the use of one or more manual or non-manual articulators to represent the actions,

thoughts, feelings or attitudes of a referent. This was operationalised via a dependency

between articulators used for constructed action and the role(s) represented by those

articulators (Author, in press). That is, if it was suspected that one or more articulators (e.g.

eyegaze, face, head, torso, arms, hands) were being used for constructed action (via native

signer intuition), one or more character roles needed to be attributed to those articulators. Likewise, if it was suspected that one or more character roles was being represented (via native signer intuition), then one or more articulators needed to be identified as the marker(s) of that constructed action. In all cases, we define entity constructions as any construction where the hand represents a person or object in order to describe location and/or motion of that referent.

1. Character scale with CA (CS-CA) was coded when the child was using constructed action and the space surrounding the child was used on a real-world scale as if the child was taking on the role of that referent. Character scale with CA could occur alone without any lexical signs or depicting constructions (as in Figure 6), or it could include simultaneous use of lexical signs, pointing signs, entity constructions or handling constructions (as in Figure 2).

2. Character scale without CA (CS-noCA) was coded when the child was taking on the perspective of an observer using entity classifier constructions to represent referent(s) in the signing space relative to his/her own body as another referent, with no evidence of co-occurring constructed action.

3. Observer scale with CA (OS-CA) was coded where the child was using constructed action and the signing space in front of the child was not used on a real-world scale – i.e. if the space were used on a small scale using entity constructions (as in Figure 1, except with constructed action), or use of space for articulation of lexical signs.

4. Observer scale without CA (OS-noCA) was coded when the child was taking on the perspective of an observer, using the signing space for lexical signs and/or partly lexical constructions such as entity constructions to describe events, with no evidence of co-occurring constructed action.

4.4.2. Segmentation of scale/CA annotations. Segmentation of annotations for scale/CA proceeded as follows. From the beginning of the narrative, an annotation for scale/CA was begun, with one of the four values above. The end of this annotation was considered to be when there was a change in scale/CA (e.g. from CS-CA to OS-noCA or from CS-noCA to CS-CA), or when there was a change in role (e.g. from CS-CA representing the Pink Panther to CS-CA representing the dog), or when there was a change in subject (e.g. from OS-noCA with the man as the subject to OS-noCA with the Pink Panther as the subject).[3]

3. Results

Here we report the frequencies of each of the 4 possible combinations of spatial scale and constructed action, within each group of children (DD and DH), as shown in Table 3. Table 4 summarises which combinations of spatial scale and constructed action occurred (or did not occur) in each group. Below we go through each combination of spatial scale and constructions action in turn, beginning with those combinations which were most frequent across all 8 children.

TABLE 3 ABOUT HERE

Table 3. Frequency of spatial scale and constructed action use: number of tokens by participant

TABLE 4 ABOUT HERE

Table 4. Use of spatial scale and constructed action in DD and DH group narratives

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[3] Our notion of 'subject' here corresponds to Van Valin & LaPolla 's (1997) semantic macrorole 'actor' which in the case of these narratives is the animate character executing the action.

5.1. Character scale with constructed action (CS-CA)

Character scale with constructed action was used by all children from both groups. Figures 6 and 7 show examples of character scale with constructed action.[4] Figure 6 replicates DH3 representing the man looking down, putting the wood into a pile before lighting it up with matches..
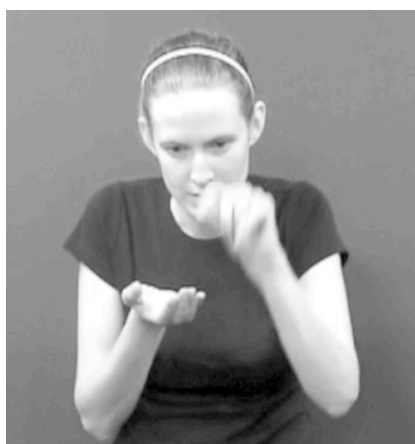

Figure 6. Example from DH3 using CSCA representing the man making a fire

All of the children produced tokens of CS-CA similar to these, for these events and for others within the cartoon. This is hardly surprising, given that these enacting constructions have been documented in deaf children as early as 2-3 years of age, and that hearing children produce similar enacting gestures along with their speech by a similar age, as noted above in §2.4. The examples given here show some fairly overt tokens of

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[4] Data collection for this study took place in 1993, before it became widely standard within sign language research to obtain indefinite consent for specific uses of video clips in publications. Therefore, examples are modeled here by a deaf adult BSL signer, replicated as closely as possible to the actual productions of the child participants in this study.

constructed action within character scale, with many articulators active as markers of constructed action. More subtle uses of constructed action within character scale such as use of only eyegaze or facial expression were also identified. For example, Figure 7 replicates DD4 producing the lexical sign WALK, with a slight break in eyegaze with the addressee (who was just next to the camera), and with the head and face slightly enacting the Pink Panther within the cartoon.

Figure 7. Example from DD4 using CSCA with subtle use of CA enacting the Pink Panther

5.2. Observer scale without constructed action (OS-noCA)

Observer scale without constructed action was also used by all children in all groups. This was used for a variety of purposes, including establishment of subject and object arguments via lexical noun signs as well as entity constructions without CA. For example, in Figure 8, the child represents two entity constructions, one on each arm/hand, to represent the dog in the story and a tree. This child (DH3) had some difficulty negotiating his left hand around his upright right arm when showing that the dog comes around from behind the tree.
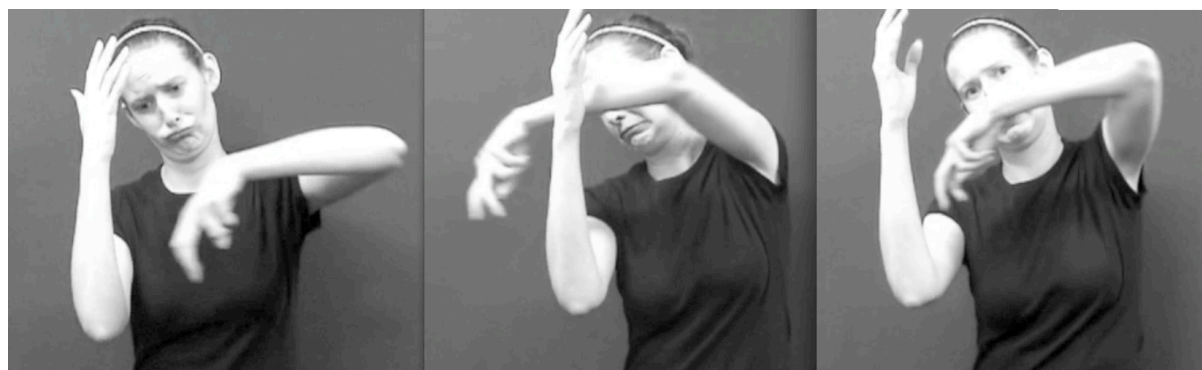
Figure 8. Example from DH3 in observer scale with entity constructions representing a tree on the right hand and the dog on the left

5.3. Observer scale with constructed action (OS-CA)

The use of observer scale with constructed action occurred much less frequently than CS-CA or OS-noCA. In fact, we only found 4 tokens of OS-CA, from two deaf children from hearing families (DH2 and DH4). Three tokens of OS-CA occurred in DH4's narrative after he has described the Pink Panther throwing water on the fire and leaving the scene. He then uses CA to "become" the Pink Panther hiding behind a tree (an event which not actually occur in the cartoon), with simultaneous use of his right arm representing a tree (as an entity construction, in observer scale), and use of his head and shoulders hunched down behind his upright forearm (i.e. constructed action representing someone, presumably the Pink Panther, hiding behind the tree). Simultaneously, with his left hand, with his arm outstretched, he produces an entity construction representing someone coming on to the scene, from left to right, as shown in Figure 9. During his narrative, DH4 produces the construction shown in Figure 9, then signs MAN with his left hand, then repeats Figure 9. Then still with his arm outstretched, in the same location where he shows the man walking on the scene with an entity construction, he also signs with his left hand FIRE STOP (i.e. 'the fire went out'). Thus he is fusing two different scales here: character scale via CA representing someone behind a

tree hiding, and also observer scale, via the entity construction and the placement of his

lexical signs in the signing space well in front of him, from the child's own perspective as

viewer of the cartoon.

Figure 9. Example from DH4 in observer scale representing location and motion of man with

simultaneous CA as Pink Panther hiding behind tree

During DH2's narrative he does not mention the Pink Panther or the fire being

extinguished. When asked what happened to the fire , he says he doesn't know and then ME

SEE MAN followed by the directional verb LOOK with constructed action. Specifically,

DH2 signs LOOK which he moves from left to right (as shown in Figure 10), indicating that

someone is watching the man walk from left to right as he comes out of the tent. This is

accompanied by simultaneous constructed action with his head and eyegaze (both of which

follow the path of LOOK from left to right), a representation of the child himself as viewer of

the cartoon casually watching the man walk past on the screen. (See §5.5 for more discussion

of this.)

Importantly, the direction of DH4's entity construction representing the man walking

out of the tent was from the left to the right of DH4's signing space, and likewise DH2's

directional verb LOOK indicating someone watching the man walking from the tent also

moved from his left to his right. These cues indicate that both children were representing the

spatial layout of the scene as an observer, since the movement of the man as viewed by the child as an observer is from the left to right, while the movement of the man from the perspective of anyone hiding behind the tree would have been right to left, and from the perspective of the dog the man would have been approaching from in front.
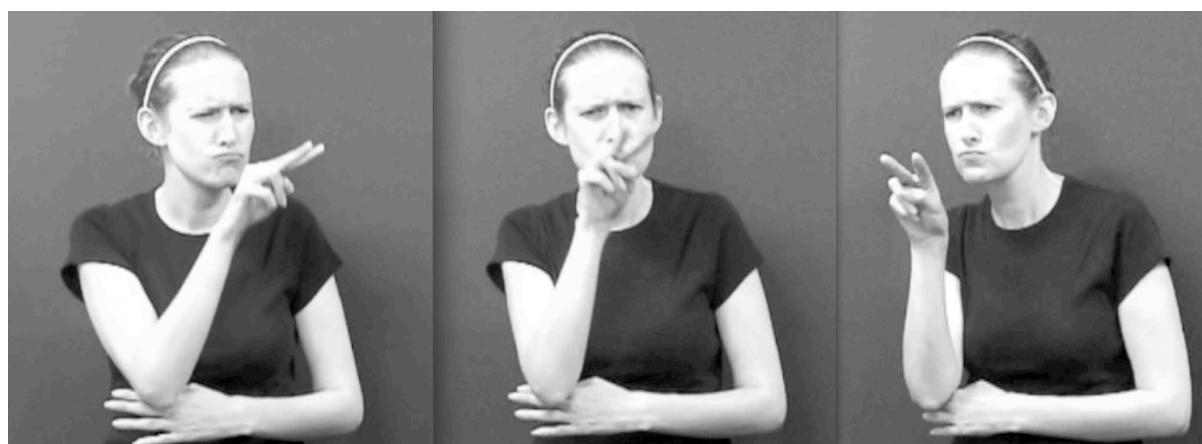

Figure 10. Example from DH2 in observer scale signing LOOK with simultaneous CA as himself as viewer watching man walk across screen

5.4. Character scale with no constructed action (CS-noCA)

The use of character scale with no constructed action was also not very frequent. This combination of scale and CA was found only in the deaf children from deaf families, and was identifiable by the use of entity constructions depicting the movement of the characters in the cartoon forwards and backwards. Because the movement of the characters as viewed by the child on screen was mainly left to right or right to left, the fact that these children were using entity constructions forwards and backwards suggests that they were taking on a character perspective – i.e. that the position and the movement of the entity constructions was meant to be with respect to their own (imagined) position within the story, rather than representations of the spatial layout as an external observer of the scene (cf. OS-CA above). These examples (as shown in Figure 11) all lacked constructed action, showing that these children were able

to position themselves in the story without needing to embody the characters at all. This may be due to the importance of location and motion in these narratives – i.e. showing how and where the different characters came onto and left the scene.

In these cases it appears that the children focused on showing these arrivals and departures of characters by assuming the position of a character already on the scene. Importantly, because they are not using constructed action, the only cue to their assuming this position is the use of space of the entity constructions around them, relative to their own position. Three of the 4 DD children used this type of construction; none of the DH children did.

Figure 11. Example from DD4 signing MAN then using character scale with an entity construction showing the man moving forward, with no constructed action.

5.5 Individual patterns

There was some individual variation in the use of scale and CA across all children. Each of the DD children used both CS-CA and OS-noCA in their narratives. DD2 used *only* CS-CA and OS-noCA – i.e. fully "in" as character or fully "out" as narrator. The remaining

DD children (i.e. DD1, DD3, and DD4) additionally used CS-noCA, with clear transitions between CS-noCA and CS-CA, or between CS-noCA and OS-noCA.

Within the DH children, all of them used CS-CA. DH1 used CS-CA only, and thus was fully "in" character during his whole narrative (including walking around the room even though he began seated). The remaining DH children used CS-CA and OS-noCA, and two of them also used OS-CA (which none of the DD children did).

DH2's narrative was notable in that he did not mention the Pink Panther at all. He described the man coming on the scene, cutting down the signpost, making the fire, and the dog being happy. But rather than saying that the man left and the Pink Panther arrived and extinguished the fire, he then skipped ahead to the man scolding the dog. When asked how the fire was extinguished, DH2 said that he didn't know and that perhaps someone poured water on it. When asked who might have done that, he said that he didn't know and then explained how he had seen the man walk across the screen (using the directional verb LOOK as described in §5.3). The man in the cartoon does not know who put the fire out, so it is interesting that DH2 also claims to not know how the fire was put out.

When describing the dog waking up after the fire has been put out, DH3 uses constructed action to represent the dog waking up surprised. While keeping one hand held as the dog's paw, he then goes on to sign WHAT-FOR BAD BEHAVE ("why this bad behaviour?"), with his head and eyegaze directed downward. Both the scolding content of the lexical signs WHAT-FOR BAD BEHAVE as well as the downward direction of his head and eyegaze should represent the Pink Panther, and yet his non-dominant hand is kept as the dog throughout this stretch of CA.

It may be possible that the use of OS-CA in DH2 and DH4 is linked to the fact that they had little if any signing exposure at home, compared to DH1 and DH3 whose mothers both signed with them at home (cf. Table 2). However, this does not mean that DH1 and DH3

were more native-like in their use of scale and CA, given that DH1's narrative was entirely in CS-CA, and DH3's narrative included some conflicting uses of constructed action.

6. Discussion

As we initially hypothesised, the use of CS-CA and OS-noCA was similar for both groups of children – i.e. deaf children from deaf families (DD) and deaf children from hearing families (DH). This is consistent with the early use of enactment and entity constructions reported in deaf children as early as 2-3 years of age (Loew, 1984, Schick, 1987). It seems that by ages 8-10 deaf children have mastered these combinations of CA and spatial scale well enough that there are no noticeable differences in frequency in narratives between native and non-native signing children. This is true even though two of the non-native signing children had little or no exposure to BSL until they started school at age 5. This is not surprising if we consider that hearing children have also been found use visible forms of enactment very early in their gestures (McNeill, 1992). In our initial hypotheses, we left open the question of whether we may find small-scale space with constructed action (OS-CA) or large-scale space without constructed action (CS-noCA). Interestingly we found opposing patterns with these two uses of spatial scale and constructed action. That is, only deaf children from deaf families used CS-noCA (no deaf children from hearing families did), while only deaf children from hearing families used OS-CA (no deaf children from deaf families did).

The tokens of OS-CA identified in the current study were identified only in the DH children, not in the DD children. Furthermore, these tokens seem odd for an adult signer of BSL. These OS-CA tokens are very similar to the "fused" perspective constructions identified by Perniss and Ozyurek (2008). These "fused" constructions were found to be rare in the Turkish Sign Language (TID) data and did not occur at all in their German Sign

Language (DGS) data. Perniss and Ozyurek argue that this difference may be due to language-specific patterns, such that different sign languages might impose different constraints on the use of space and perspective. Given these few tokens of OS-CA that have occurred in the current study, there may be a few other explanations for Perniss and Ozyurek's findings. One may be the age of acquisition of their Turkish signers. They note that all of their participants were native or early learners of TID – i.e. all had learned TID at age 6 or earlier. If all of their participants who produced "fused" productions were non-native TID signers (i.e. early learners, as in the current study), then this would be consistent with the findings of the current study, where only the deaf children from hearing families produced OS-CA. However, this does not appear to be the case; three of the four TID signers from the Perniss and Ozyurek study were native signers, including the signer shown in Figure 3a who had deaf parents and grandparents (Perniss, personal communication). Therefore another explanation is needed. One possibility may be the age of TID as a language. Perniss and Ozyurek note that the first deaf school in Turkey was established in 1902. BSL and DGS are both older sign languages, with the first deaf schools in Britain (Jackson, 2001) and Germany (Vogel, 1999, cited in Perniss & Ozyurek, 2008) being established more than 100 years earlier than in Turkey. Sign languages can change rapidly within that amount of time, as we have seen with the evolution of Nicaraguan Sign Language in the past 40 years (Senghas, 2003). Of particular relevance here is the speed with which has Nicaraguan Sign Language developed systematic spatial modulations. Although Senghas focused on spatial rotation for the purposes of verb directionality, and not the combination of spatial scale and use of constructed action, the findings from the Nicaraguan study suggest that aspects of spatial grammar can emerge within a sign language over the space over just a few generations. Thus, it may be that the relative youth of TID compared to BSL and DGS accounts for why "fused" constructions (i.e. a mixture of two scales) may occur in TID but may not occur in BSL or

DGS. The fact that a few of the DH children in the current study used this type of construction in BSL (OS-CA) may reflect early stages in both language diachrony and child development.[5]

The tokens of CS-noCA in this study were identified only in the DD children, not in the DH children. With CS-CA, signers position themselves "in" the story space in terms of how they use the space around them, but also use elements of constructed action. With CS-noCA, the use of space is the only cue that the signer is positioning themselves "in" the story space; there is no CA to additionally give this indication. The use of CS-noCA is consistent with Janzen's (2004) claim that a shift in signer's perspective can be achieved by using the signing space in a way such that the space is used relative to the signer's body, and the implication that this can occur with or without constructed action. Janzen's study was based on personal experience narratives by adult native signers of ASL. The fact that we see in the current study the use of CS-noCA in BSL narratives in native signing children (but not non-native signing children) at 8-10 years of age suggests that native exposure to a sign language may be required for this skill to be acquired by children by this age. This may be linked to differences in eyegaze as used by deaf versus hearing mothers when deaf children are infants

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[5] It would be useful to know if OS-CA constructions occur in non-native (e.g. early learner) adult signers of older sign languages like BSL, as evidence of whether OS-CA as identified in non-native child signers of BSL might persist into adulthood. It would also be useful to know at what age this type of construction emerges in native signing children, or if this stage is bypassed by native signing children completely. We leave these issues for future research.

(Kyle et al., 1987, Waxman and Spencer, 1997). It could also be linked to age of acquisition effects that have been found for theory of mind in deaf children via false belief tasks (Courtin, 2000). Whether there is CA or not, the use of character scale does require taking on someone else's perspective. However, CS-CA involves full embodiment where various articulators on the signer's body are mapped onto the other referent *and* also the space around the signer is used as if the signer is the referent. CS-noCA is similar but requires the ability of the signer to "switch off" CA via his/her bodily articulators and only use the space as if he/she is the referent. Thus CS-noCA is a quite complex use of spatial scale compared to CS-CA. It may be that the early use of sign language appropriate eyegaze patterns that deaf native signing children are exposed to early on as infants, and the increased abilities of theory of mind in deaf native signing children, both help explain why this complex CS-noCA is found in native signing children but not non-native signing children in these data.

In addition to the presence of OS-CA and lack of CS-noCA in the DH children, all four of the DH children exhibited some problems with their narrative skills, This included embellishment of narratives with events that did not occur in the cartoon and likewise omission of important events in the cartoon. For example, DH4 narrated that the Pink Panther hid behind a tree (as described in §5.3 above), and DH3 described the Pink Panther scolding the dog (the Pink Panther does not even acknowledge the dog in the cartoon). Also, DH2 omitted the Pink Panther from his narrative entirely, and when asked about who put the fire out, he claimed that he did not know, even though this is an important event that the addressee would need to know in order to understand the story. Additionally, as noted above, DH1 mimed the entire narrative so in a sense there was no real narration at all. These patterns contrast with Morgan's (2002, 2006) studies on BSL narratives in native signing / early learning deaf children who use BSL both at school and at home. As noted in §2.4, these children at ages 7-10 were able to include relevant information about characters. The fact that

the DH children in the current study lacked important (or included inaccurate) information, or lacked narration altogether, suggests that early exposure at both home and school (not just at school) is important for acquisition of narrative skills.

These findings have important implications for our understanding of age of acquisition effects in sign languages. While age of acquisition effects (i.e. differences between native and non-native signers) have been found in deaf adults at various levels of sign language grammar, there have been fewer studies examining age of acquisition effects in deaf children. The current study suggests that cognitive abilities such as perspective taking and use of spatial scale should be considered along with linguistic abilities when looking at age of acquisition effects.

There are also important implications for the sign linguistics literature which has largely focussed on the use of constructed action with or without use of depicting constructions (Aarons and Morgan, 2003, Dudis, 2004, Metzger, 1995, Quinto-Pozos, 2007) or spatial scale with depicting constructions (Perniss, 2007, Perniss and Ozyurek, 2008). Very rarely are all three considered together – i.e. spatial scale, constructed action, and depicting constructions (Janzen, 2004 may be one exception). The current study has shown subtle but important differences between native and non-native signing children in the combined use of spatial scale and constructed action, which would not have been found if we had only compared one or the other. To our knowledge, the use of CS-noCA in signers has not been described explicitly in the literature before. More attention to CS-noCA (and also OS-CA), and further evidence from larger datasets, may help us further untangle what may often be subtle differences in age of acquisition related to perspective, space and enactment within sign languages.

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	Character scale	Observer scale		
	Large-scale space	Small-scale space	Pointing space	Non-locative space
Emmorey (2002)	Viewer space	Diagrammatic space	--	Articulatory space
Schick (1987)	Real-world space	Model space	--	--
Liddell (2003)	Surrogate space	Depicting space	Token space	--
Morgan (2002, 2006)	Shifted referential space (SRS)	Fixed referential space (FRS)	--	--
Poizner et al. (1987)	Shifted referential space	Topographic space	Fixed referential space	Syntactic space
Perniss (2007)	Character perspective	Observer perspective	--	--
Slobin et al. (2003)	Protagonist perspective	Narrator perspective	--	--

Table 1.

Participant code	Age of child	Family background	Communication at home	Type of school	Communication method of school
DH1	8	Hearing family	Mother signs at home	Deaf unit	Bilingual
DH2	9	Hearing family	Parents sign a little	Deaf unit	Bilingual
DH3	9	Hearing family	Mother signs at home	Deaf school	Bilingual
DH4	9	Hearing family	Parents sign a little	Deaf unit	Bilingual
DD1	9	3-4 generation deaf family, deaf siblings	BSL	Deaf school	Bilingual
DD2	10	3 generation deaf family, hearing sibling	BSL	Deaf school	Bilingual
DD3	9	Deaf parents, hearing grandparents, deaf siblings	BSL	Deaf school	Bilingual

DD4	10	2 generation deaf family	BSL	Deaf school	Bilingual

Table 2.

Participant code	CSCA	OSnoCA	OSCA	CSnoCA
DH1	9	0	0	0
DH2	6	5	1	0
DH3	10	7	0	0
DH4	9	7	3	0
Total DH	**34**	**19**	**4**	**0**
DD1	10	10	0	3
DD2	10	11	0	0
DD3	13	19	0	3
DD4	9	11	0	2
Total DD	**42**	**51**	**0**	**8**

Table 3.

	DD	DH
CSCA	✓	✓
OSnoCA	✓	✓
OSCA	✗	✓
CSnoCA	✓	✗

Table 4.