STAGES AND TRANSITIONS IN CHILDREN'S SEMIOTIC DEVELOPMENT

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Abstract. Stage models were prevalent in developmental psychology in the past, but have recently been subjected to much criticism. We propose "rehabilitation", defining *semiotic stage* as a (not necessarily stable) period characterized by the clear establishment of a novel semiotic capacity, which may "dominate" the communication of the child at this stage, but does not replace capacities from previous stages. This is spelled out by adopting one particular model of semiotic development – the Mimesis Hierarchy (Zlatev 2008a, 2008b) – and presenting comparative and developmental data from 6 children in Sweden and Thailand, between 18 and 27 months of age, analyzing their *acts of bodily communication* (ABCs) in relation to their emerging linguistic capacities. The results show evidence for a transition around 20 months, when children display the use of (stable) signs, shared with their community, in both the linguistic and gestural modalities, but do not yet systematically combine them. Only towards the end of the period under study does this begin to occur on a more routine basis. Implications are drawn for the continuous debate on "insight" vs. gradual development in ontogeny, suggesting a compromise.

Introduction

The concept of *developmental stage* played a central role in nearly all the classic theories of cognitive, emotional, and moral development of the past century, such as those of Montessori, Piaget, Kohlberg, Freud, Erikson and Vygotsky. In language acquisition, "it is possibly the most often used term" (Ingram 1989: 32). During the last two decades, however, the stage concept has come under a good deal of critique for being inconsistently defined (or not defined at all), failing to predict the varying performance of children in different cognitive domains (Gardner 1992), being too discrete and static (Siegler 1996) and often implying a complete replacement and "dismantling" of the previous stage, while "no emerging domain disappears; each remains active and interacts dynamically with all the others" (Stern 1998: xii). However, such critiques can be taken as implying the need to *improve* on the notion of developmental stage, rather

than reject it. Contributing to this is one of the more general goals of this chapter.

In his stage-based model of human cognitive *evolution* Donald (1991) placed a crucial role on the notion of *mimesis* – "the ability to produce conscious, self-initiated, representational acts that are intentional but not linguistic." (ibid: 168) – for the evolution of human cognition and communication. Zlatev (2005, 2007) defined more precisely and elaborated the concept of *bodily mimesis*, distinguishing between two types: dyadic and triadic mimesis, where only the second is intentionally communicative, as well as proto-mimetic capacities serving as a precondition for both to develop, and post-mimetic ones, with mastery of language being the most significant one. These divisions give rise to a "logical" progression called the *Mimesis Hierarchy*, which based on evidence from primatology and comparative psychology has been applied to the evolution of human intersubjectivity and language (Zlatev, Persson and Gärdenfors 2005; Zlatev 2008a, 2008b). However, the Mimesis Hierarchy (MH) model was also intended to capture parallels (though not "recapitulation") between evolution and ontogenetic development, and while some developmental data has been offered in support in previous work (Zlatev 2002, 2003; Zlatev, Brinck and Andrén 2008), it has remained somewhat unclear to what extent the postulated stages of the model map onto *developmental stages*.

In this chapter, we aim to do precisely this, focusing on *semiotic stages*, and integrating concepts and methods from semiotics, the systematic study of meaning (cf. Sonesson 2007), developmental psychology and gesture studies into the emerging field of *cognitive semiotics.*[1] By "semiotic stage" we here mean *a (not necessarily stable) period in development characterized by the clear establishment of a novel semiotic capacity, which may "dominate" the communication of the child at this stage, but does not replace capacities from previous stages*. This definition is quite general, and different theories may propose different such "semiotic capacities", and hence different stages and transitions between these. After presenting the MH-model as it applies to development, we present a study of the development of children's gestures, or more generally *acts of bodily communication* (ABCs), from 18 to 27 months, a 10-month period that is usually marked by important developmental transitions. In the end, we draw some preliminary

[1] "… integrating methods and theories developed in the disciplines of cognitive science with methods and theories developed in semiotics and the humanities, with the ultimate aim of providing new insights in the realm of human meaning production." (*Cognitive Semiotics* #1, editorial preface)

conclusions from the study, and some other recent results on infant development, concerning the ontogeny of human semiotic capacities, of which language is but one, albeit one of crucial significance for communication and cognition.

Before we proceed, we should point out that all empirical analysis reported in this chapter was carried out by both authors, while the first author is mainly responsible for the theoretical interpretation of the data.

The Mimesis Hierarchy Model and ontogenetic development

The MH-model, summarized in Table 1 below, defines each of its five successive stages through the *clear* attainment of a previously unavailable (cognitive) semiotic capacity. At the same time, it is not a classical "stage model" in the spirit of Piaget where each consecutive stage brings with it total reorganization but a "layered model" (Stern 1998 [1985]) where earlier capacities continue to co-exist with newer ones, which subsume but do not abolish their predecessors. Neither does it imply discrete transitions. Each of the novel capacities defining the different stages typically make their entry somewhat earlier than specified in Table 1, but it takes time before they generalize beyond these first "islands".

Table 1. The stages of the Mimesis Hierarchy, applied to child development

	Label	**Novel capacity**	**Cognitive/communicative skills**	**Approx. age**
1	Proto-mimesis	Mapping between exteroception and proprioception	- emotional and attentional contagion - neonatal imitation - mutual gaze	0-8 m
2	Dyadic mimesis	volition and representation	- imitation - imperative pointing - shared attention	9-13 m
3	Triadic mimesis	communicative signs	- declarative pointing - iconic gestures - (full) joint attention	14-19 m
4	Protolanguage	conventionality/ normativity	- one-word utterances - holophrases	20-27 m
5	Language	Semiotic systematicity	- spoken or signed language	28 m-

Stage 1 (*proto-mimesis*) rests on a special form of active perception in which (dynamic) aspects of the environment – especially the actions of con-specifics – are mapped onto one's own bodily actions and sensations.

This gives rise to "shared representations" between self and other (Decety and Sommerville 2003), and "self-other matching" (Barresi and Moore 2008). This makes it possible for the infant to experience "human-scale" meaningful physical and social aspects of its life-world, distinguishing between e.g. inanimate objects, animals and persons, and to communicate above all affective states, via neonatal imitation (Meltzoff and Moore 1977) and proto-conversations (Trevarthen 1979). Yet, until approximately 8 months of age, this is done without a clear differentiation between self and other, or a sense of agency.

Stage 2 (*dyadic mimesis*) occurs once a "sense of a core self" (Stern 1998 [1985]) in which the body is felt to be "one's own" and under *volitional control* stabilises, around 9 months.[2] This highlights the lack of direct control of *others*' *actions*, and along with that the need to communicate something that is *not* shared. This may initially be done through *signals*, based on associations between bodily movements and vocalizations and others' responses. But increased bodily control, combined with differentiation from others also brings about a surge in imitation (of novel actions and events) and with time the use of the body as a true *representation* or *sign* of something else.[3] Piaget (1962) offers the example of an infant opening and closing her mouth to model the opening and closing of a matchbox, which would be an example of an *iconic* correspondence (i.e. based on similarity) between the act and the object of attention. Children's acts of pointing for themselves in order to help guide their attention (Bates, Camaioni and Volterra 1975), emerging around 10-11 months would qualify as *indexical* (and more specifically *deictic*) mimetic acts. Note that neither of these examples is communicative. Children at this stage do begin also to point "imperatively" for others, but even though this is literally "triadic" (since it involves three entities), it does not imply that children are using these gestures as *communicative signs*, expecting that the addressee will understand the intended meaning.

Stage 3 (*triadic mimesis*), which (as with the other stages) may begin earlier, but becomes more firmly established around 14 months (Bates 1979; Liszkowski et al. 2004; Blake et al. 2003) introduces precisely this: the intersubjective (self-other matching and differentiation) and representational (expression-content correspondences) abilities developed

[2] While researchers disagree on its nature, there is considerable agreement for a (qualitative) transition in development around 8-9 months (e.g. Trevarthen and Hubley 1978; Kaye 1982; Tomasello 1999).

[3] These terms are used in the sense of Piaget's double criterion of *both* differentiation *and* correspondence between "signifier" and "signified" from the subject's point of view (Piaget 1962; Sonesson 2007).

earlier are merged and become true communicative signs. The three-part relationship between (i) self-initiated mimetic gesture, (ii) its intended meaning and (iii) the receiver of the intended meaning is what justifies calling this "triadic mimesis". An example of an iconic mimetic sign is the *miming* of an action in addressee-directed "symbolic play". A mimetic sign that combines iconicity (since the motion and direction of the hand resembles the intended direction of attention of the addressee) and indexicality is so-called *declarative pointing*, which is qualitatively distinct from imperative pointing, since the latter starts as a signalling behaviour (Brinck 2003). Signs at this stage may have the same meaning for child and addressee (if communication succeeds), but they are *not known* to have the same meaning.

Stage 4 (*protolanguage*), from approximately 20 to 27 months, brings along a more or less *explicit understanding* (insight) that the meaning of the sign (gesture or word) is common to oneself and the addressee, i.e. the sign's *conventionality*. This is closely related with understanding that there is a "correct" way to express something, i.e. a conception of (deontic) *normativity* (cf. Carassa, Colombetti and Morganti 2008). With this, the iconic and/or indexical motivation – or "ground" (Sonesson 2007) – of the sign loses much of its function, allowing the relationship between expression and content to become increasingly *arbitrary*.[4] The child at this stage engages in a gestural-verbal protolanguage, largely lacking grammatical organization. The transition to this stage is marked most clearly by the "vocabulary spurt", which usually starts earlier, but is clear by 20 months.[5]

Finally, Stage 5 (*language*) introduces *semiotic systematicity*, involving hierarchical relations between composite and simple signs (corresponding to what is usually referred to as "compositionality"), and furthermore relations between signs. This corresponds to the basic mastery of a public language (spoken or signed). Children make this transition at different ages, but 27 months is an approximate average: "Somewhere between 24-30 months, most children show a "second burst", a flowering of morphosyntax that Roger Brown has characterized as "the ivy coming in between the bricks"" (Bates, unpublished report: 15).

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[4] Therefore arbitrariness and conventionality are related but not synonymous notions. In adult signed language, up to 50% of signs are more or less iconic (Woll and Kyle 2004), but nonetheless conventional (and thus "symbolic").

[5] "At first their rate of vocabulary is very slow, but one typically sees a "burst" or acceleration in the rate of vocabulary growth somewhere between 16-20 months" (Bates unpublished report: 15).

Admittedly, this outline of children's cognitive-semiotic development may again raise the objections of those critical toward stage-models. The current zeitgeist is pretty much against any general qualitative transitions, favouring instead more gradual and piecemeal development (cf. Racine 2005; Brinck 2008). Still, the MH-model avoids most of the objections mentioned in the onset of the chapter: definitions are provided and the model does not postulate discrete and "static" stages centred solely on a particular mode of cognition, with transitions implying radical re-organization. As such, it should at least be treated as a hypothesis when investigating empirical evidence. The nature of children's *semiotic development*, which includes but is more general than language acquisition, is still to a large extent shrouded in mystery, with plenty of theories but not enough data. In the remainder of this chapter, we present some evidence which can help us evaluate the model, with focus on Stages 3 and 4, the onset of Stage 5, and the transitions between them.

A study of the ontogeny of children's acts of bodily communication (ABCs)

We carried out a developmental and cross-cultural study of the "gestures" of three Swedish and three Thai children on the basis of a video-linked corpus, consisting (currently) of ten 15-minute long video-linked transcriptions of naturalistic caretaker-child interactions per child, recorded once a month from the time the children were 18 months until they were 27. The choice of this age interval was not accidental. A good deal is known about the emergence of children's communicative gestures, and especially *pointing*, up to roughly 18 months (e.g. Bates 1979; Acredolo and Goodwyn 1990; Iverson and Goldin-Meadow 1998; Liszkowski et al. 2004; Blake et al. 2003; Racine 2005). Also, there are some studies documenting the close interrelationship between gestures and language after 36 months (cf. McNeil 2005). Less is known about the period that bridges these.

Concepts and measures

Terminologically, we found it necessary to go beyond the term "gesture", as it is most often used in the literature, into a broader notion of *acts of bodily communication* (ABCs). These are defined as *communicative signs in which the signifier is visibly articulated, at least in part, using the body.* This does not exclude the possibility of involving manipulation of physical objects in the communicative acts, as for example done by Goldin-

Meadow and Iverson (1998), Acredolo and Goodwyn (1990) and many others in the psychologically oriented literature on gesture. The definition includes both deictic acts involving objects as well as (mostly) iconic acts such as symbolic play. One important motivation to extend the scope of acts under scrutiny is that many of these seem to be combined with spoken language in similar ways as gestures in the more narrow "empty-handed" sense, temporally and semantically (Andrén forthcoming).

Each of the three Thai and three Swedish children's ABCs in the Thai/Swedish corpus (for 5 minutes per data point due to time constraints) were coded with *one or more* of the semiotic categories: *Deictic*, *Iconic* and *Emblematic*, which correspond to the classic threefold division of semiotic relations (cf. Sonesson 2007). The categories are not mutually exclusive: an act of pointing may also have iconic elements (for example using the index finger to trace the shape of the target being pointed at (cf. Goodwin 2003), an emblematic (symbolic) act may have iconic and indexical components, and so on. Hence, we will mostly refer to *semiotic components*, instead of categories.

ABCs with a DEI component indicate or individuate an external target, either present or "created" virtually in the surroundings (cf. McNeill, Cassel and Levy 1993; Butcher, Mylander and Goldin-Meadow 1991), such as a physical object, person, location, direction, sound or a whole event. ABCs with ICO components instead achieve reference either through the shape of the hand(s), or through the movement of the whole body, matching the expressed action, in one respect or another. ABCs with an EMB component display a clear correspondence between a conventionalized form and a specific meaning. These forms are conventional in the strong sense of being mutually known, rather than being (individual) "habits". Sub-categories of EMB acts were labelled as new types when found in the data, e.g. *nod-yes*, *wave-hello*, forming a small lexicon. In addition, the code OBJ was used, marking ABCs that actively involved physical objects. This code is independent of the three semiotic dimensions, and may co-occur with any combination these (Andrén forthcoming). It was used in order to distinguish, for example, acts of symbolic play that involve objects from other iconic acts performed with "pretend objects".

The coding scheme is summarized in Table 2. Each of the codes was tested for interrater agreement between two independent coders for 12% (190 ABCs) of the corpus. The measure used was Cohen's Kappa, and this was calculated separately for each sub-category, apart from EMB, where Cohen's Kappa was calculated on the top category level.

Table 2. The coding scheme, involving categories ("semiotic components") and sub-categories used for analyzing children's acts of bodily communication

Deictic components (DEI)		
Index finger pointing	Prototypical and well articulated index finger pointing.	$\kappa = 0.94$
Other forms of pointing	Pointing acts with less articulated form, or with another hand shape or body part.	$\kappa = 0.68$
Object to attention	Object brought to attention, rather than the opposite (as in the two previous categories), e.g. giving, showing, placing and other variants.	$\kappa = 0.87$
Iconic components (ICO)		
First person perspective	Explicit or implicit mapping of the *whole* body onto the signified, even if only a part of the body is thematic.	$\kappa = 0.89$
Third person perspective	The articulating parts of the body figure as observed objects, *isolated* from the rest of the body (which does not bear any relation to the signified).	$\kappa = 1.00$ (but few instances)
First person display of external characteristics	The body movement is iconic to a certain action, while what is thematic is not the action itself, but its "complement"; something outside the body. Example: *This big* while "holding" an imagined object.	$\kappa = 0.85$
Third person display of external characteristics	Iconic acts where the shape or configuration of the body or body parts is not iconic. Instead the iconicity is to be found in the *trajectory of movement* as related to characteristics outside the body. Example: "drawing" the form of something with a finger.	$\kappa = 0.5$
Emblematic components (EMB)		$\kappa = 0.82$

It was further necessary to choose a suitable overall frequency measure. Raw *observed frequencies* have two major drawbacks: they are dependent on how many communicative acts actually appear in certain segment of the corpus. Other measures such as *relative frequencies*, where one type of act (such as all ABCs involving a particular semiotic component) is presented in proportion to that of other types, have the drawback of making it artificially appear as if one type increases just because another decreases and vice versa. We needed a measure of *the proportion of a given type of ABCs in the children's overall communicative activity*. This was measured as the number of a given type of semiotic components divided by the overall number of the child's

utterances, both verbal and gestural.[6] For example, a rate of 0.2 would mean that a certain component was present in 20% of all utterances in a particular data point. This measure also has the benefit of "normalizing" frequencies for differing lengths of time of the compared data.

Cross-cultural comparisons

A first analysis focused on similarities and differences between the Thai and Swedish data. ABC rates were compared for the whole corpus, and also for a specific chosen activity, *picture-book reading*, to see whether differences in the Swedish and Thai parts of the corpus were due to differing kinds of activities, or due to more specific cultural differences.

The ABC rate for acts containing DEI components (index finger pointing, other forms of pointing or object-to-attention acts) is shown in Figure 1 and Figure 2. As can be seen, the Thai children produced fewer DEI acts in all but one case. They used index finger pointing half as often as the Swedish children in the corpus, and surprisingly, even less during picture book reading. Both groups produced proportionally more index finger pointing during picture book reading than in the corpus in general, which is not surprising since this activity involves many acts of reference to pictures. In the case of the Swedish children, this was a rather remarkable 39% of all utterances.

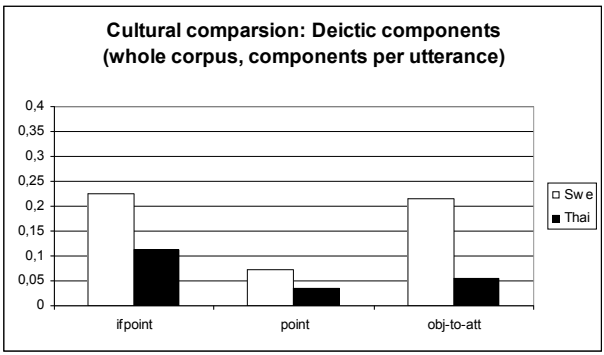

Figure 1. DEI components (whole corpus)

[6] These correspond to the number of *CHI tiers in the CHAT transcripts.

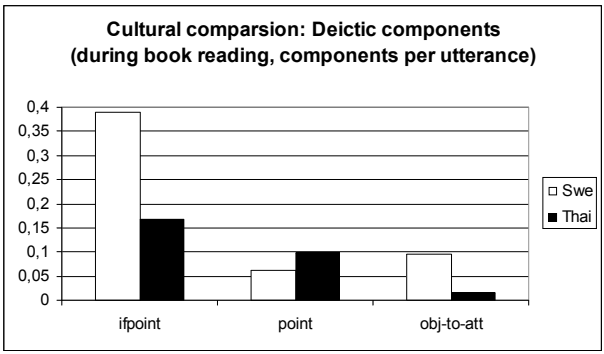

Figure 2. DEI components (picture book reading)

With respect to deictic ABCs with non-index finger pointing, the difference between the whole corpus and the picture book reading context was interestingly reversed: the Thai children produced such acts much less than Swedish children in the whole corpus, but *more* often than the Swedish children during picture book reading. Since this goes against the general trend for the Thai children producing fewer ABCs for *all other subcategories* and considering that these two kinds of pointing are very similar functionally, it is likely that they "substituted" some of the index finger pointing acts for non-index finger pointing acts during picture book reading. This suggests that the form of pointing in (at least) Thai children is strongly affected by the type of context, and one possibility is that this reflects an early (implicit) conformity with a norm to avoid index-finger pointing, especially directed at people (Zlatev and Andrén in preparation).

Analysis of ICO components showed a nearly complete dominance of *first-person perspective* (1pp) in the iconic acts for both groups, the clearest case of triadic mimesis (see previous section). During book reading 1pp occurred in all the iconic acts in the Thai data. The rate of 1pp was quite similar for the two groups during book reading, whereas it differed within the corpus at large. This suggests that the differences in the rates of ICO-gestures in the whole corpus are at least partly due to *differing activities* in the two parts of the corpus rather than specific cultural differences related to the use of ICO-gestures. *Third-person perspective* (3pp) ABCs *without* any object manipulation were very rare, and in fact only occurred seven times out of the 1592 studied ABCs in the corpus (most of these between 23-25 months). Almost all were part of symbolic play, involving objects, rather than typical empty-handed iconic gestures. 1pp ABCs were more varied when it comes to whether they

involved objects or not. In the total Swedish data 54% of the 1pp iconic acts were performed without objects, corresponding to gesture categories such as "pantomime" or "illustrators". For the total Thai data, the corresponding value was 78%. For the book reading contexts, almost all of the 1pp iconic acts were performed without objects (97% for the Swedish children and 100% for the Thai children).

The rate of EMB acts in the Swedish and Thai data, unlike the other two categories, were very similar, with emblematic components in approximately 5% of the utterances. As pointed out earlier, the property of *conventionality*, which is the defining hallmark of this category, does not imply *arbitrariness*, and this was supported by the degree of similarity between the specific categories of emblematic gestures in the two groups (assuming, of course, that these similarities are not due to borrowing). The clearly most common emblematic ABCs were the same for the Thai and the Swedish children: *nod-yes* (vertical movement of the head) and *shakehead-no* (lateral movement of the head). Together they add up to 65% of the EMB tokens in the Swedish data and 55% in the Thai data. They were also the only ABCs found that were articulated using the head. The third, and last, gesture that occurred in the data from both cultures is *scold-point* (1.8% of the Thai EMB tokens and 7.2% of the Swedish EMB tokens). This pointing-like gesture, performed with the same hand shape as index finger pointing, but resembling "hitting" someone with the finger had a higher rate in the Swedish data. On the one hand, this is not surprising considering the norm against pointing to people in Thailand mentioned earlier. But on the other, its bare existence in the Thai data underscores the role of cross-cultural similarities.

The remaining EMB acts (28% of Swedish tokens, 44% of the Thai tokens) consisted in ABCs that were only found in the data for one of the two cultures. One typically Thai emblematic act is the *wai* (see Figure 3), which is a respectful greeting performed firstly (and sometimes only) by the person of lower status in a communicative encounter. It was common in the Thai data (15% of the EMB tokens), but unsurprisingly was not present in the Swedish data (where it would have been interpreted as "begging" or "praying").

Figure 3. The Thai *wai gesture*

Developmental patterns across the cultures

Considering the overall similarities in the two parts of the corpus, and more relevant for the present purposes, we investigated general developmental patterns across the Thai and Swedish data. The literature also contains support for such culture-general patterns: "In conclusion, the development of communicative gestures across the transition period to language in Japanese infants showed some changes very similar to those found in other cultures, thus supporting universality." (Blake et al. 2003: 17). For all 6 children, language developed considerably during this age: from ritualized use of a limited vocabulary, through a period of mostly single word utterances, towards the onset of productive and relatively systematic language use toward the end. The general tendency is reflected in the average development of MLU for all children, which is steadily increasing from approximately 1.25 at the beginning of the studied period, to 2.15 at the end of the period.

Plotting the rates of the three major categories DEI, ICO and EMB showed interesting correlations between these on the one hand, and with the development of the children's linguistic skills on the other. The rate of iconic components showed a U-formed pattern. This is similar to results from Iverson et al. (1994), who found a decline in the production of "representational gestures" relative to words at 20 months, suggesting that

this reflects their subordinate role to the emerging linguistic system. However, the subsequent increase in ICO components shown in Figure 4, reaching a high along with productive language (MLU > 2) has not been reported in the literature. This finding is possibly due to our broader definition of acts of bodily communication. On the other hand, DEI components (Figure 5) increased up to 20 months. In most of these cases a pointing gesture was combined either with a deictic expression, or a nominal expression.

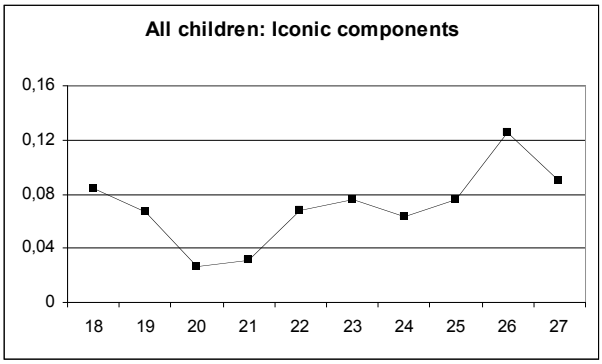

Figure 4. Development of ICO components for all 6 children

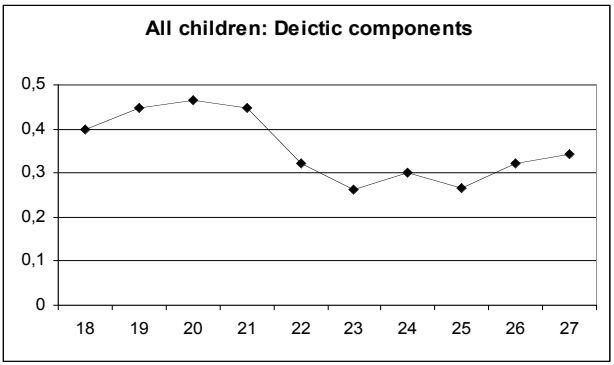

Figure 5. Development of DEI components for all 6 children

At the same time as DEI components decreased around month 21-22, the iconic ones increased. This seemed to mark the beginning of routine coordination between iconic ABCs and speech, a process that emerges

much earlier than the ”gesture explosion” (involving primarily iconic gestures) between 36 and 48 months suggested by McNeill (2005: 183). Accordingly, a possible explanation is that *the integration of speech with iconic gestures starts in contexts involving objects, such as symbolic play*, which may be a step in the development of iconic gestures that are detached from objects (cf. Capirci et al. 2005).

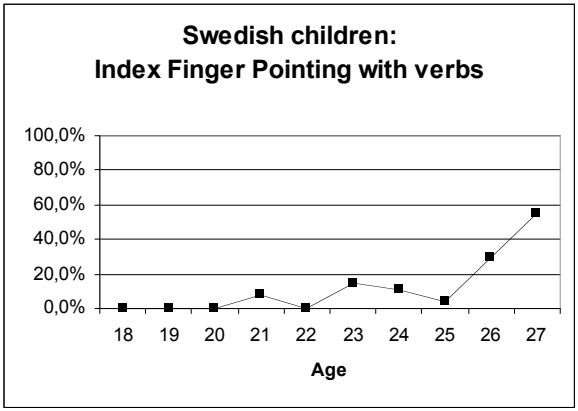

Figure 6. Index finger pointing with verbs

Further support for such a pre-history of the “gesture explosion” is offered by the developmental trend displayed in Figure 6, showing the use of index finger pointing in conjunction with action words (“verbs”) which are usually combined with iconic gestures.[7] This novel use of index finger pointing, standing in contrast to combinations with nominals and deictic words, first appears around the middle of the studied period, and increases rapidly towards the end, during the period where iconic ABCs become more common, and also with the point in time where Mean Length of Utterance (MLU) reaches 2.[8]

Finally, EMB acts – which are conventional and mostly holophrastic– showed a somewhat more unstable rate at the beginning of the period, but

[7] The results in this figure are based only on the Swedish data since only this part of the corpus has been analyzed more extensively with respect to gesture-language timing.

[8] During this period, children also generally start using verb tenses. The developmental graphs found in Plunkett and Strömqvist (1992) of verb tense development in Danish and Swedish children look very similar to what is shown in Figure 6.

reached their peak towards the middle, and then a gradual but steady decrease, see Figure 7. As mentioned in the previous section, headshakes and nodding gestures constitute a large part of this category.

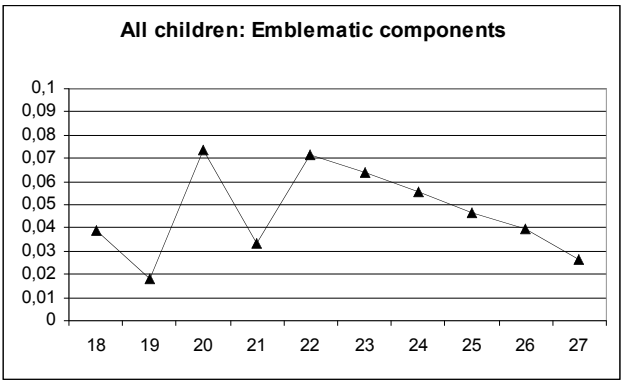

Figure 7. Emblematic components for all children

A preliminary analysis of the combination of *nod-yes*/*headshake-no* ABCs with verbal utterances on the three Swedish children (Figure 8) revealed that during the period 18-20 months, there were quite few such acts. Starting from month 20 they suddenly increased markedly, first (and also mostly) with the prototypical 'yes' and 'no' words, supporting the holophrastic nature of these gesture-language combinations. Starting from 22 months they were also combined with other kinds of utterances, such as 'I want', (for *nod-yes*) and 'not that' (*headshake-no*), as well as being performed alone without speech, and from this point in time they were also decreasingly combined with 'yes' and 'no'. At 26 months the prototypical 'yes'/'no' combinations dropped below the other two categories in frequency and at age 27 months they were for the first time most frequently performed more with other linguistic constructions than either with 'yes'/'no' or without speech.

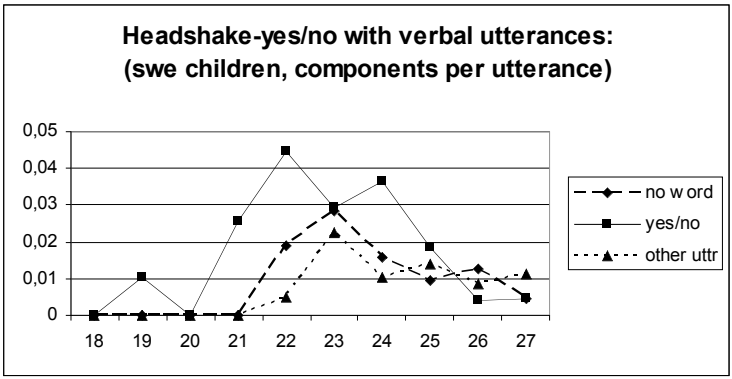

Figure 8. Nod-yes/headshake-no in combination with spoken utterances (for the 3 Swedish children only)

Finally, since the coding scheme involved semiotic components rather than mutually exclusive categories allowed us to utilize a measure that can be said to reflect "ABC complexity": the average number of semiotic components per ABC. Figure 9 plots this measure over the period, and again yields a U-shaped curve: a decrease to approximately 1 component per ABC around month 20 (correlating with the peak for DEI-components, and the valley for ICO-components), and then a steady increase.

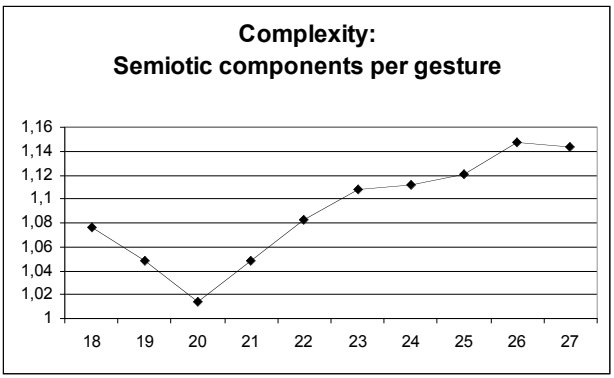

Figure 9. ABC complexity

Summary of results

Despite some notable differences the study showed considerable similarities in the early acts of bodily communication of children in Sweden and Thailand (e.g. 1pp dominance in the ICO category, and similar EMB rates and even types such as *nod-yes*/*headshake-no*). The higher rates in the Swedish corpus could be related to different activities in the data, and to the Swedish children themselves being more active conversational participants. When the comparison was made on a similar activity, picture book "reading", the similarities became clear. The one major difference was in the preference in Thai children for "other" (non-index finger) kinds of pointing, which is consistent with the discouragement of index-finger pointing (to people) in Thai culture.

When viewing the children from both cultures as a single group, some general developmental patterns appeared. In particular, there was *evidence for a transition around 20 months*, when DEI components (in association with deictic expressions and nominals) peaked, along with a dip in ICO components, and a rather sudden increase of EMB components (consisting to a considerable degree in *nod-yes* and *headshake-no*), plus an all time low in the "semiotic complexity" measure.

In the months following this, all patterns were reversed: DEI and EMB decreased, while ICO, mostly due to symbolic play, increased, along with semiotic complexity, and the flexibility in which different gestures (pointing and nod/headshake) were combined with language. A possible interpretation, consistent with the MH-model, is that this "20 month revolution" consisted in a kind of "symbolic insight", not in the sense that the children did not use any signs prior to that, but that they grasped, at least partially, the nature of semiotic norms (conventions) around this time. After that, follows a period in which different gestures (ABCs), semiotic components and linguistic utterances gradually begin to be *combined*. Symbolic play (defined as iconic acts with objects) seemed to play an important role in this process.

Conclusions: Stages and transitions

The study presented in this chapter provided evidence for the following three developmental stages of children's sign use: (a) a period prior to 20 months, with pre-conventional signs (apparently) dominated by DEI and ICO gestures, followed by (b) a transitional stage (20-26 months) in which gestures and single-word utterances become gradually integrated, and (c) the onset of a "systematic" stage, after approximately 26 months, with

multi-word utterances and flexible speech-gesture combinations. In terms of the MH-model (a) corresponds to triadic mimesis (Stage 3), (b) to protolanguage (Stage 4) and (c) to the onset of language proper (Stage 5). The transition between Stage 3 and Stage 4 appeared to be relatively abrupt, while that between Stage 4 and Stage 5, more gradual, to the extent that Stage 4, was not a plateau-like stage, but itself a transition from mimesis to language. This should hardly be surprising, since even if "protolanguage" characterized the communication of our ancestors over a prolonged period of time (as e.g. assumed by Arbib (2005) and Bickerton (2003), despite their disagreement on its nature), there is no reason to expect that in this respect ontogeny should "recapitulate" phylogeny: children are both (most likely) biologically predisposed and socio-culturally "pressured" to adopt the semiotic resources of their surroundings.

What about the early stages of the MH-model, which could not be studied in the available data? In a recent study of children's compliance to parental directives in the UK and India, Reddy et al. (2007) studied the period between 6,5 and 12,5 months and argued that "infant awareness of parental intentions for infant intentions is unlikely to be based on an 'idea of intentions' or on a recursive representational awareness of intentions-for-intentions." (ibid: 77). The exceptionally early time period (6.5 months) in which directives were used by parents and complied with by infants in both UK and India, and the stable percentages of levels of compliance for the next 6 months do seem problematic for a stage model that predicts an abrupt transition which, according to Tomasello (1999), should occur around 9 months. But even in a layered model such as the MH-model with less discrete stages, one would also predict some form of behavioural evidence of a transition during this period. In fact, Reddy and colleagues allow the possibility for this, pointing out that there was more redundancy and reliance on affordances in the early data than in the late data, and that a tendency for a "drop in compliance between 6.5 and 9 month" (ibid: 65) may even indicate that "the compliance at 6.5 months is governed by different processes" (ibid: 66). Two major conclusions could be drawn from this study: (a) complying with directives is strongly scaffolded by parents and arises in a positive rather than negative frame at an earlier age the expected and (b) the development of intersubjectivity (and other semiotic skills) appears to take place in a more piece-meal, gradual fashion than assumed by classic stage models, but within a broad frame of continuity there also seem to be periods of "punctuated equilibria" in which new skills and understandings emerge.

Despite the different theoretical points of departure, and the ages of the children, in our study and that of Reddy et al. (2007), it can be observed that independently they came to two similar conclusions: (a) that there are both cultural differences and cross-cultural similarities in children's semiotic development, but that the second seem to outweigh the first and (b) that there is both more gradual (and more context-based) development and changes which appear more discrete, reflecting the emergence of novel capacities. It is also possible that the more gradual kind of development found in the compliance study has to do with the fact that it concerns the period *prior* to the clear onset of sign-use by children, while our study involved transitions and stages that were "post-sign". Unfortunately, the period which is critical for the appearance of the *sign function* (Piaget 1962; Sonesson 2007) 12-18 months, was not investigated by any of the two studies. It has been, e.g. by Bates (1979), Iverson and Goldin-Meadow (1998), Liszkowski et al. (2004), Blake et al. (2003) and others, but these studies addressed different questions, and were not couched in any explicit semiotic framework. Clearly, there is need for future research in order to gain a better understanding of the stages and transitions in children's semiotic development.

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