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# Towards an Integrated Model of Semiotic Development

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## Abstract

In previous work, McCune (1995, 2008) and Zlatev (2007, 2013) recognized the importance of reviving a coherent cross-domain theory of semiotic development. Despite inevitable differences, the two approaches converge on their explanations of development across the first three years. Both recognized representational ability as a critical feature at the transition to language and both emphasized the importance of intersubjectivity. McCune sought a non-linguistic measure of mental representation for comparison with language development in its early phases and operationalized Piaget’s descriptions of play levels through detailed analyses of naturalistic longitudinal and cross-sectional data. Zlatev documented a step-wise development of intersubjectivity over the first three years of life, emphasizing the central role of bodily mimesis (cf. Donald, 1991).Despite varying sources, both models identified five levels/stages of semiotic development that cohere remarkably well. The present chapter presents a comparison of the McCune and Zlatev models, and proposes an integrated account offering a more complete analysis that now recognizes six stages of semiotic development, extending from birth through three years of age. The model is discussed in the context of broader frameworks such as dynamic systems (Thelen and Smith, 1994) and cognitive semiotics (Zlatev, 2012).

**Keywords:** Imitation, intersubjectivity, language, mimesis, play, representation, symbols

## 1. Introduction

Children’s cognitive development is closely interrelated with their *semiotic development*: the progressive use of communicative and meaning-making resources in intersubjectivity[[2]](#footnote-2), play, imitation, gestures, pictorial representations, and language. While there is extensive literature on these individual topics (e.g. Trevarthen, 1979; Nelson, 1996; Tomasello, 1999; DeLoache, 2004; Reddy, 2010), there is currently much less work in exploring the parallel and interactive development of several different semiotic resources, along with domain-general developmental processes and structures, as in the classical comprehensive theories of Piaget (1962) and Werner and Kaplan (1963). Bates, Benigni, Bretherton, Camaioni, and Volterra (1979) as well as McCune (McCune-Nicolich, 1981a, b) pioneered this approach in considering cognition-language relationships in early development, but the decades that followed were dominated by the ideology of “modularity” (e.g. Fodor, 1983; Gardner, 1992). While this trend may have waned in the new millennium, a more integrated approach to semiotic development is still largely lacking (cf. Lenninger, 2012; Zlatev, 2013).

In previous work we had independently sought more comprehensive approaches to semiotic development in our respective fields. McCune (1995) began by developing a non-linguistic measure of mental (conscious) representation for comparison with language development in its early phases. Following Piaget’s analysis of the development of representational play, she operationalized his descriptions through analysis of longitudinal and cross-sectional observations of children’s play, and found intriguing correspondences with levels of language development. She subsequently developed a dynamic systems approach, integrating critical variables, in addition to mental representation, that contribute to language transitions (McCune, 2008). Zlatev (2008a, 2013) focused on interactions between levels of imitation, intersubjectivity and gestural communication, which were argued to allow the emergence of language as a (predominantly) “conventional (normative) semiotic system for communication and thought” (Zlatev, 2008a: p216). On this basis, Zlatev (2013) proposed a five-stage model of semiotic development called *the mimesis hierarchy*, which integrated ideas concerning the emergence of representational capacityfrom imitation in childhood (Piaget, 1962) and the crucial role of *bodily mimesis* (i.e. the use of the body as a representational device) in human evolution (Donald, 1991).

Discovering each other’s work, we were impressed by the correspondences regarding what our approaches suggest about child development across the first three years. This is particularly remarkable given the complementary behavioral foci and the disparate sources of our evidence. McCune had concentrated on symbolic play and vocalization, including babbling, grunts, first words and word-combinations, while Zlatev addressed imitation and gestures. Regarding sources of evidence, McCune primarily emphasized naturalistic observation, while Zlatev sought evidence largely from experimental studies. Both of us identified hierarchies of five levels/stages of semiotic development, culminating in the ability to use differentiated signs/symbols, as both external (bodily) and internal representations. Thus, both of us aimed to explain how and why language develops as it does.

As we engaged in more detailed comparison between our respective models, we also discovered some differences, such as a greater emphasis on communicative intentions in Zlatev’s model, and on word combinations in that of McCune; on *mimetic schemas* for Zlatev, and on *image schemas* by McCune (see Section 2). Delving still deeper, we discovered that these differences could be reconciled in a more comprehensive model of semiotic development. The main goal of the present chapter is to propose an integrated model, along with a summary of the relevant evidence, after summarizing the most essential ideas of our individual approaches. We conclude by linking our project to the emerging new field of cognitive semiotics, aiming to understand human cognitive and cultural specificity within evolutionary and developmental frameworks (Zlatev, 2012).

## 2. Comparing the Two Models

What is the basic logic of the two theoretical approaches to semiotic development? What are the major overlaps and differences? We attempt to answer these questions in this section.

### 2.1. McCune

McCune (2008) presented a dynamic systems model (e.g. Thelen, 1989; Thelen and Smith, 1994) for the development of linguistic reference, that is, the ability to use language denoting objects and events. The work began with the analysis of the development of representational play as a non-linguistic measure of mental representation against which to compare the development of language (McCune-Nicolich, 1981a). In the 1970s there was interest in object permanence as a potential correlate with language (e.g. Bloom, 1973; Corrigan, 1979), but pilot studies convinced McCune that any children using more than a few single words demonstrated entry into Stage 6 of object permanence by solving tasks with an invisible displacement. McCune’s thesis was that language, as a symbolic process, should share underlying structure with other symbolic activities. Representational play was chosen as the cognitive variable for comparison since Piaget (1962) described the internalization of sensorimotor knowledge during the second year of life as the development of increasingly sophisticated ability to represent reality, using children’s pretend play acts as the rubric. Task analyses allowed mapping of language and play levels to one another, showing a scalable relationship among the levels, and finding relationships between representational play and developing language skills. In other research McCune (1993) applied these same representational levels to mother-infant intersubjectivity. The levels are intended to capture underlying symbolic capacity, or mental representation (as distinct from perception) that is available for use across domains of behavior.

The McCune play levels begin with the child, at *Level 1* mentally engaging with meaning, but only with strong support. Recognizing familiar objects by acting “out of context” is an almost automatic act, such as touching an empty cup to the lips. The children do not elaborate or bring the play partner into the act. At *Level 2* the child, still playing at his own activities, shows awareness of pretend in smiling and adding sound effects. As the child begins to differentiate meaning from his own body, play acts applied to dolls and mother as play partner,or derived from adult activities, begin (*Level 3*), and acts begin to be combined *Level 4* (e.g. groom self + groom mother). Single words are first used referentially (i.e. *standing for* an object and/or event) at this level if other variables have reached threshold levels. At the final play level, *Level 5*, the first kind designated as “symbolic” by Piaget, play is conceived mentally prior to enactment and the internal mental intention underlying the external act continues to be the driver of the activity. For children who are phonetically capable, McCune found the beginning of ordered combinations of words, and a spurt in MLU (mean length of utterance in words) in the next few months.

The source of the McCune system is theoretical analysis (Piaget, 1962, regarding play; Werner and Kaplan, 1963, regarding language), followed by empirical studies. Adjustments in understanding steps in development were made as the theoretical and empirical were brought into alignment. The final outcome was a description of internal “symbolic structure” that evolves over time and can be observed across activities in different domains. Each activity requires different sorts of additional competence in order for it to be expressed. So, for example, vocal language requires the capacity for phonetic/phonological expression. Representational play requires the ability to manipulate objects. Children with blindness tend to be more advanced in language than play, since lack of vision inhibits their awareness of the details of acts such as feeding, cooking, grooming, as well as motoric expression with toys. For some children with cerebral palsy this may also be the case. In typically developing children the variability in phonetic development is much greater than the variability in underlying representational ability (as shown in play), so there is high variability in the length of time between showing a skill in representational play and showing the same skill in language.

In addition to mental representation, phonetic skill and communicative ability contribute to the dynamic systems model. In collaboration with Marilyn Vihman (Vihman and McCune, 1994; McCune and Vihman, 2001; McCune, Vihman, Roug-Hellichius and Delery, 1996) two sorts of word use were defined, and measures of phonetic ability were developed. The phonetic measure, termed *vocal motor scheme* (VMS), defines the number of consonants expressed productively by the child over a period of months (see also Vihman, Di Paolis and Keren-Portnoy, 2009). Achievement of two VMS consonants appears necessary, but not sufficient, for the capacity for referential use of words. Some children with strong phonetic skill produced words in limited contexts prior to showing representational combinations in play, but words were not generalized referentially prior to this milestone. In an adventitious finding, McCune et al. (1996) discovered that use of a non-linguistic, physiologically-based form, the *communicative grunt*, also appeared as a necessary but not sufficient behavior prior to referential extension of word use.

The McCune model assumes appropriate development of intersubjectivity. Werner and Kaplan (1963) proposed that the motivation for communicative development (gesture and language) is the child’s attachment to the caregiver, along with recognition of separateness. Recognition of differentiation from mother brings with it the goal of a higher form of re-integration: communication. It is through communication that mother and child can experience the meeting of minds in joint attention and eventually, language.

### 2.2. Zlatev

In a series of publications, Zlatev pointed out a number of parallels between Merlin Donald’s model of human cognitive evolution (Donald, 1991, 2001) and children’s cognitive-semiotic development during the first three years of life (Zlatev, 2003, 2007, 2013; Zlatev and Andrén, 2009). Zlatev (2013) emphasized the need to distinguish between two parallel and interacting dimensions of meaning: *representational complexity* and *level of intersubjectivity***.** At its fully developed state, representation was understood as the subject’s conscious differentiation between expression and content, including understanding their asymmetrical relation. Following Piaget (1962), mental representation was seen as emerging from imitation: from (i) sensory-motor imitation, through (ii) deferred imitation, to (iii) representative imitation where “the interior image precedes the exterior gesture, which is thus a copy of an ‘internal model’ that guarantees the connection between the real, but absent model, and the imitative reproduction of it” (Piaget, 1962: p279). This is remarkably similar to Donald’s concept of (bodily) mimesis as “the ability to produce conscious, self-initiated, representational acts that are intentional but not linguistic” (Donald, 1991: p168). On this basis, Zlatev proposed that the children’s first concepts (or pre-concepts, if one wishes to reserve “concept” for language-mediated representations) emerge as *mimetic schemas*: “dynamic, concrete and preverbal representations, involving the body image, accessible to consciousness and pre-reflectively shared in a community” (Zlatev, 2005: 334), including schemas such as kiss, kick, eat, jump. Zlatev (2005) suggested that these provide the basis for some, though not all, of the child’s early verbs. More recently, Zlatev analyzed the gestures of six children between 18 and 26 months, and showed convincing evidence that the children’s first iconic gestures (enacting the corresponding practical actions in play, communication or both) corresponded to such mimetic schemas (Zlatev, in press).

The other dimension is that of *level of intersubjectivity*. Zlatev characterized children’s initial engagement with others (above all caregivers) as based on partial non-differentiation from the mother, and resonance-like processes of mutual attention and emotional contagion. Initial neonatal mirroring (distinct from imitation, which implies volitional control of the body) followed by proto-conversations are examples of non-representational modes of communication. With increased volitional control of the body and increased mobility, the child becomes both physically and psychologically separated from the caregivers. In consequence of this, the first pointing gestures and true imitation (as opposed to resonance) emerge from around 9 months. Yet, during the first year of life there is very little evidence of intentional communication, in the sense of Grice (1957): intending both to communicate something to an audience, and for the audience to recognize this.This implies a second-order intention (Zlatev, 2008a), which is typically enacted through bodily action: gaze, smiles, raised eye brows, holding of the gestures or repeating the vocalization until reply (Zlatev et al., 2013; Moore, under review).

The two dimensions, representational complexity and level of intersubjectivity can be “aligned”, as in the production of a representation/sign with explicit communicative intent, but they do not need to be, as in a declarative pointing gesture which displays intent but lacks representational content, or an act of symbolic play, which is representational but lacks the (second-order) communicative intention. Zlatev did not use the concepts of dynamic systems theory, but it is possible to view the two dimensions as *dynamic variables* since when both reach threshold levels, children show a marked increase in their use and comprehension of referential language and (simple) grammatical constructions. By the middle of the third year, children have typically acquired a sufficiently expressive repertoire of constructions to be able to comprehend and create non-trivial narratives, which play an important role for understanding themselves, others and the world (Nelson, 2003).

### 2.3. Similarities and Differences

McCune’s five levels of representational play provide a fine-grained analysis of children’s emerging representational capacity in the months before and after their first birthday. There is a certain degree of correspondence between these levels and the progression from sensorimotor to representational imitation, emphasized by Zlatev. This correspondence is only to be expected, given that both models were indebted to Piagetian theory, and Piaget (1962) emphasizes the complementary relation between imitation and symbolic play, with the first serving as an important form of *accommodation*, and the latter as *assimilation*: “As long as equilibrium has not achieved, either there is primacy of accommodation, resulting in representative imitation, or primacy of assimilation, resulting in symbolic play” (Piaget, 1962: p273). Both models emphasize the role of intersubjectivity (e.g. McCune, 1993; Zlatev, 2007), though Zlatev paid comparatively more attention to early forms of intersubjectivity such as “neonatal mirroring” and “affect attunement” as well as to the manifestations of communicative intent such as gaze shifting at the beginning of the second year.

However, a more careful consideration of the first nine months of development (e.g. Reddy, 2010) justifies dividing this period in (at least) two stages, with a relatively less detached, adualistic period of mother-infant interaction, followed by a more detached period, with evidence for an emerging sense of self and attention-shifting between caregiver and others. Furthermore, while McCune did not analyze the phenomenon of communicative grunts in such terms, they are easily interpreted as evidence for “intentional communicative behavior” (Brinck, 2008): occurring often in conjunction with a referential gesture, the communicative grunt may be the first vocal intentional communicative vehicle.

Another similarity in the two approaches is that both McCune and Zlatev emphasize a combination of continuity and discontinuity between pre-linguistic and language-mediated meaning and cognition. Continuity lies in the “grounding” of language in sensorimotor intelligence, and in the mental representations (semiotic function, mimetic schemas) that emerge at the end of the sensorimotor period. With the acquisition of conventional and at least in part language-specific semantic differentiations, such pre-linguistic meanings become molded into language-mediated representations and concepts, demonstrating a degree of discontinuity between pre-linguistic and linguistic cognition.

A complementary feature is that McCune attributed greater importance to the pre-representational operative structure of sensorimotor cognition, and in particular to children’s early understanding of reversibility in time and space, resulting in structures such as appearance/disappearance, containment. Thus McCune’s model (e.g. 2008: 106) proposes a possible developmental basis for one of the most influential concepts in Cognitive Linguistics: the *image schema* as “a recurring dynamic pattern of our perceptual interactions and motor programs that gives rise to coherence and structure to or experience” (Johnson 1987: xiv). Importantly, these schemas were shown to be realized in some of the first non-nominal linguistic symbols used by children: dynamic event words like *allgone*, *in* and *out*. On the other hand, Zlatev’s concept of *mimetic schemas* such as kiss, kick, eat and jump, gaining increasing recognition in the field (e.g. Cienki, 2013), appears to underlie both children’s early iconic gestures (Zlatev, in press) and their first action-expressing verbs, like *eat* and *jump*. An additional complementary feature is that while McCune examined the onset of combinations within both language and representational play, Zlatev’s model extends to the origins of discourse and narrative.

This comparison illustrates the value of a more inclusive model, combining concepts and findings from our previous work in a more comprehensive account of semiotic development, such as the one proposed in the following section.

## 3. Outline of an Integrated Model

The extensive similarities and complementary differences in our approaches have motivated us to go further than just comparing our models. With awareness that many relevant empirical findings remain debatable, and many details remain to be worked out, in this section we propose the outlines of an integrative model of cognitive-semiotic development. It is “integrated” not only in the sense that it brings together the essentials of two independent models, but because it offers the opportunity for combining a larger set of cognitive-semiotic phenomena (play, imitation, intent, word-combinations etc.), and thus to provide a more comprehensive account of semiotic development. In Piagetian terms, we focus especially on providing a sequential organization and coherence to the period between the culmination of the sensorimotor period and the beginning of “pre-operations”, highlighting developments in representation and intersubjectivity. Piaget devoted little attention to emotion and is often accused of neglecting intersubjectivity and especially emotions (e.g. Kugiumutzakis, Kokkinaki, Makrodimitraki and Vitalaki, 2004), so our model can be seen as contributing towards filling this lacuna as well.

Table 1 shows the model as a sequence of six stages of the child’s semiotic development in the first three years of life (36 months). A stage is here understood as *a period in the child’s life characterized by a set of cognitive-semiotic capacities which dominate cognition and meaning-making during this period without replacing earlier capacities, and which potentiate the development of further stages.* This implies that, as in evolution, no genetically-determined saltations[[3]](#footnote-3) are expected: ontogenetic development is basically continuous, with behaviors of different stages potentially overlapping. On the other hand, in line with dynamic systems theory the model predicts that there may be discontinuous phase shifts leading to qualitatively different modes of functioning. The labels of the stages are mainly given for convenience, and the ages are approximate.

### Primary Adualism (0-4m)

From birth infants undergo continuous processes of change, while maintaining an intimate relationship with their mother, and other caregivers (Hrdy, 2009). The term “primary intersubjectivity” (Trevarthen, 1979) could be an adequate descriptor of this period, but we remain skeptical to claims that “self” and “other” are concepts present at birth, or that the neonate is fully capable of imitation, as claimed by Trevarthen and colleagues. Rather, our model concurs to a greater extent with the descriptions of Piaget (1962) and Werner and Kaplan (1963) of the first few months of life as characterized by a lack of clear discrimination between self and others. Empirical evidence of such immersed primary relationships, with only gradually emerging self-differentiation are phenomena such as molding, affect contagion, and mirroring.

The typically developing infant molds easily to the caregiver’s body, often in the rather tight pre-birth position. Contagious crying in the neonatal nursery demonstrates infants’ sensory-affective integration with the human world: hearing the other infants’ cries brings about analogous feelings, which may be seen as an initial form of empathy (Darwin, 1872/1965; Preston and de Waal, 2002). Attaining homeostasis in the external world takes its toll, however, so that the infant’s availability for interaction is at first limited to a few hours at most of the quiet alert phase that allows interaction with objects and conspecifics (Brazelton et al., 1974).

Table 1. Six stages of an integrated model of semiotic development  
in the first 3 years of life

|  |  |  |  |
| --- | --- | --- | --- |
|  | Stage | Cognitive-semiotic skills | Approximate age |
| 1 | Primary adualism | - neonatal mirroring  - bodily molding  - affect attunement  - proto-conversations | 0-4 m |
| 2 | Dyadic interactions  (self-other, self-object) | - social routines  - social referencing  - stranger anxiety  - locomotion and object exploration  - pre-symbolic play (Level 1) | 4-9 m |
| 3 | Triadic interactions (self, object, other) | - imitation (of novel acts)  - deictic gestures  - context-limited words  - self/other pretend play (Level 2/3) | 9-14 m |
| 4 | Intentional communication | - communicative intent  - communicative grunts  - referential words  - combinatorial representational play (Level 4) | 14-20 m |
| 5 | Onset of symbolic  communication | - integrating representation and intent  - hierarchical representational play (Level 5)  - sign combinations: words and gestures  - onset of grammar | 20-24 m |
| 6 | Discourse and narrative | - complex sentences  - discourse  - onset of narrative | 24-36 m |

Tasks such as visually following an object or face, or responding to models for motoric replication can only be successfully applied on the infant’s schedule, which may account for high participant loss and high variability in findings in this period. This may be why the literature on so-called neonatal imitation of simple movements involving the tongue, mouth, head and hands includes reports of both replications (Meltzoff and Moore, 1997) as well as non-replication (Anisfeld, 1996). In this respect we concur with the more balanced assessment of Suddendorf et al. (2012), and refer to the phenomenon as *neonatal mirroring*: non-volitional, semi-automatic matching of simple bodily movements.

By 3 months, most infants fail to show such mirroring responses, but rather begin to engage in turn-taking interactions known as *proto-conversations*, where adult and infant engage in exchanges of rhythmic movements and vocalizations (Brazelton et al., 1974; Trevarthen, 1979). Also at about this age children begin displaying behaviors such as mutual gaze, intense smiling and “coyness” (Reddy, 2008), most often directed towards the mother. These suggest at least the beginning recognition of the mother’s separateness and importance. Caregivers respond to infants’ smiles with their own, and attune to the baby’s expressions of excitement or discomfort with their own expressions; with time attunements become mutual (Stern, 1985). As pointed out by McCune (2008: 21), “such attunements have the essential quality of shared affective meaning that allows the infant to experience a unity with the parent that is psychological, occurring in the context of physical separation but in visual and auditory contact”. Thus, by the end of this stage, the child has progressed from initial adualism to the beginning of a dyadic relationship.

### Dyadic Interactions (4-9 Months)

During this stage, the infant is psychologically distinct enough to begin more active engagements in the social and physical environment – with others and with objects – but is not yet capable of bringing these into an active triadic relationship (e.g. Tomasello, 1999).

With respect to social interactions, repetitive games such as peek-a-boo begin with the infant in a passive role but gradually developing over the months to an increasingly more active role (Bruner, 1983). With clearer recognition of the mother (or other primary caregiver) as a special person, other adults begin to get a second look, both as interesting and as sources of anxiety. Between 5 and 9 months this discrimination increases leading to intense attachment and fear of strangers. Partly following from prior adult attunements, infants begin *social referencing* by 7 months (Reddy, 2010) looking to mother to determine whether a new person or object is safe for exploration.

By 7 months, locomotion (crawling) typically begins, and along with that, more careful examination of objects. Werner and Kaplan (1963) proposed that infants derive the meaning of objects through observations and activities that reveal their affordances (Gibson, 1969) in human social and practical commerce, in line with some modern proposals (e.g. Rodriquez and Moro, 2008). By recognizing object meaning the child establishes the first clear connection with the surrounding culture. It may be remembered that McCune’s pre-symbolic play (Level 1), which may begin as early as 8 months**,** involves enacting familiar actions with familiar objects out of context. These actions are limited to their own bodies (put cup to lips, comb to hair, etc.) and are brief, enacted with serious demeanor. In a sense, the act represents itself, with no differentiation between expression and content on the side of the child.

### Triadic Interactions (9-14m)

Mahler, Pine, and Bergman (1975) traced developments from an initial state of adualism through a period of initial differentiation beginning at about 5 months, characterized by exploration of others and beginning initiation of dyadic interaction, culminating in the infant’s “individuation” occurring at about 9 months of age. A new degree of volitional control of the body is typically shown in competent locomotion, and Mandler (2004) attributes the imitation of novel acts applied to novel objects to such control. Along with this development in imitation follows a fuller understanding of both self and other, or as famously formulated: “My sense of myself grows by imitation of you and my sense of yourself grows in terms of myself” (Baldwin, 1894). This understanding highlights the lack of direct control of others’ actions, and along with that motivates attempts to influence others to perform actions that are desired (cf. Werner and Kaplan, 1963). This effectively brings both the addressee and the external object into focus, giving rise to a surge of *triadic interactions*.

Indeed, from about 9 months appear different forms of communicative gestures such as (whole-hand) pointing and showing (Bates et al., 1979; Carpenter, Nagell and Tomasello, 1998) and the use of a restricted number of *context-limited words* (McCune, 2008). What distinguishes these from later gestures and vocalizations is lack of clear evidence of communicative intent such as gaze-shifting to the face of the adult. Bates et al. (1979) argued that children’s early use of gesture was indexical (i.e. associative) rather than “symbolic” (i.e. representational). Another trait is stereotypical usage: context-limited words like *doggie* used only in the presence of the family pet, are more appropriately said to participate in situations than to denote/represent them (cf. Zlatev, 1997, Ch5).

In terms of the two dimensions distinguished by Zlatev (2013, cf. 2.2), this suggests that while children are in the process of developing representations such as mimetic schemas through the imitation of culture-typical acts, and developing their understanding of others as psychological beings – neither of these capacities is yet fully developed. This interpretation is further supported by McCune’s findings on the onset of self/other pretend play (Levels 2/3), which occur at the latter part of this stage. Such play actions display awareness on the part of the child of the *as-if* nature of their act, and could therefore qualify as representations (cf. 2.2). However, while infants are more likely to display these acts in maternal presence, and may look to mother as they occur, there is nothing to show that children wish their addressee to understand these acts as particular messages, i.e. as forms of intentional communications.

### Intentional Communication (14-20m)

Iconic gestures, in which the child enacts some mimetic schema (e.g. “kicking” the picture of a crocodile in a book at 18 months) are observed in the period leading to stage 4, though few are accompanied with markers of communicative intent, similar to the self/other pretend acts discussed above (cf. Zlatev 2013). With deictic[[4]](#footnote-4) gestures and vocalizations, however, the situation differs. So called declarative pointing, which displays a desire to inform others of something new, increases in frequency from about 14 months (Carpenter, Nagell and Tomasello 1998). Gaze-alternation and mutual gaze in establishing joint attention are much more common at 18 months than at 12 months (Zlatev, Brinck and Andrén, 2008). The *communicative grunts* discovered by McCune et al. (1996) appear at this stage, quite consistent with their interpretation as expressions of communicative intent. As pointed out earlier (cf. Section 2.1), these are a good predictor of the subsequent emergence of referential words. By 20 months of age, all participants in the McCune (2008) study who were phonetically capable (i.e., had developed at least two vocal motor schemes) produced at least 30 different words in a half hour observation, and in some cases many more. The most advanced children produced combinations of two to three words at this age.

Experimentally, the most common paradigm for assessing children’s understanding of communicative intent is the “object-choice task”: a reward is hidden in one of several locations, and then the correct location is communicated by means of pointing or some non-linguistic representation. Behne et al. (2005) showed that 14-month old children passed the task when the experimenter pointed, while gaze-shifting between the location and the child, but not while the experimenter was looking elsewhere. Zlatev et al. (2013) demonstrated that 18-month-old children succeeded equally well with pointing (which was familiar to them) and placing a marker (which was at least in part novel), but not when seeing a picture representing the correct location – which was comprehended first by 30 month old children. Experimental studies of comprehending iconic gestures have also showed that at 18 months there is no advantage for learning the link between iconic gestures and denoted objects compared to arbitrary gestures (Namy, Campbell and Tomasello, 2004), suggesting that both kinds are learned as associations rather than being recognized as signs/representations at this age.

Thus, both the observational and experimental evidence support the claim that the onset to intentional communication is made through deictic gestures, the first referential words, or combinations of these – and markers of communicative intent such as gaze shift during the first half of the second year. On the other hand, the systematic understanding that words, gestures or/or pictures can be used to represent events, objects and actions for the purpose of communication is yet to emerge. This is shown by the fact that children still use fairly few words, and lack the ability to combine them in complex representations. It is rather in the domain of representational play that the capacity to combine (non-communicative) representations is being practiced: between 15 and 22 months, all children begin to produce combinations of pretend play acts (Level 4).

### Onset of Symbolic Communication (20-24m)

The term “symbol” is heavily ambiguous in the literature, and we use it to denote the use of signs which are (a) representational, i.e. expression and content are clearly distinguished (Piaget, 1962), (b) used together with communicative intent (Tomasello, 1999) and (c) systematically combinable (cf. Deacon, 1997). Note that this does not imply that symbols, at least initially, need to be either conventional or arbitrary. Thus defined, we can understand the onset of Stage 5 with *the onset of symbolic communication*, as the outcome of several “dynamic variables” reaching threshold levels: (1) representational complexity, (2) communicative intent, (3) phonetic/motoric proficiency and (4) the combinatorial capacity, e.g. witnessed in Level 4 play. Therefore, while the referential transition documented by McCune (2008) occurs in the previous stage, the onset of true symbolic communication – implying the capacity to combine symbols, occurs at Stage 5. Indeed, between 19 and 24 months, word combinations become more frequent than single word productions for many children. Such combinations of conventional linguistic symbols are “prepared” not only by the symbolic play combinations, but by combinations of words and gestures: a number of studies have shown that type and number of word-gesture combinations at 18 months predict later grammatical complexity (e.g. Rowe and Goldin-Meadow, 2009).

An important milestone of this transition in the domain of representational play is hierarchical play (Level 5), in which the child exhibits a plan before some acts, searching for materials, announcing the next act, or substituting one object for another. For example, a wooden block stands for car, but is never confused with it; cf. the analogous notion of “dual representation” used by DeLoache (2004). It is this level of differentiation that is required for symbols to combine directly, as in words combining in initial syntactic combinations. By analogy with ‘planned symbolic play’ the child can internally construct a symbolic combination of words: an early sentence. In play this was achieved in her longitudinal sample between 15 and 22 months (McCune, 1995), with a spurt in MLU following in 1 to 3 months, depending partly on the child’s prior lexical development.

### Discourse and Narrative (24-36m)

During the third year of life, most children show mastery of a number of grammatical constructions of various degrees of abstractness (Tomasello, 2003), and this mastery rapidly develops. This potentiates development in both communication and thought. Structural features like mental predicates (verbs like *think, believe, know*) and sentential complement constructions (Astington and Jenkins, 1999) and pragmatic features like disagreements, repairs and meta-linguistic discourse (Lohmann and Tomasello, 2003) appear to contribute to performance in so-called “theory of mind” tasks. Hutto (2008) has argued that linguistic proficiency brings first apprenticeship and then mastery in understanding and producing *narratives*, and it is through these that children, at least from their fourth year, begin to understand the folk-psychology of beliefs and desires.[[5]](#footnote-5) Nelson (2003) has further argued that, knowledge of “cultural myths and social narratives” has a constitutive role for forming autobiographical memories.

The relationship between linguistic and pictorial competence is highly understudied (Lenninger, 2012), but given that only at this stage are children capable of utilizing the referential function of pictures (DeLoache, 2004; Zlatev et al., 2013) it remains possible that language as a symbolic system serves as a contributing factor.

## Summary and Conclusions

As we stated in the introduction, after decades of exaggerated emphasis on distinct “mental modules”, it is time to re-awaken the study of semiotic development from a prolonged period of semi-hibernation, connecting to the classical theories in the field, such as Piaget (1962), Werner and Kaplan (1963) and Vygotsky (1978). Of course, this does not imply a “regression”, since many of the original ideas need to be rethought, re-evaluated in relation to modern evidence, and brought together in novel integrative theories, such as the one we suggest in this paper. While we disagree with accusations (e.g. Kugiumutzakis et al., 2004) that the classics showed a complete disregard of emotions and “constructed” an over-intellectual “apathetic” conception of the child, there is certainly a need for a more concerted consideration of the role of affect in the development of intersubjectivity, consciousness and language across the entire age range of semiotic development (cf. Foolen et al., 2012).

What we have attempted to demonstrate here is not so much a well-worked out theory of semiotic development, but an argument for the *viability* of the project. It is indeed risky to take up at once many different semiotic resources and a virtually bottomless well of potentially relevant empirical evidence, forcing one to paint in rather broad strokes. But unless this is at least attempted, correspondences such as those between representational play and language, between communicative intent expressed in gestures and in vocalizations, between semiotic competence shown in speech and in pictorial understanding would never stand the chance of being discovered. Again, this is far from saying that such correspondences would be simple and direct ones, as if there were a single “semiotic function”, progressing along a universal timetable, as caricatures of an integrated approach would sometimes say. Different resources have their own semiotic properties (e.g. various kinds and degrees of iconicity), communicative function (e.g. play vs. pointing) and rely on different sensorimotor skills (vocalization vs. manual movement), so very naturally there will be substantial cross-domain, as well as individual differences. To be able to model these, we find the dynamic systems approach most productive, though even there – we do not hold that it is sufficient to reapply the analyses of simple motoric skills; there will have to be active theoretical extensions to understand which exactly are the “thresholds” and “control parameters” in considering complex phenomena such as representational complexity and level of intersubjectivity as dynamic variables, as suggested in this chapter. Still, dynamic systems are attractive in their potential to model continuous development with multiple interactive factors and some relatively sharper transitions, without necessarily being confined to maturational timetables.

Finally, rising still one level of generalization higher, models of general semiotic development such as the one we here propose contribute to integrating developmental research with even broader concerns such as the “embodiment” of (linguistic) meaning, essential properties of human consciousness such as intersubjectivity and imagination, and the evolution of human cognitive specificity. It may be remembered that classic theorists such as Piaget, Werner and Vygotsky were not interested in development only for its own sake, but for gaining insights in such fundamental issues. And of course, understanding these more fully will reverberate back on the understanding of how they develop in children, in a circular, or rather spiral-like fashion. In this way, the study of semiotic development will take its natural place within the new (but with ancient pedigree) field of cognitive semiotics.

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2. Understood generally as “the sharing of affective, perceptual and reflective experiences between two or more subjects, [which] can take different forms, some more immediate, while others more mediated by higher cognitiveprocesses” (Zlatev, 2008a:p215). [↑](#footnote-ref-2)
3. The term “saltation” is used in evolutionary theory to refer to sudden jumps in evolution as a result of (biologically implausible) “macro-mutations” (cf. Johansson, 2005). [↑](#footnote-ref-3)
4. The paradigmatic example is pointing, but this category includes all gestures, such as showing, that serve to bring the attention of an addressee to a target object, place or event (cf. Zlatev, Brinck and Andrén, 2008). [↑](#footnote-ref-4)
5. This does not exclude the possibility of some basic forms of narrativity to appear earlier, and also in other modalities than language. [↑](#footnote-ref-5)