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7 Children's Multimodal Language Development

Abstract: Through constant exposure to adult input, in dialogue, children's language gradually develops into rich linguistic constructions that contain multiple cross-modal elements subtly used together for coherent communicative functions. In this chapter, we retrace children's pathways into multimodal language acquisition in a scaffolding interactional environment. We begin with the first multimodal buds children produce that contain both gestural and vocal elements and how adults' input, including reformulations and recasts, provide children with embedded model utterances they can internalize. We then show how these buds blossom into more complex constructions, focusing on the importance of creative non standard forms. Children's productions finally bloom into full multimodal intricate productions. In our last part, we focus on argument structure, Tense, Mood and Aspect and the complexification of co-verbal gestures as they are coordinated with speech.

Keywords: language development, adult scaffolding, multimodal language, language acquisition

1 Introduction

Thousands of multidisciplinary studies of first language acquisition do not reduce our capacity to be amazed by infants' interactive skills and the speed with which children become multimodal speakers. The analysis of their first steps into language can only increase our appreciation of the importance of their interactions with adults and older siblings in the development of their multimodal language skills. Even if children have innate biological and cognitive capacities, they need to learn social and linguistic conventions from the input. They construct these capacities in parallel with other cognitive and social skills, such as the ability to follow the others' gaze, to draw their attention, to read their intentions, to make analogies, to symbolize.

Gestures, verbal productions, signs, gaze, facial expressions, and postures, are all part of our socially learned, inter-subjective communicative system. Human beings, with all their representational skills, combine modalities in order to share meaning, to refer to present and absent entities and events, to express their intentions, their desires and their inner feelings. As McNeill (1992, 2) pointed out, we might "broaden our concept of language." Research in signed languages has helped to show how the visual modality can be used symbolically. Thanks to combinations of experimental and field studies, video recordings, specialized software, multi-language databases, theoretical approaches that include multiple levels of analyses, and thanks to rich

collaborations among experts from several scientific fields (↗2 Research Methods), we now have the tools to pursue the insight that "vocal language is inherently multi-modal" (Muller 2009, 216).

One approach to children's linguistic knowledge is to study longitudinal naturalistic recordings of individual children and analyze both the children's productions and the input they receive over a certain period of time. Child language research is one of the first fields in which spontaneous conversation data was systematically collected, initially through diary studies (Ingram 1989; Morgenstern 2009), and later by audio and video recordings shared worldwide thanks to the CHILDES project (MacWhinney [3]2000). Corpora from various languages therefore form the backbone for a large number of issues in the field.

The data-centered method has allowed many researchers to confirm that in the course of their development, children make their way through successive transitory systems with their own internal coherence (Cohen 1924). This phenomenon can be observed at all levels of linguistic analysis.

Following Tomasello (2003), we assume that children initially learn concrete chunks of language, linguistic gestalts that can take different sizes and shapes, in dialogue. They then generalize across those various elements in order to assemble abstract constructions (Fillmore 1988; Goldberg 1995; Michaelis [2]), in the process of creating new utterances. These linguistic constructions are units of language that contain multiple cross-modal elements used together for coherent communicative functions.

Language acquisition is a fruitful field in which to apply Construction Grammar and in particular "Multimodal Construction Grammar." As Ingram (1989, 483) reminds us: "Constructions have been in child language all the time." The 19th-century observers of child language had already expressed their intuitions about gestalt language in their diaries about their own children (Stern/Stern 1907; Pavlovitch 1920). These intuitions were expanded on by Brown (1973), and applied by authors such as Crystal/Fletcher/Garman (1976) to assess language levels, by Peters (1980) to describe the development of language units, and by many developmental-functionalist approaches to language acquisition (Budwig 1995; Clark 2003) to relate language development to other domains of cognition and to its social, conversational anchoring.

The "founding fathers" of the study of child development and language had great intuitions about the importance of gestures and their relation to language. Darwin (1877), in his notes on his son's development, stresses the importance of observing the transition from uncontrolled body movements to intentional gestures. Romanes (1889) compares human and animal gestures. He makes new observations about qualitative differences and mentions the "gestural language of deaf people" as a sign of the universality of symbolic gestures.

The starting point of language acquisition scholars' interest in gesture, visible bodily action or object-actions (Sansavini et al. 2010) could be summarized in de Laguna's assertion that "in order to understand what the baby is saying you must see

what the baby is doing" (1927, 91). Children's productions are like evanescent sketches of adult language and can only be analyzed in their interactional context by taking into account shared knowledge, actions, manual gestures, facial expressions, body posture, head movements, all types of vocal productions, along with the recognizable words used by children (Morgenstern/Parisse 2007; Parisse/Morgenstern 2010). Research in language acquisition has therefore developed the tools, methods, and theoretical approaches to analyze children's multimodal productions in context as early as the second half of the 19th century, through scientists' diary observations of their own children, followed by audio and then video-recordings made by outside observers. The detailed follow-ups of children's language anchored in their daily lives are a source of links between motor and psychological development, cognition, affectivity, and language.

Children can internalize the language to which they are exposed; and they can extract form-function pairings, use them with sensitivity to the pragmatic and dialogue context (Halliday 1967). But they also exploit the creative potential of language (Chomsky 1959), going beyond rote learning based on situations that are fixed in advance. Children are both lumpers, as they generalize observations into patterns, and splitters, as they analyze patterns based on item-specific knowledge. Their mastery of language is marked by how freely they combine constructions and produce utterances that are accepted and understood by their interlocutors in context through negotiation of meaning as part of the social practice of conversation (Gumperz/Levinson 1996). The main factors affecting language development thus are 1) communicative intention, 2) frequency and saliency in the input, and 3) children's very own affective, social and practical concerns. Those three main factors come into play to various degrees according to the specific linguistic item that is being acquired.

2 First multimodal buds

2.1 Pre-Linguistic Scaffolding and Replication

Vygotsky's theory of learning as socially co-constructed between collaborating partners within a cultural context (1934; 1978) gives a fundamental role to interaction in the cognitive and language development of children. Originally developed by Wood/Bruner/Ross (1976) in the context of first language acquisition, scaffolding is a metaphor that is based on the Vygotskyan premise of learning as a socially constructed process (↗8 Bases of Linguistic Development).

Children's understanding of novel entities is often mediated by their interlocutors' affective display, especially through facial expressions (Ekman 1984). This type of "social referencing" and the "affective frames" is fundamental to children's cognitive and linguistic development (Klinnert et al. 1983; Ochs/Schieffelin 1989).

Children's entry into language is therefore guided by the input and is also very much triggered by children's eagerness to imitate their conversational partners (Gop-

nik/Meltzoff/Kuhl 1999). Children's first productions are permeated with imitation and replication of the constructions heard in the adult input. In order for them to actually learn linguistic constructions, be they sound patterns, gestures, words or multimodal constructions, children must repeat and manipulate the forms, play with them, at first often on their own, in monologic cooing and babbling that serves as a kind of laboratory to test a wide range of sounds and prosodic patterns, or gestural configurations and movements. They activate them in a productive manner in interactions focusing on average frequencies and producing syllables or gestural configurations that are closer to the adult system. It begins with dialogical babbling or conversational vocalizations (Trevarthen 1977), for example, during diaper changing, when it is not really clear who, between the parent and the child, imitates the other. It continues with routines (Bruner 1983) and conventional gestures that enter the child's repertoire around 10–11 months old either through everyday playful scripts or songs and nursery rhymes, such as "au-revoir" (waving hands), "caché" (playfully hiding face with hands), "bravo" (clapping hands), "Ainsi font, font, font les petites marionettes" (a French song that is accompanied by hand gestures representing puppets). All those gestures derive from the culture the children are brought up in and have very strong social and symbolic values.

If children take up and imitate the forms produced by their parents, parents also seize and take up the sounds and movements produced by their children, in order to endow them with as much meaning as possible, and shape them into a form that could be compatible with the adult communicative system. In the following example taken from the Forrester corpus (CHILDES database; Forrester 2008), the father takes up his daughter's gesture, which could be interpreted by the observer as not being intentional and communicative at all, and transforms it into a game that serves as a transition toward meaning.

> Example 1. Ella 1;02[1]
> *The father and the daughter are having breakfast*
> *FATHER : Are you tired ?
> *Ella whimpers and rubs her face.*
> *FATHER : Oh a little bit.
> *She then makes a very unexpected gesture. Her hand goes down along her hair. She hits her head and looks at her father as she produces a short vocalization.*
> *ELLA : eh !
> *He takes up his daughter's gesture and points to her head*
> *FATHER : baby's head.
> *He then points at his own head.*
> *FATHER : daddy's head.

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1 Age is indicated in [X years; Y months]: 1;02: 1 year and 2 months.

The father takes up what seems to be a non-intentional non-communicational gesture and transforms it by shaping it into a conventional pointing gesture, through which he can designate alternatively his own head and his daughter's head. He has changed it into a social gesture which is part of the string of routinely-used pointing gestures of the various members of the family that Ella will take up and replay herself in the following sessions in the data.

2.2 Language in Action

Language – a social phenomenon – is captured, internalized and reconstructed again and again by each individual child thanks to its transmission by care-givers in their daily interactions with their upspring. "Meaning comes about through praxis – in the everyday interactions between the child and significant others" (Budwig 2003, 108). Joint parent-child action/interaction provides the scaffold for children's growing ability to grasp both what is happening around them, and what is being said in the situation. They learn to understand language and action together, each providing support for the other. Duranti explains that language is "a mediating activity that organizes experience" (1984, 36) but of course, experience is conversely a mediating activity that organizes language. To examine how children come to use language in general, one must examine the broader context in which the child experiences events and interaction.

Zlatev (1997) suggests that sensorimotor schemas provide the "grounding" of language in experience and will then lead to children's access to the symbolic function. Infants' imitation and general production of gestures has indeed been studied as a prerequisite to construct "pre-linguistic" concepts, as a pathway into the symbolic function of language or a bridge between language and embodiment. Gestures are viewed as representational structures, constructed through imitation, that are enacted overtly and can be shared with others. Mimetic schemas for imitable actions, shared representations of objects that can be manipulated, ground the acquisition of children's first gestures and first words or signs. In addition, evidence from brain and behavioral studies shows that language use engages motor representations (Glenberg/Kashak 2003) and that through complex imitation, manual-gestural communication in social interaction leads to language (Arbib 2012).

2.3 First Gestures and "Multimodal Constructions"[2]

Children's neurological maturation enables them to control their bodily movements and transform them into gestures thanks to increasingly finer motor skills. Some of

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[2] This expression was first coined by Andren (2010).

these gestures are assigned meaning by their interlocutors. First gestures, just before the first birthday, are usually deictic: pointing at an object or waving an object to show it to the parent and attract joint attention. Pointing gestures in particular combine motor and cognitive prerequisites with the capacity to symbolize and to take up forms used by adults in dialogue.

At around a year old, children produce representational gestures using their entire bodies to imitate an animal for example. Children also start using gestures that reflect those in their input around the same period (Estigarribia/Clark 2007). They develop cognitive prerequisites that allow them to take up symbolic gestures from the environment.

Children's interactive gestures have been mostly studied either in the stage called "pre-linguistic" when they are used in isolation, or when they are combined with words and are described as facilitating children's access to first combinations. Synchrony and asynchrony have been presented as important features in multimodal multi-element communication. Kelly (2011) has observed in her data that children's interaction skills unfold from communications across a single modality to multimodal synchronized communications. Goldin-Meadow and her colleagues have thoroughly investigated productions of gesture-speech combinations and their comprehension at the one-word stage and beyond (*Özçalışkan*/Goldin-Meadow 2005). They observe that children first use the two modalities to communicate about the same element like holding up a cookie and saying "cookie." Later on, speech and gesture will together form an integrative system (Goldin-Meadow/Butcher 2003). Using two modalities for two different elements is described as preceding the onset of two-word speech. The skills to express more than one element or aspect of an event in the same turn as opposed to what Scollon (1976) calls "vertical constructions" (different elements expressed in two successive turns that are often united in parents reformulations), are necessary for children to be able to combine two words. The multifaceted character of an event is first expressed through two complementary modalities, with a gesture and a word referring to two different elements. Those word-gesture combinations have been documented in the second year and could be considered as a transition towards two word utterances (Goldin-Meadow/Butcher 2003). In the situation of book-reading for example, a care-giver will very often repeat the "multimodal construction" look (or here) plus pointing. Example 2 shows that Madeleine, a French little girl, takes up the exact same construction with the directive verbal element "regarde" and the gestural deictic element towards the illustration on the book:

Example 2. Madeleine 1;01
*MER: oh regarde le petit Popi !
The mother points at a character on the magazine (Popi) with her index.
Madeleine looks at the magazine.
*MER: oh il met les pieds dans l'eau ?
Madeleine tries to turn the page but her mother is still showing her other elements in the same picture.

*MER: regarde c'est quoi ça ?
The mother is pointing at an element on the picture.
*MER: c'est quoi ça ?
*MER: c'est un ?
*MAD: ver (
%pho : vɛʁ
Madeleine turns the page.
*MER: oh petit ours !
*MAD: regarde.
%pho: œga
She points at an element on the picture
*MER: oui.

In this extract, Madeleine uses exactly the same prosodic pattern as her mother when she produces her incomplete string of phonemes "œga" for the word "regarde" (look). Children are quite skilled at using the right prosodic patterns at a very early age (Konopczynski 1990) to transmit their intentions through a range of speech acts (request, directive, comment) and it compensates for their incomplete phonological system. Prosodic patterns therefore help them make the transition from pre-linguistic vocalizations to first words.

The transition from gesture-word combinations to word-word combinations is scaffolded by the adult communicative strategies, as when the mother replies to the infant's gesture-word combination by translating it into a "unimodal" spoken utterance (Goldin-Meadow 2009).

3 The Blossoming of Multiword Utterances

3.1 A Transitional Period

The transition from one to two word utterances in children's development is usually viewed as a fundamental stage around the age of 18–24 months. Word order (Schlesinger 1971), their function and the organization into a system have been analyzed in detail. Prosody plays a very important role during this transition period. Speech is organized into prosodic units and children are particularly attentive to those patterns.

Before they produce two turns in which two words could be considered as complementary, children actually produce one word utterances combined with gesture and gaze synchronously, and those Successive Single Word Utterances (Bloom 1973) do involve gaze and gesture as well.

Children start producing two word utterances around 18 months but individual variations are quite important. There is a coincidence between children's lexical explosion and the first two word utterances (Bates 1994) and an intermediary stage during which either a predication is separated by a pause and there is one single prosodic pattern or a predication is constructed over two turns.

Example 3. Léonard 1;10
Léonard seems to offer Aliyah a meatball.
*A: Elle est à moi la boulette? Je peux la manger? Non! Elle est à toi.
*L: nɔ̃ //
*M: C'est la boulette de Aliyah ou c'est la boulette de Léonard
*L: n : //
*M: Hein?
*L: nona //
*M: Ouais.
L is pensive.
*L: alija //
Everybody laughs.
*M: Aliyah oui!
*L: mɑ̃z //
*M: Aliyah elle mange? Non!

The child has produced two separate turns that are linked both by a syntactic and a semantic relation. Léonard is not exactly constructing predications on his own; it is collaborative work with the help of adult interlocutors. The mother reformulates the whole predication by putting together in one turn what the child has produced in two separate turns. Aliyah/mange becomes "Aliyah elle mange?" ("Aliyah is eating?"). Scollon (1976) used the term "vertical constructions" for those Successive Single Word Utterances strung together in dialogue. His work showed that discourse competence developed before complex syntax, and that interaction with competent interlocutors facilitated development. Veneziano (1999) has explained the impact of adult scaffolding through their reformulation between two Successive Single Word Utterances.

3.2 Multiword Speech

According to Veneziano/Sinclair/Berthoud (1990, 646) children can enter multiword speech once they have the capacity to keep more than one aspect of the event or situation in their minds and to express these simultaneous aspects through the linear arrangement of language. The child enters syntax and produces several terms with the same prosodic pattern (no pause longer than 1.5 seconds between terms, Greenfield/Smith 1976). Prosody is therefore a great part of these first syntactic structures in which several elements are integrated in a single intonational unit.[3]

Children's longer utterances are often triggered by the fact that they express information that the adult does not have as in the following example.

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3 For a more elaborate description of the role of prosody in a French-speaking child during this period, see Martel/Dodane (2011).

Example 4 – Léonard 2;0
His mother asks him to tell her what he did in nursery school
*M : qu'est-ce que vous avez fait ? (what did you do ?)
*L : fe la pɛ̌tyr (do painting)
*M : vous avez fait de la peinture ! (you did painting !)

The child's production is initiated by the mother who has not witnessed his activities in his daycare center. His utterance is fully scaffolded by the mother's question: he takes up the predicate (fait) and adds the name of the activity (la peinture). The mother reformulates and adds the grammatical subject, which was omitted by the child, providing a model with a verbal construction that is complete.

It has been found that children do not produce all the arguments at once at the beginning of multiword speech. Rather, they have a tendency to omit subjects even when they are grammatically required (Bloom 1990), and they do not produce complex constructions with two or three arguments at first. Nativist theories (Chomsky 1959, Pinker 1984) assume that despite the fact that they don't use adult-like utterances, children operate with an abstract knowledge of grammatical categories. The "incomplete" form of young children's productions is explained by performance limitations: the limitation in memory capacity governs their ability to realize sentence constituents overtly. Valian (1991) has argued that since children have full competence, they will avoid producing utterances that they know are wrong; instead, they will make less "complex" utterances, in particular more intransitive constructions than transitive constructions. But from a constructivist perspective, Theakston et al. (2001) have demonstrated that a clearer predictor of the sentential frames the children use with specific verbs is the frames their mothers use with the same verbs. These authors have found no significant differences between adult speech and children's speech in terms of preference for certain verb frames for particular verbs. Indeed, "constructionist approaches emphasize the fact that languages are learned, that they are CONSTRUCTED on the basis of the input together with general cognitive, pragmatic and processing constraints" (Goldberg 2006, 3).

In their conversational exchanges with adults and in the surrounding language they overhear, children are provided with information about the frequencies of various forms and seem to be extremely sensitive to that factor. They opt for the most frequent and productive affixes in word-formation, for example, and only later master the less frequently used ones (Clark/Berman 1984). Children use specific verbs only in constructions they have heard in the input (de Villiers 1983).

Progressively, and in part owing to their parents' reformulations or requests for clarification embedded in dialogue, children will tend to use standard constructions more and more.

Example 5. Léonard 2;0
*L : a pœ ki klun (a afraid of the clown)

*M : qui a peur du clown ?
*L : wi **nona** pœ ki klun (yes, Nona is afraid of the clown)

The child has clarified the reference of the subject, first produced as what the literature calls a "filler syllable" (Peters 2001), the vowel "a" of which the reference remains vague, and has used his own name instead of the first person pronoun "je" that enables speakers to refer to themselves. This non-standard contrastive and disambiguating use of his name instead of the first person pronoun is part of the child's pathway into the adult linguistic system.

3.3 Emergent Categories

Children produce a number of non-standard forms at the beginning of the learning process. Observers of child language have noted the recurrent "errors" produced by children between one and three, which have been referred to as "barbarisms" (Egger 1879) or "incorrect forms" (Bühler 1935). Most linguists now consider these "errors" as revealing the process of early grammaticalization in children's speech, as in Eve Clark's description of what she calls "emergent categories" (2003). Some of those forms illustrate how children are able to move beyond frozen expressions thanks to productive analyses of the input, and might create non-adult constructions in the process of learning form-function pairings.

The deviations children make could be non-standard forms derived from over-generalizations, such as "les chevals" instead of "les chevaux." But they could also be standard forms used with non-standard functions such as the second person pronoun used to designate "themselves" (Morgenstern 2012). It is important to analyze the transitory aspect of the child's productions at each stage of development and to consider each stage as an interlanguage on its own, a system that is quite unstable but with its own identity: "Emergent categories are a fleeting phenomenon, in part because children are so sensitive to the speech addressed to them and hence to the conventions of the language they are acquiring" (Clark 2003, 399). Clark explains that children grammaticalize the notion of "control," which is the equivalent of high agentivity, by using strong pronouns. The choice of a unique form such as "moi" or "me" will then be abandoned in order to express the standard functions found in the adult system. In certain cases, some notions that the child uses are not grammaticalized in the adult system that surrounds them. They will abandon them just like they abandoned the phonemes they were able to produce when they were babies and stopped using when their phonological system followed the model of the surrounding input.

Children's productions do differ somewhat from the input for pragmatic reasons (use of imperatives in child-directed speech, infrequent in the children's productions except in set expressions like "tiens"/"here"), cognitive-developmental reasons (missing arguments, phonologically incomplete forms) or because they create non stan-

dard forms derived from their own analysis of the input. But over time, thanks in part to their cognitive capacities, experience, and amount of exposure, and in part to the adults' recasts, reformulations and expansions in conversational exchanges (Chouinard/Clark 2003), the children will fully acquire the adult patterns, and abandon the somewhat creative variations and deviations they have constructed in the process.

4 Language in Bloom

Children have been shown to match the input and its specificities as language develops. We will focus on a few elements of language complexity: argument structure, the expression of time, mood and tense and the blossoming of co-verbal gestures.

4.1 Argument Structure

Children do not produce elements for a given verb that are markedly different from what they hear. We can observe a progression from incomplete patterns to complete patterns in development. Young children have difficulties producing forms with many arguments, and this is especially true for three-argument constructions. They first tend to omit unstressed syntactic markers such as clitics, although a large number of filler syllables are produced. Children's early productions do not demonstrate a coherent formal grammar but initially consist instead of a set of item-based constructional islands.

In our study of six French constructions (Morgenstern/Parisse 2012b), we found that during a first period (up to 2;01), the three children we studied slowly entered the system with deviations of all kinds from the adult input. We noted the co-occurrence of two strategies at the same age: using fixed patterns directly replicated from the input on the one hand, and creating more elaborate constructions on the other.

The following examples occur at 2;09 in Madeleine's data.

> Example 6
> *MAD: Faut la mettre comme ça.

In the adult's data we find examples of this exact same utterance.

> Example 7
> *MAD: Je vais la mettre derrière la table à langer pour les animaux.

Example 7 is more elaborate, and it only makes sense in the specific situation in which it has been produced, requiring more creativity in the child's production.

There are other original instances that demonstrate her creativity, such as when she uses *tu me donnes un service* at 2;04 instead of the correct adult French *tu me rends un service*. She has of course most likely never heard an adult produce such a

construction since it is not "conventional" French. Her use of *donner* might be seen as tinting the expression with the sense that the favor is actually a gift from the adult (the agent) to her (the recipient).

At the end of the data, the children's productions tend to resemble the adults', but they still use fewer three-argument constructions and more two-argument constructions than the adults.

4.2 Tense, Mood, and Aspect

Because time is a complex abstract notion not manifest in daily life through objective experience or direct perception, language is one of the main means by which children acquire its essence in interaction. The development of verbal temporal morphology is a domain in which children's cognitive, communicative and language abilities are clearly intertwined. A number of cognitive prerequisites, particularly the need to remember or anticipate remote events, are essential. The specific semantic and morphosyntactic properties of the language being learned must also be taken into account. We have observed two main stages of development in the acquisition of the French temporal system (Morgenstern/Parisse/Sekali 2009):

1) Only a small subset of the large variety of forms available in French is initially used. Children produce forms that are frequent and salient in the input, using them even more frequently and systematically than the adults.
2) Later, a variety of forms appear, including forms that are infrequent in the input. Children start producing several inflections for the same verb.

Children's ability to include temporal reference in their productions is often reported as developing gradually and slowly (Bronckart/Sinclair 1973; Smith 1980). Weist/ Wysocka/Lyytinen (1991) show that children are first linguistically, semantically and cognitively limited to the immediate situation – the here and now. Then they become capable of displacement and invoke past and prospective intervals. French children for instance start to produce present forms, closely followed by *passé composé* and periphrastic future forms, with gradual progress in the production of the actual morphosyntactic marking. It is only later that they start using less frequent forms, such as *imparfait* and future. The relative infrequency of linguistic forms to express displacement from speech time is consistent with most previous research, which proposes that children mark aspect before tense and are restricted to referring to the here and now. The pace of acquisition is considered as being governed by a combination of factors, including syntactic, semantic and cognitive complexity, as well as the frequency of the forms in the input.

However, children appear to be able to refer to past, present, future, and to different aspectual meanings, from quite an early age, but in order to observe this, it is necessary to go beyond language forms and to pay attention to communicative

meaning (Parisse/Morgenstern 2012). Children's productions are interpreted in context as referring to complex events and a variety of temporal realities and situation types from very early on. Linguistic forms are not always produced and indeed not required. But in some cases, especially when shared knowledge is insufficient, explicit markers become necessary. It takes a certain amount of experience for children to use the forms borrowed from their input productively. When the value of explicit grammatical marking becomes clear to them, the children can achieve more confident agreement about meaning and function with their interlocutors. In the following example, Léonard wants to use the inflectional future in order to answer the observer's question about what he will do at his neighbours' place later on, but the morphology is quite unstable.

> Example 6. Léonard 3;0
> *OBS: qu'est-ce-que vous allez faire là-bas ?
> *CHI: et puis et puis et puis moi je jouais.
> *CHI: et moi je je jouais
> *CHI: moi je joueRA !

Léonard's hesitations at the level of the verbal morphology, and his inadequate self-repairs show that he aims to produce a very precise form. By contrast, Madeleine displays a certain mastery of the use of the inflectional future at an even younger age.

> Example 7. Madeleine 2;09
> *MOT: et est-ce-que tu as raconté nos vacances de Noël à Martine.
> *MOT: tu lui as raconté ou pas ?
> *CHI: non j(e) lui raconte pas parce que <c'est pas> [///] c'est un secret.
> *CHI: <on lui> [/] on lui dira **quand ce s(e)ra plus un secret**.
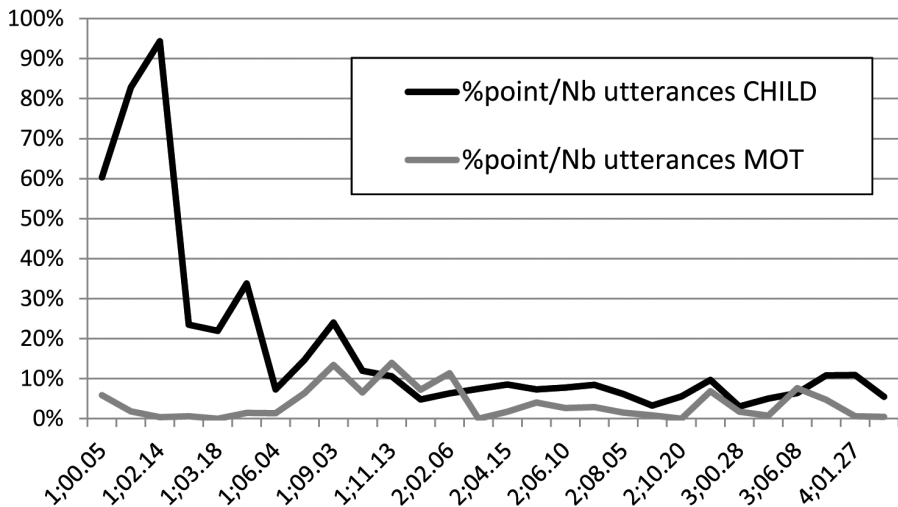
Even after children begin to produce clear grammatical forms, we must keep in mind the fact that it does not guarantee that they have the same form/function mappings as their interlocutors. Gradual co-adjustment is needed between children and adults for meaning to be co-constructed in discourse.

4.3 Co-Verbal Gestures and Complexification

Gestural communication does not totally disappear with the emergence of vocal productions (Marcos 1998). Furthermore, it is still largely used by adults themselves in combination with vocal productions (Guidetti 1998). Pointing does not only remain functional but diversifies in form and function as children become skilled multimodal conversationalists.

Our analyses of Madeleine's data (Morgenstern et al. 2010; Morgenstern/Parisse 2012b) show that vocal and gestural modalities are associated and complement each other from the very onset of pointing. We categorized all Madeleine's pointing

gestures and the adults' in order to analyze their quantity and functions from their "pre-linguistic" to their co-verbal uses.
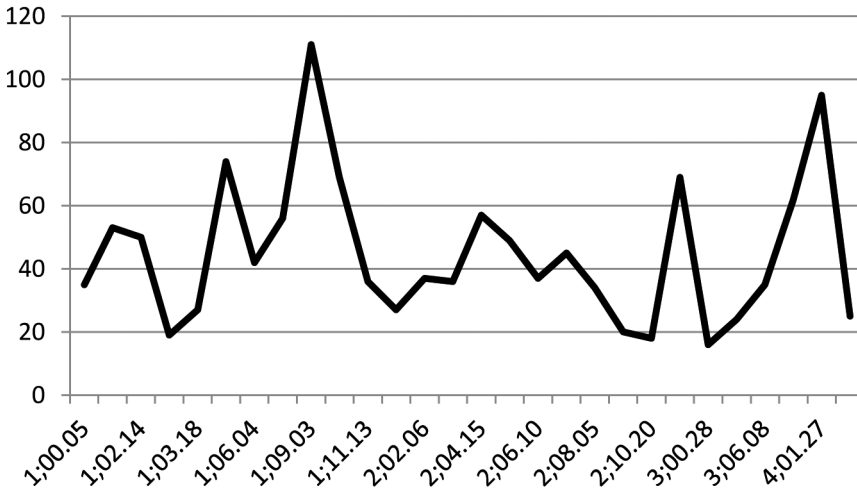

Graph 1: Rate of Madeleine and her mother's pointing gestures over the number of utterances[4]

As shown in graph 1, the increase in Madeleine's use of speech over pointing gestures is spectacular: the rate of her pointing gestures over the number of utterances is much higher at the beginning of the data until she is about 2;0 (up to 93% at 1;02) and then stabilizes around 5 to 10% as of 1;06, which is quite close to her mother's use. In a previous study, we have shown that Madeleine's uses of deictics is complemented by pointing gestures 100% of the time at the beginning of the data, and only 5% of the time at 2;0 (Mathiot et al. 2009). But the gross number of pointing gestures used in an hour is in fact still quite important at the end of the data. She produces 95 pointing gestures in one hour at 4;01,27 for example (graph 2). The variation is of course very much linked to situational factors (reading with her mother elicits a lot of pointing gestures).

The functions of Madeleine's pointing gestures diversify greatly over the course of the data. At first, pointing gestures are produced in isolation with either a proto-declarative (comment) or a proto-imperative (request) function. At around one year old, they begin to be complemented with vocal productions with the same overall functions. Around 1;06, pointing gestures are produced with deictics or nouns and clearly localize the objects shown or requested. The verbal productions simultaneous to pointing then become more and more complex: first with predicates, then with

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4 Numbers on X Axis are child's age. 1 ;02.14 for example correponds to 1 year 2 months and 14 days.

Graph 2: Number of pointing gestures per hour in Madeleine's data

whole utterances. At 2;0, we find the first use of a pointing gesture with a totally different symbolic meaning that can be glossed as "beware!" The Index is vertically held in front of her chin, the tip at the height of her mouth. She is speaking to her doll and telling her "faut pas attraper froid." She also starts pointing to absent entities. At 2;06 she points to several locations during her fictive narratives. She also starts using more diversified co-verbal gestures. At 3;0, her speech becomes extremely complex with embedded clauses and diversification of her tense system and in parallel she goes through what McNeill (2005) calls "the gesture explosion" with more and more co-verbal gestures.

Madeleine enters a different stage around 3;06–4;0 when the functions of her pointing gestures become more and more diverse. For example, she points up her fingers to count the dolls she is talking about, but she also then uses her pointed fingers to embody the dolls themselves as if they were classifiers in sign language.

By the age of 4;0, her pointing gestures are integrated in fluid co-verbal gesturing. Pointing can follow the rhythmic variation of her prosody: gestures and vocal productions are linked with great subtlety. She demonstrates excellent mastery of the location, the orientation and the motion of her pointing gestures, which enables her to differentiate among their functions. She uses pointing to refer to time-spans or to attenuate, to suspend the predication she is making in speech. For example, as she sets out to retrieve a costume in her room in order to disguise herself, she forbids the observer who is filming her to come with her. She lifts up her left index finger near her chin as she says *je dois chercher mon déguisement*. She starts to walk towards her bedroom stealthily, and her index finger continues to go upward, as in a "shushing" gesture. We interpreted that co-verbal gesture as an attenuation of the prohibition she

targeted at the observer, with whom her behavior is fairly deferential. This gesture is a modalization of the prohibition. The behaviour conveys the message "beware," but in a subtle fashion. And she ends this scene by saying *tu me suis pas hein?*

Madeleine's very sophisticated gesturing illustrates, specifies, reinforces or modalizes the meanings of her vocal productions. Gestures thus continue to enhance the blossoming of children's communication skills after the "pre-linguistic" and the first gesture-word combinations. They are part of an intersubjective multimodal communicative system in which it is more and more complex to tease apart gestures from speech. The performative, interactional and sociocultural nature of language involves the cooperation of both modalities, with one constantly supporting, extending or modifying the other.

We need to understand not only how the vocal modality or how the visual modality are used more and more skillfully by children, thanks to adults' scaffolding in everyday life interactions, but how the different channels and modalities work TOGETHER. This perspective will give us better insights on how children become experts in face-to-face social interaction, which is necessarily multimodal in nature.

5 Conclusion

Children's increasing capacity to analyze the input seems to guide their usage. They assemble pieces of various structures without having full control over the complexity of each grammatical marker or each construction. They elaborate creative transitory systems (Cohen 1924), which contain "errors" or discrepancies compared to the adult system, and it takes time for them to learn all the relevant conventional forms. But through constant exposure to adult input, children's language slowly develops, gets enriched and becomes closer and closer to the model they hear. And little by little, as children internalize this model, they become more and more able to make self-repairs (Morgenstern et al. 2013), thus creating an additional locus of language elaboration and acquisition.

The child internalizes the adult's role and appropriates linguistic tools, social codes and behaviours, which are intertwined in language, in and thanks to dialogue. The multimodal construction process of gestural and vocal grammatical tools and constructions takes place through collaboration between adults and children.

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