Language Acquisition: A Multimodal Avenue

1. Milestones and variations

Usually language acquisition is viewed in terms of milestones that have to be reached by each learner. An engaged parent knows that his or her child will start to talk with so-called one-word expressions like “Gone!” and progress toward multiword utterances, for instance, “They all are gone!” Milestones, as McGregor and Samuelson (in press) point out, may be useful to clinicians and teachers in tracking the development of an individual child. However, “when determining a child’s adherence to developmental milestones, it is important to be mindful of normal variation” (ibid.). This means that when the development of a child has to be evaluated, it is appropriate to take advantage of milestones in order to analyze the development systematically. At the same time, however, it is not appropriate to view the learning process in a strictly linear way, which would mean that one particular milestone has to be reached before the other. Rather, development shows fluctuation with regard to milestones both for an individual child and between children. This means that a child may show a different performance depending on “conversational partner, task demand, and the child’s current level of motivation” (ibid.). A child may, for example, utter her or his first word around the age of seven months. But this mastery may then disappear for several weeks, which is part of normal variability for a child. Some children will reach a milestone earlier, some later, and some may skip a milestone, which is also a part of normal variability.

In order to evaluate a child’s development appropriately, more and more recent research focuses not exclusively on milestones in language skills, but also observes the development of other motor and cognitive abilities. This perspective comes from a more systemic approach in which different abilities are not only linked together but develop in a symbiotic manner. Dynamic systems theory (e.g. Smith and Thelen 2003) is a good theoretical background for this perspective. It offers a solution to the seeming contradiction that, on the one hand, there are similarities in human developmental outcomes as almost all human infants learn to speak. On the other hand, very small differences in initial states can become greater and lead to large individual differences. “From the dynamic perspective, then, it is important to understand the processes through which the everyday activities of children create developmental change” (Smith and Thelen 2003: 347).

In the following sections, the goal is not to provide an exhaustive summary of milestones in language acquisition. Instead, I aim to provide a review of abilities that contribute to language use. From this perspective, language acquisition is not limited to speech but includes multimodal communication and the ways the environment may influence it. My main objective follows Kaye’s (1977) view, pointing out that dialogue as a social act is a necessary context for language acquisition.
2. **Early communicative acts**

### 2.1 Turn taking

A prerequisite for the development of communication is the ability to participate cooperatively in shared discourse (Kaye 1977; Masataka 2004). Dialogue seems to be acquired (Kaye 1977) in the sense that a child has to learn how to time his or her behavior in order to communicate something and how to coordinate communication when handling or manipulating objects at the same time. Astonishingly, this learning seems to begin very early and in a situation that has seemingly little to do with vocal communication: In a study, in which mothers and their newborns were observed during feeding time, Kaye analyzed burst-pause patterns and their advance. A burst is characterized as several successive sucking acts by the baby. When a baby pauses while breast-feeding, her or his mother seems to interpret this behavior as tiring and is therefore inclined to stimulate the baby’s behavior. A mother’s common reaction is to jiggle the baby. But interestingly, jiggling – as analyses show – does not cause another burst immediately. Instead, the crucial signal is the pause after the jiggling that seems to allow the baby to resume the sucking. Interestingly, over time, the jiggling of the mothers becomes shorter. After two weeks, mothers seem to change their behavior from jiggle to jiggle-stop. Kaye interprets the results in terms of a dialogue: Both, the mother and the child, learn to anticipate one another’s behavior in terms of symmetry, meaning that when one person is doing something, the other will wait. This is the rule of turn taking, and it is learned as certain interactive sequences (which seem to occur naturally) become more frequent. Infants seem to be sensitive to such contingencies and regularities in behavior. According to Masataka, contingent stimulation that children were exposed to had a positive effect on their motivation insofar as their performance on a subsequent task was facilitated. In contrast, children’s performance was impaired if they had previously been exposed to the non-contingent stimulation.

From the dynamic systems perspective, the example of turn-taking shows that children may inherently produce rhythmic behavior but that it is unstable insofar as it needs responses from and interaction with the environment (in this case, the caregivers) to become established. The nature of the interactive sequences causes researchers such as Legerstee (2005) to claim that from birth, infants produce organized actions that are specifically meant for interacting with people. These proto-conversations have a definite turn-taking structure. As Masataka shows, animals also seem to follow the turn-taking rule, which allows for an efficient transfer of information.

### 2.2 Cooing

According to Masataka cooing is assumed to be the earliest and most basic unit of signaling in the vocal mode (besides crying). It appears in an interactional situation such as the feeding time described above, but also as a further development of
infants’ responses to jiggling and the pause which follows jiggling: It was observed that when caregivers remain unresponsive, infants will coo and in answer to this vocal behavior of infants, mothers are reported to jiggle immediately (Masataka 2004). This interplay shows that, again, the dialogic responses are learned by participants, the child and the adult: The vocal production of the infant seems to solicit a pause and attention and, therefore, a response from the caregiver.

Why does the child use the vocal mode when no responses come from the adult? The reason could lie in the level of stimulation in the infant. It is assumed that in the absence of the expected responses from caregivers, the infant’s level of stimulation or arousal increases, which in turn induces vocal production. This new behavior is interesting from the dynamic systems point of view, because it is obviously the variability in the adult’s behavior that leads to a reorganization in the system of the infant, who is learning to take turns and expects a response from the adult. This new behavior will elicit a vocal response from the caregiver, and in this way, infants learn to vocalize as a new form of interaction (Masataka 2004). Cooing is just one example that shows that systems can generate novelty by means of their own activity (Smith and Thelen 2003).

2.3 Babbling

In vocal coordination, babbling is considered to be a milestone (Masataka 2004). There are two types of babbling: reduplicative and variegated, which occur between six and eight months of age: The production of repeated sequences of identical syllables like “bababa” is termed reduplicative babbling, usually referred to simply as babbling or canonical babbling. In contrast, variegated babbling is a mix of syllables such as “kadabu.” While traditional research has regarded babbling as the true precursor to speech, more recent research emphasizes rather more the continuity between babbling and earlier vocalization that contains sequences of vowel-like sounds without distinctive consonant-like elements (Masataka 2004).

When we consider language acquisition as a multimodal avenue, babbling is a vocal ability that discloses the involvement of other modalities: Several recent studies (Ejiri and Masataka 2001; Iverson and Fagan 2004) have reported that the most reliable event which predicts the onset of canonical babbling is the emergence of rhythmic hand movements, typically, banging actions, which assumes, in contrast to earlier views, that babbling is a deeply biological phenomenon driven predominantly by maturation (Masataka 2004: 168). In this sense, an interesting multimodal picture of language is painted by recent research about vocal-motor coordination: Babbling and hand banging share the property of rhythmicity. Eilers and her colleagues (1993) therefore argue that the auditory feedback generated by hand banging may influence the development of the babbling ability in hearing infants.1 “It appears that the speech motor-control system uses auditory information to monitor and adjust the state of the vocal tract to coordinate succeeding gestures

1 For more on Deaf children see V. Gramley on sign language acquisition in this volume.
and that the ability to use auditory feedback may play an important role in normal speech development” (Eiler et al. 1993: 310).

Iverson and Fagan (2004) further suggest that vocal-rhythmic movement may not only contribute to language acquisition; together they may also be protogestural behavior: "Our data suggest a link between more speech-like vocalizations and manual activity that may be a precursor to coordinated manual movement of the sort involved in adult gestures (Iverson and Fagan 2004: 1063).

2.4 Joint attention

Not only the production of a sound but, more importantly in recent literature, the comprehension of somebody’s communicative act is discussed as an early communicative skill. This is termed joint attention; as Baldwin (1995: 132) puts it: “Technically speaking, joint attention simply means the simultaneous engagement of two or more individuals in mental focus on one and the same external thing.”

Two representatives of joint attention have been identified: infants’ ability to follow another’s direction of gaze and the ability to follow another’s pointing gesture. Both deictic gestures serve as actions which cue infants’ perception in experimental studies focusing on joint visual attention.

As I will show in the following, one still controversial topic is the onset of joint attention skills: Some researchers view the ability to understand a deictic gesture within the context of the cognitive milestones and see it as part of the social interaction of children in their second year (e.g. Corkum and Moore 1995; Moore and D'Entremont 2001). Others view the origins of gesture comprehension as cued by low-level perception preferences which already occur early in infancy (e.g. Hood, Willen, and Driver 1998; Farroni, Johnson, Brockbank, and Simion 2000).

Deictic Gaze. The ability to follow somebody’s gaze develops gradually. Three age-specific mechanisms have been inferred from studies by Butterworth and his colleague (e.g. Butterworth 1995; Corkum and Moore 1995). Accordingly, when an adult looks to one side indicating a target object, the following behavior of joint visual attention is observable between six and eighteen months:

1) Ecological mechanism: at six months of age, infants reliably follow the direction of the eyes and turn their heads to the correct side of the room in the case of targets within their own visual field (but not for ones behind them!); they are attracted by the first target they find when scanning the environment, even though this may not be the target of the adult’s gaze.

2) Geometric mechanism: at twelve months of age, infants follow the direction of the gestures and identify the precise location of targets regardless of their position along the path of scanning.

3) Spatial-representational mechanism: at 18 months, infants follow the direction of gestures, can identify the location of the targets, and now search for targets that are located even behind them, mostly when their own visual field is empty of targets.
In recent literature it is discussed whether these stages may be due to experimental design and hence not valid. Will, for example, six-month-old children (who usually sit on their parents’ laps) ever be tempted to identify a target behind them. This criticism implies that if the experimental conditions are modified accordingly, infants will exhibit deictic competence earlier.

Hood, Willen, and Driver (1998) assumed that infants develop a rudimentary ability to follow somebody’s gaze very early but are usually more interested in a human face and keep looking at it. They changed their experimental design to remove fixation from salient stimuli like a human face by using a computer-animated presentation in which the main stimulus, i.e. a human face, was shown only briefly and disappeared after its eyes had turned to one side. The focus of the analysis was on the attention shift of infants: After the face disappeared, the latency and direction of infants’ orientation toward a peripheral target (a white-black bar appearing at the side of the screen) was measured.

Farroni and her colleagues (2000) replicated these findings for four- and five-month-olds and went on to show that it is not the eye gaze that cues the shift in attention but rather the motion of the pupils. When there was no apparent movement of the pupils and the redirected gaze was presented statically, there was no evidence of four-month-old infants following the shift in the direction of gaze. This data reveals that the direction of the eyes per se does not have an effect in directing infants’ attention. Motion and perceptual saliency (Golinkoff and Hirsh-Pasek 2006) seem to be the important cues for infants.

**Pointing.** The developmental relationship between the understanding of pointing and the referential significance of direction of gaze is debated. There are findings suggesting that in the first half of their first year, infants try to communicate with adults by means of their eyes (Hains and Muir 1996; Amano, Kezuka, and Yamamoto 2004). Thus, children may be more advanced in following the gaze than other deictic gestures. Bruner (1975) as well as Moore and D’Entremont (2001) view pointing as a more advanced deictic ability, and various studies confirm that the understanding of a pointing gesture arises between nine and fifteen months (Desrochers, Morissette, and Ricard 1995; Butterworth 2003). However, adapting the same paradigm used by Hood et al. (1998), Rohlfing, Bertenthal, and Longo (2004) tested infants between 4.5 and 6.5 months for the ability to follow somebody’s pointing gesture. Babies were shown a series of computerized stimuli projected onto a screen while sitting on their parents’ laps; infants as young as 4.5 months respond to a dynamic pointing gesture by shifting their visual attention to a shared referent (Bertenthal and Longo 2007).

More recent studies consider the variety and interplay of those factors which contribute to infants’ joint attention capabilities. Flom, Deák, Phill, and Pick (2004), for example, show that redundant gesture combinations such as looking, pointing, and verbalizing lead to an increase in the frequency of gaze toward peripheral targets among 9-month-olds, even when this means ignoring an object
closer to midline, but not to ones outside their visual fields. Studies presented by Amano, Kezuka, and Yamamoto (2004) concentrate on infants’ understanding of a pointing gesture combined with adult’s eye gaze and show that this combination may be a precursor of joint attention. Interestingly, Amano, Kezuka, and Yamamoto differentiated between pointing done by an experimenter and that done by the mothers. Their findings showed that infants need the combination of eye gaze and pointing gesture more in the case of the experimenter than in the case of the mother. In the latter case, children were able to follow the pointing gesture while the mothers maintained eye contact (i.e. did not redirect their gaze). The question remains whether children perform better in shifting their visual attention in the case of mothers pointing because the face is familiar and they do not pay great attention to it or because they are familiar with their mothers’ behavior (including their pointing behavior).

2.5 First manual gestures

Pointing gestures. So far, I have discussed the ability to follow somebody’s pointing as part of understanding somebody’s communicative act. The production of pointing of course also plays a significant role in language development. Even though some proto-pointing activities with the index finger are already reported from three-month-old babies (Masataka 2003, see Figure), communicative pointing is observable at ten months of age in some early pointers (but see a summary in Liszkowski 2006). According to Desrochers, Morisette, and Ricard (1995: 94), three developmental stages can be differentiated:

1) pointing production without looking at adult’s face;
2) pointing first and then looking at adult’s face within 1 second;
3) looking at adult’s face within 1 second before pointing, or pointing and looking at the adult’s face simultaneously.

The “visual checking” (Franco and Butterworth: 307) as characterized in (3) is assumed to attest to some degree of awareness of psychological processes in the other. In this sense, the child makes sure that its partner pays attention to the pointing goal. According to Liszkowski (2005), children are motivated to develop visual checking because they are driven by the intrinsic need to share attention and interests.

The contribution of pointing to the process of language acquisition has been analyzed in Butcher and Goldin-Meadow (2000); and in Goldin-Meadow (1999) gesture is seen as a precursor to speech. This “avenue of expression” (Goldin-Meadow 1999: 423) allows children to express concepts about which they have
limited verbal knowledge. For example, children may point to an object that has caught their interest and simultaneously produce a sound. This gesture-speech combination is then encoded by their caregivers as they provide the right word for the objects (Leung and Rheingold 1981). In this way, children can communicate by sharing attention and interest (Liszkowski et al. 2004), which seems to be species-typical. In particular, indexical pointing in order to share attention and interest, known as **declarative pointing**, (“Look here!, this is interesting!”) is specifically human, whereas request pointing, known as **imperative pointing** (“I want this!”) has been observed between apes while declarative pointing has not (Butterworth 2003; Tomasello and Camaioni 1997; Liszkowski 2005).

In focusing on the role gesture plays in language development, Butcher and Goldin-Meadow (2000) evaluate the semantic coherence (combining gesture with meaningful and related speech) and temporal synchrony (gesture produced in overlap with speech). On this basis, one or more elements of an utterance can be expressed in unimodal forms (word + word or gesture + gesture) as well as in cross-modal forms (word + gesture). These cross-modal combinations can be either equivalent, when, for example, a child says “door!” and points at a door or supplementary, when for example a child points to a door and then points to a person (gesture + gesture combination) or points to a door and then says “mom!” (gesture + word combination meaning that the mother has just come through the door). One obvious implication of Butcher and Goldin-Meadow’s (2000) data is that there appears to be a time early in the one-word period when communicative gesture is not yet fully integrated with speech. This lack of integration is seen in both the synchrony and the semantic coherence. For each of the five children tested, three events converged: gesture-alone combinations began to decline and synchronous gesture-speech combinations began to increase at just the moment when gestures were first combined in the same utterance with a meaningful word (ibid.: 248). Butcher and Goldin-Meadow infer that the gesture-speech combination allows a child to express two elements of a sentence (one in gesture and one in speech) at a time when the child may not be able to express those elements within a single spoken utterance (ibid.: 238). Furthermore, the authors observed that children begin producing gesture-speech combinations prior to their first two-word utterances. They conclude that gestures provide the child with an important vehicle for information that is not yet expressed in speech. Thus, to put it in Goldin-Meadow’s (1999) words, gesture may serve as a way-station on the road to language, both ontogenetically and in evolutionary terms.

**Iconic gestures.** Another type of gesture, iconic gestures (also labeled representational, symbolic, referential, or baby signs), emerge before children can speak more than about 25 words. These gestures “carry meaning in their form to symbolize a referent, and that form does not change with context” (Capone and McGregor 2004: 174). Acredolo and Goodwyn (1988) studied in what ways this form of gesture might contribute to language acquisition. They found that children
who exhibit more representational gestures tend to have larger vocabularies and pass their first 10-word milestone earlier than children with fewer object gestures. Representational gestures seem to be an additional avenue of expression for a particular group of children, namely late talkers. This group includes about 10% of all children, who show typically poor or delayed performance in regard to expressive vocabulary development (Grimm 1999). In addition, they fail to produce two-word combinations by 24 months of age. What measure can show that 24-month-old children are delayed in their lexical and syntactic development? A formal test under laboratory conditions is not possible because children behave differently when facing a strange person. For this purpose, a parent-report measure termed MCDI (MacArthur-Bates Communicative Development Inventories) was developed (Fenson et al. 2007). This formal instrument is designed for children aged 16 to 30 months and can be conducted in a home environment. For this, parents evaluate their child’s abilities in several linguistic areas (such as vocabulary and syntax) and generate separate scores for each. The scores provide orientation and help in identifying children at risk of becoming language impaired with consequences for cognitive and psycho-social development (Grimm 1987).

In the course of further development some late talkers become late bloomers, which means that these children will catch up. Children who do not recover from the language delay by three years of age constitute the other group, that of late talkers. In a study by Thal and Tobias (1992), the comprehension and production of gesture among late talkers was compared with their expressive vocabulary performance. The results suggest that to differentiate the late talkers from late bloomers may be inaccurate when done on the basis of their expressive vocabulary. Instead, the data reveals a difference in gestures showing that late bloomers produce significantly more communicative gestures of both the pointing and representational types. This means that late bloomers can be differentiated from late talkers by their gestural performance. “It appeared that late bloomers, as a group, used gesture early on to compensate for their oral expressive deficits whereas truly late talkers did not” (Capone and McGregor 2004: 180).

3. First Words

All the abilities so far compose what has been traditionally termed preverbal communication. Not surprisingly, children’s first words are considered a milestone in language acquisition (McGregor and Samuelson in press). However, even though it seems like we know how to determine a child’s first word, it is still difficult to define the criteria for this. If we define a word as a particular sequence of sounds that picks out some particular object, person, or event, or perhaps a concept, then some words will fit this description, but others such as function words (e.g., the, a, of) will not (Koenig and Woodward 2007). “The multi-faceted nature of words creates a challenge in development, but it is also a guide to further development” (Koenig and Woodward 2007: ??). With reference to Hirsh-Pasek et al., they point out that word learning requires a coalition of systems that
Rohlfing “First-Language Acquisition” in Bielefeld Introduction to Applied Linguistics

gradually integrate during the process of development. In this linguistic knowledge (both syntactic and semantic) plays a role.

First achievements in linguistic production, i.e. the first five words can be observed between 8 and 16 months of age (Fenson et al. 2007). First words are – grammatically speaking – often context-dependent nouns referring to a very specific object (like car to the family’s car) or social words such as hi! However, the meaning of some nouns may involve not only objects but also activities as is the case with the noun bathing.

Once the first words are spoken, it takes months for children to extend their vocabulary. However, when the lexicon encompasses around 50 words, a vocabulary spurt can be observed in which the rate of word learning is faster than in other periods. This means that children add very many words in a short time. The onset of this vocabulary spurt may vary: some children go through this period when they are 14, some other when they are 24 months old (Szagun 2006; McGregor and Samuelson in press).

One process that drives the vocabulary spurt is fast mapping, which was observed in an experiment by Carey and Bartlett (1978), who taught a novel word chromium to three-year-olds. This word was supposed to refer to the color olive green. In the nursery school, two objects were painted this color, and the teacher asked the children to fetch the chromium tray or cup and not the blue or red one. After one week, about half of the children still remembered this novel word. Carey (1978: 265) specifies that the process of fast mapping takes place when an unfamiliar action / object / attribute is referred to with a novel word. The situation and the sentence construction can provide indications about what class the novel word belongs to, for example, a verb, as when somebody shows you “a picture of an unfamiliar action being performed upon an unfamiliar substance in an unfamiliar container, and tells you the picture depicted how to sib”.

The reference of the first words is usually different than in adult language use. On the one hand, children may use a single word for many instances which are labeled differently in adult language use (e.g. dog for a dog, a cat, and a kangaroo). This is an example of overgeneralization, which means that the meaning of dog has been induced based on insufficient evidence such as the criterion of having ears and a tail. Another deviation from adult language usage is overdiscrimination. This is the case when a word such as money is applied to coins, but not to bills. De Vilers and de Vilers (1992: 352) give an example of a boy who used the word duck only when he threw one of his rubber ducks into the bath tub. After several weeks, he also used this word with reference to other situations with his toys, but not for real ducks. He jumped to overgeneralization five months later when he labeled all water animals ducks (including ducks).

4. First Sentences

Between 16 and 30 months, another important language milestone is reached – the emergence of two-word combinations (Bates et al. 1988; Fenson et al. 2007). This milestone usually coincides with the vocabulary spurt (Grimm 1987). Recently,
while focusing on different modalities, Özçaliskan and Goldin-Meadow (2005) investigated what role gestures play in the development of syntactic competence and suggest that – similar to pointing gestures, which precede the first words – cross-modal combinations occur earlier than unimodal word + word combinations.

For their investigation, Özçaliskan and Goldin-Meadow analyzed different types of semantic relations. In their analysis they used the terms “argument” to relate to object information and “predicate” to refer to event information. These terms capture not only verbal but also nonverbal behavior. For example, when children use gestures pointing to an object (argument) or representational gestures, such as “fist pounding in the air to refer to the act of hitting” (predicate) (ibid.: 103). Semantic relations could be then expressed as shown in Table 1.

<table>
<thead>
<tr>
<th>Argument + argument</th>
<th>Verbal expressions like</th>
<th>Gesture-speech expressions like</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Mama chair”</td>
<td>“Mommy” + pointing to the couch</td>
<td></td>
</tr>
<tr>
<td>“Baby sleeping”</td>
<td>“drive” + pointing to a car</td>
<td></td>
</tr>
<tr>
<td>“done cooking”</td>
<td>“I paint” + representational gesture of giving</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Two pieces of information expressed verbally and non-verbally (cf. Özçaliskan and Goldin-Meadow 2005: 106)

Özçaliskan and Goldin-Meadow (2005: 110) found that a typical developmental path seems to be that children produce a construction in gesture and speech first and only later produce this construction entirely within speech. The authors concluded that gesture provides children with a tool to express complex ideas and thus to expand their communicative repertoire. The reason why gesture functions like a tool may be that conveying information by gesture is cognitively less demanding than producing it entirely in speech. In this sense, gesture may reduce the cognitive load of communication. Once a child learns to express two elements of information within speech, complex sentences can be formulated. The ability to produce complex sentences correlates with memory capacity and emerges between 24 and 41 months McGregor and Samuelson in press). Starting at 28 months of age, some children may be able to combine simple clauses using connectors such as and, because, so, when, and if (Diessel 2004).

5. Support for language acquisition from the environment

The impact of adult behavior on children’s language development is undisputed. Information of a different type, as provided by the word-learning environment, has been investigated in its role of supporting language learning (cf. the overview provided below).
5.1 Joint attention: Social learning context

Infants can capitalize on eye gaze as a cue to the meaning of novel words. For example, Baldwin (1993) found that eighteen-month-old infants are sensitive to eye-gaze, while fourteen-month-old ones are not yet. The eighteen-month-olds can also successfully map novel words onto the object of joint attention even when it requires them to disengage from their own current focus of attention.

Research demonstrates the relevance of pointing for word learning. Woodward and Guajardo (2002) show that though nine-month-old infants cannot yet do so, twelve-month-olds respond to pointing gestures as relevant to objects in the world, and that by thirteen months, pointing (in concert with eye gaze) facilitates word learning in infants (Woodward 2004). Following on these findings, in their recent research, Booth et al. (in press) tested a variety of gestural cues for their facilitative effect on the learning of novel words by two-year-olds. The gestural cues tested were: eye-gaze alone, i.e. the experimenter looked at the reference object and labeled it; eye-gaze in combination with pointing; eye-gaze in combination with touching an object; and eye-gaze while manipulating an object such as moving the object to one side and labeling it. In this comparison, Booth et al. found first clear evidence of the influence of pointing, touching, and manipulating on word learning in toddlers, as children who were provided with these cues during the presentation of a novel word and a novel object showed better than chance mapping and extension of novel words as well as retention of those associations after an extended interval. Eye-gaze alone as a cue had a less pronounced effect but children’s attention during training was similar when pointing was provided as a cue. These results suggest that manual forms of referential gesture (such as pointing, touching, or manipulating together with gazing) are superior to eye-gaze alone in facilitating word learning in this age group. The results also suggest that cues involving contact between speaker and referent were more effective than those that did not involve such contact.

5.2 Multimodal motherese

Motherese or Child-Directed Speech (CDS) contains prosodic and acoustic features which highlight the speech signal so it can be perceived more easily. Dominey and Dodane (2004) conclude that CDS contributes to language acquisition because characteristics of the target language (also present in adult-directed speech) are acoustically exaggerated or modulated. Motherese which goes beyond the acoustic signal to include gesture and non-symbolic motion will be presented below.

**Gesture.** Gestures clarify the verbal message as they provide additional visual information. In talking to young children, it is especially deictic gesture which has been reported on. Iverson et al. (1999) investigated the synchronization of verbal semantics and pointing of Italian mothers when they were engaged in an interaction with objects varying in their degree of familiarity. Again, they analyzed the semantic coherence, i.e. whether the gestural information reinforced the verbal message or supplemented it. They found that it is mostly reinforcing information
which is provided by deictic gesture used with children between sixteen and twenty months of age. Gestural motherese thus seems to consist of fewer, but more concrete, gestures which are redundant to and merely reinforce the message conveyed by speech. Özçaliskan and Goldin-Meadow (2005) reported the same finding for 22-month-old English-learning children and their mothers. Iverson et al. (1999) found that the production of pointing correlated positively with children’s vocabulary size suggesting that children whose mothers pointed more were more advanced in their vocabulary. This correlation was significant in sixteen-month-olds but no longer so in twenty-month-olds. In a similar vein, Rowe and Pan (2004) found that children’s vocabulary correlated positively with maternal pointing in a book-reading situation. This means that children whose mothers pointed more (thus reinforcing the verbal information) were more advanced in their receptive vocabulary development.

Capitalizing on the idea that representational gesturing can foster language development Goodwyn et al. 2000 assessed children from different groups whose parents provided either mono- or bimodal input. In the group of parents providing bimodal input, the adults were trained to model gesture-words pairs in their daily interactions with their infants. Results showed a larger lexicon of gestures for the infants exposed to input that consisted of gesture-words pairs. Furthermore, at 24 months the children who received bimodal input outperformed the control groups in tests of receptive and expressive language. While this benefit may be temporary, it is possible that gesture may be more helpful for children whose speech development is different from their peers (cf. the late talkers described above). Though very few studies have investigated the role of gestures in language-impaired populations, Ellis Weismer and Hesketh (1993) found that a novel word is comprehended better when spoken language is accompanied by gestures in a group of language impaired learners.

**Motion.** Recently, the role of non-symbolic motion and its temporal relation to speech has been focused on in investigations of the language learning process. As already suggested above, motion helps children to follow a communicative cue such as pointing (Rohlfing, Longo, and Bertenthal 2004) as does eye-gaze (Farroni et al. 2004). In mother-child interaction, Gogate et al. (2000) observed the manner in which action is modified in order to be synchronous with spoken words and to facilitate the learning of new words. In this study, mothers were asked to teach novel words for a novel object (a stuffed animal) and for a new action with this object (such as a shaking action of the object). The authors found that in pre-lexical children who are five to eight months old, mothers present the novel words and move the object in temporal synchrony with the word. Motion, thus, seems to support the relation between object and label. In early-lexical children who are 9 to 17 months old the synchronous presentation decreased but is more present than in advanced-lexical children who are 21 to 30 months old. Gogate et al. conclude that mothers use temporal synchrony of words and motion to highlight novel word-referent relations for young infants, behavior also observed in other cultures...
Rohlfing “First-Language Acquisition” in *Bielefeld Introduction to Applied Linguistics*

(Gogate and Prince 2005). In a subsequent study (Gogate and Bahrick 2001) found that moving a novel object in synchrony with a verbal label facilitated the long-term memory in infants as young as seven months. It seems that by providing redundant sensory information (movement and spoken syllable), infants’ selective attention is affected and seven-month-old infants learn the relation between vocalization and an object more rapidly (Gogate and Bahrick 2001).

5.3 Child-directed actions: Motionese

Brand et al. (2002) discovered modifications to motion (hence: “motionese”) that are analogous, and perhaps similar in effect, to the modifications to the speech stream known as “motherese.” In this experimental study, mothers were instructed to demonstrate action properties of objects. The objects used were toys chosen as being interesting to both adult and infant participants, and mothers had little or no prior shared knowledge of the objects to rely on. The ways they presented the objects and what can be done with them to a child, on the one, and to an adult, on the other hand, were compared in an analysis. Eight characteristics features of maternal behavior were identified: range of motion, rate, repetitiveness, proximity to partner, enthusiasm, interactiveness, punctuation, and simplification. The authors found that as “part of ‘motherese’ [...] mothers’ infant-directed actions [...] reveal distinctive characteristics that amplify or exaggerate meaning and structure within their bodily motions” (Brand et al.: 73).

In a further study, Rohlfing et al. (2006) extended the investigation of parents to include fathers (see picture). In addition, familiar functions of objects were focused on. In contrast to Brand et al. (2000), who used a manual coding system, Rohlfing et al. applied an automatic body tracking system and found statistically significant evidence for motionese as well. Brand et al. (2002) characterize these motion modifications as a form of behavior adaptation toward somebody who needs assistance in learning. More specifically, according to Zukow-Goldring (2006), in this adaptation, the attention is trained and directed to aspects of an ongoing event; the learners are then guided into perceiving possibilities for action or uses of the event in the environment. The knowledge gained can then be employed when planning actions. In a recent experiment, Brand and Shacross (in press) have shown that children prefer child-directed actions in the form of motionese. The impact of these motion modifications on children’s learning still has to be investigated.
6. Conclusions

For each child, language acquisition is a multimodal avenue. In investigating the ability to communicate we have to be mindful of the contribution of various cognitive and motoric abilities. Conversely, language – as the ability to recognize and form abstract symbols and to communicate – is also a guide to and impulse for further development. Consequently, development is not merely “an inevitable march towards maturity” (Smith and Thelen 2003: 344) but must be envisioned as interaction on two levels: the internal, which involves multimodality and the external, which draws on the support of the environment.

7. Exercises

1. What is “babbling”? Can you elaborate on different types of babbling?
2. What is “joint attention” and what abilities are discussed as representative of joint attention?
3. What are the precursors of a baby’s first words?
4. What does it mean when two pieces of information can be provided uni-modally or cross-modally? Please give an example.
5. What does the term “Late Talkers” refer to? How does their gestural and verbal development differ from Late Bloomers?
6. Imagine that your friend, who has a two-year-old child, asks you whether she has to be worried because her child cannot speak many words at this age. What would you recommend?

8. Useful literature for further reading


