Advances and lacunas in usage-based studies of first language acquisition

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1. Introduction

A central question in language acquisition research is how language is acquired by children in naturalistic settings. For a long time, it has been assumed, within the influential generative tradition, that parental input to children is largely uninformative of the target grammar and, therefore, not sufficient to enable children to learn language, the so-called *poverty-of-the-stimulus* problem (Chomsky 1975, 1988; Pinker 1989, 1994; see also Lidz and Waxman 2004; Lidz, Waxman, and Freedman 2003). Hence, in order to explain "how you get from here to there" generative grammar posits an innate component within the learner that is supposed to guide a child through the acquisition process by structuring the impoverished input in a way that makes learning possible. This innate structure is a set of hard-wired domain-specific principles, i.e. principles specific to language. The generative view hinges on the so-called *continuity assumption* that a child's grammar is essentially a miniature of an adult grammar. Language development is then seen as a matter of maturation and selecting the relevant parameters that match the input in the ambient language.

The generative approach has more recently been contested by the usage-based theory of language acquisition (Tomasello 2000b, 2003), a view suggesting that it *is* possible to learn a language from the input by means of social skills and powerful generalization mechanisms. In this chapter we review major advances made in usage-based studies of (first) language acquisition over the past years, critically assess the current research agenda in this area and suggest some avenues for future investigations.

Since usage-based approaches to language acquisition largely rely on cognitive linguistic theories of language, we start this chapter with an overview of the major tenets of cognitive linguistics (Section 1.1) and then review key assumptions and directions of usage-based research on language acquisition (Section 1.2). We do not strive for a complete overview of usage-based language acquisition research (for comprehensive reviews the reader is referred to Behrens 2009 and Tomasello 2003). Instead, in this

section we focus on the main assumptions of the usage-based theory of language acquisition and thereby set a stage for a critical assessment of its current applications further in the chapter. Section 2 reviews studies on the role of input frequencies in language acquisition. Section 3 reflects on the definitions and operationalizations of caregiver input. Section 4 explores the relationship between language acquisition and other aspects of child development (cognitive, social, motor) and evaluates the conformity of usage-based acquisition studies to the domain-general spirit of cognitive linguistics. Main conclusions are summarized in Section 5.

1.1. Cognitive linguistics as a usage-based approach to language

A keystone of cognitive linguistics is language use (Bybee 1985, 2007; Goldberg 1995, 2006; Langacker 1987, 1999). Unlike generative grammar, cognitive linguistics assumes that knowledge of language is not an abstract grammar, but rather a result of generalizations over actual use. More abstract patterns of various levels of complexity are thought to be grounded in individual usage events. Hence no level of language can be studied independently of language use. According to Langacker (1987, 1990), cognitive linguistics is a usage-based model of language due to the maximalist, non-reductive, and bottom-up character of the approach, as opposed to the minimalist, reductive, and top-down spirit of generative grammar.

A central assumption in usage-based studies of language is that there is no autonomous language faculty and that linguistic activities of human beings are based on the same cognitive principles as various non-linguistic abilities, such as perception, reasoning, memory and motor activity. This principle stands in stark contrast to the basic assumption of generative grammar that language is an autonomous module separated from other cognitive abilities.

Cognitive linguistics is a *maximalist* approach in the sense that it considers the linguistic system to be a massive and largely redundant inventory of form-function units of various sizes (e.g. small morphemes *vs*. lengthy idioms) and degrees of abstractness and productivity, rather than a self-contained set of rules. In this paradigm, both highly general constructions (Goldberg 1995, 2006) and completely idiosyncratic units can be part of the linguistic system. In addition, there are mixed constructions that are partly lexically specified and also contain open slots, such as the famous *What is X doing Y* construction (e.g. *What's that fly doing in my soup?*) studied by Kay and Fillmore (1999).

Cognitive linguistics is *non-reductive* in the sense that general rules (schemas) and individual instantiations of these rules (specific linguistic units such as words and multiword utterances) are considered as phenomena of the same kind. Thus, Langacker discards Pinker's (1989) idea that only those linguistic phenomena that do not fit the general rules should be listed in the lexicon as a *rule-list-fallacy*. In Cognitive Grammar, rules and lists are not mutually exclusive. The same construction can be represented both in the generalized form (as a schema/rule) and by specific instantiations. This implies that the same unit, say a specific morpheme, can be represented in many different combinations, which renders the system redundant. This is nicely illustrated by the experiments reported in Mos (this volume) demonstrating that language users exploit different representations depending on the demands of the task at hand.

Finally, cognitive linguistics is a *bottom-up* approach to language, since it posits that more general patterns are abstracted from specific instances and usage events. Accordingly, attention is given not only to general rules, but also to specific instantiations of these rules and to the process by which people generalize over specific expressions and arrive at more abstract schemas. In Goldberg's words, "speakers' knowledge of language consists of systematic collections of form-function pairings that are learned on the basis of the language they hear around them" (Goldberg 1995: 227). Thus, grammar for cognitive linguists is not a device for producing utterances, but rather an inventory of symbolic resources. Since different people are exposed to different usage events, cognitive linguistics envisages that the linguistic systems of individual speakers do not have to be the same. Language acquisition is then seen as a process of "mastering a large inventory of patterns of activity" (Langacker 2009: 628). Since all linguistic units at various levels are seen as form-function pairings, cognitive linguistics predicts that the same mechanisms apply to the acquisition of various linguistic phenomena.

1.2. Usage-based theory of language acquisition

Within the usage-based paradigm, there is no need to postulate an innate component of grammar in order to explain "how you get from here to there", since language learning is thought to be possible due to early emerging social skills (chiefly, intention reading) and powerful generalization (pattern-finding) capacities of young humans.

1.2.1. Intention reading and joint attention

Human infants are able to develop unique social skills. Herrmann et al. (2007) found that chimpanzees and two-and-a-half-year-old human children have comparable cognitive skills for dealing with the physical world (including space, quantities and causality). However, human children far outperform chimpanzees on tasks of the social world (social learning, communication, theory of mind). These sophisticated social skills are argued to be a major driving force behind a child's communicative development, including the acquisition of language.

In the usage-based theory of language acquisition, the utterance is considered to be the primary unit of early language acquisition. An utterance is defined as "a linguistic act in which one person expresses towards another, within a single intonation contour, a relatively coherent communicative intention in a communicative context" (Tomasello 2000a: 63). This definition captures an important idea that children do not merely parrot parental input. Rather they understand communicative intentions of their conversation partners and (re)produce linguistic sequences with the same communicative function as in the input. This process is known as *cultural learning* (Tomasello, Kruger, and Ratner 1993). Thus, intention-reading is argued to lay a crucial foundation for the acquisition of language. Pre-linguistic infants are able to discriminate sounds, but they do not learn to comprehend and produce linguistic utterances before around their first birthdays; this is when the ability to understand other people's intentions emerges.

Intention reading has been shown to play a critical role in early word-learning (Akhtar and Tomasello 2000; Baldwin et al. 1996). On this account, children do not try to grasp the abstract meaning of novel words. Rather they try to understand what their communication partner wants to draw their attention to and, therefore, direct their attention towards the same entity (object, action, property) on which the speaker is focussing. Put another way, for word learning it is crucial that children are able to enter into a state of joint focus with the adult. Hence, understanding intentionality of other people's communicative behavior is seen as a key social skill needed to be a successful word learner.

Brooks and Meltzoff (2008) related vocabulary growth to infant gaze following and pointing. Infants who followed the adult's gaze and looked longer at the object, as well as infants who were pointing during the experimental session (at 0;10−0;11) had a faster vocabulary growth between ages 0;10 and 2;0. In the same vein, Carpenter, Nagell, and Tomasello (1998)

found that children with earlier emerging joint-attentional skills also start acquiring words at an earlier age.

Joint attention has been shown to play a crucial role not only in word learning, but also in understanding longer utterances. In fact, recent evidence suggests that joint attention even enables toddlers to understand indirect language and draw relevance inferences (Schulze, Grassmann, and Tomasello 2013; Tribushinina 2012). Until very recently, it was assumed that children develop the ability to understand relevance implicatures (and implicatures in general) only by the time they are six or seven (Bernicot, Laval, and Chaminaud 2007; Loukusa, Leinonen, and Ryder 2007; Verbuk and Schultz 2010). However, Schulze et al. (2013) demonstrated that three-year-olds are able to draw relevance inferences if this process constitutes a necessary part of an ongoing interaction and is supported by joint attention. Tribushinina (2012) replicated this result and showed that even two-year-olds can understand quite complex indirect utterances when implicature generation is supported by joint attention and constitutes an intrinsic part of natural communication. In a context of a shopping game, children without joint attention with the person producing the target utterance had trouble understanding that a negative utterance such as *I find it boring* is an indirect refusal to buy a product. By contrast, children having joint attention with the "customer" performed equally well on direct and indirect, positive and negative utterances. These findings are consonant with the general idea that intention-reading supported by joint attention plays a key role in language comprehension and language development.

1.2.2. Piecemeal learning and generalization

On the usage-based view, children are both conservative learners and quick generalizers (Goldberg 2006: 91). A child's conservativeness involves the finding that early constructions are highly concrete and item-specific; children seem to merely learn them as *prefabs* (Dąbrowska 2004a) from the input language. This means that early in development children reproduce utterances (or rather parts of utterances) stored in the ready-made form from the input in communicative situations that are similar to the ones in which the utterances were pronounced by the caregivers.

Furthermore, this acquisition is piecemeal. The fact that a child has mastered, say, a locative construction with one verb does not necessarily mean that she has also acquired the same construction with other verbs (Pine, Lieven, and Rowland 1998; Tomasello 1992). Tomasello (1992) studied

early use of verbs in his daughter's speech and proposed the so-called *Verb Island Hypothesis,* according to which children learn morphosyntactic properties, such as argument structure, morphological marking and subject-verb agreement, for each verb individually. Similarly, research on morphologically rich languages has repeatedly shown that children gradually master some inflections with some verbs and other inflections with different verbs (e.g. Gathercole, Sebastián, and Soto 1999; Pizutto and Caselli 1992; Rubino and Pine 1998; Stoll 1998). This means that productive use of person in one tense does not necessarily imply a person distinction in another tense (Gathercole et al. 2002).

Although a lot of research in the usage-based paradigm focused on verbs, it should be mentioned that item-specific learning is not restricted to the verbal domain. For example, Clark and Nikitina (2009) report that the acquisition of the plural marker *−s* proceeds in a piecemeal, word-by-word manner. Some nouns are already used in the target plural form, whereas the plural of other nouns can still be expressed in a non-canonical way, for instance, by combining *two* with the singular form of a noun (e.g. *two cow*). Pine and Lieven (1997) found that early determiner-noun combinations are also lexically-specific. Some nouns are initially combined with *a,* some with *the*, and in many cases determiner-noun pairings are part of a larger rote-learnt construction such as [*in the* N]. Interestingly, even the distribution of fillers, which presumably function as proto-articles, was shown to be to a large extent lexically-specific. The study by Taelman, Durieux, and Gillis (2009) revealed that fillers in spontaneous speech of a Dutch-speaking child were particularly frequent after a number of 'anchor' words such as *is* 'is', *ook* 'also' and *niet* 'not', i.e. words often followed by articles in child-directed speech.

Taking a more global approach, Lieven, Salomo, and Tomasello (2009) traced all multi-word utterances in the speech of four two-year-olds and related these utterances to the child's own speech in the preceding six weeks (cf. Dąbrowska and Lieven 2005; Lieven et al. 2003). The majority of the child's utterances could be related to what she had said before. More precisely, 58−92% of utterance types were either exact repeats of the child's previous productions, or could be related to previous utterances through only one operation, usually a substitution of a semantically similar slot.

The most straightforward implication of item-based learning is that child grammars are qualitatively different from adult grammars, which goes against the continuity assumption of generative grammar. According to the usage-based view, children arrive at more abstract grammatical representations by generalizing over the stored instances. Their rules/schemas gradu-

ally grow in abstractness "as more and more relevant exemplars are encountered and assimilated to the construction" (Tomasello 2003: 316). The onset of the generalization process is usually heralded by relatively late overgeneralization errors (e.g. Dąbrowska and Lieven 2005; Lieven et al. 2003; Tomasello 1992, 2000b). In other words, children start making errors once they proceed to productive use on the basis of the generalizations drawn from the lexically-specific constructions. Although we do not yet know exactly how this generalization process unfolds, many researchers follow the idea proposed by Marchman and Bates (1994) that children need a 'critical mass of exemplars' of a particular construction before they can make generalizations and extract more abstract rules.

2. Frequency is not the key to all doors

Frequency is a central notion in usage-based research. Converging evidence from naturalistic and experimental studies strongly suggests that it is a significant factor in the process of language learning. Therefore, this section starts with a review of usage-based studies illustrating the important role of input frequencies in acquisition (Section 2.1). Research on the role of frequency in language acquisition has been extremely fruitful, which may in part be due to the fact that frequency is easy to operationalize and to analyze (see also Stein-krauss, this volume). This said, the increasing attention to frequencies seems to over-shadow the role of other important factors, such as transparency of form-function pairings, functional load, conceptual salience, complexity and communicative functions of linguistic units. We briefly review these factors in Section 2.2.

2.1. Type and token frequencies in language acquisition

The notion of frequency plays a central role in usage-based studies of language processing and acquisition. Since grammar is grounded in usage, it is assumed that each event of use leaves a trace in the processing system and, therefore, has an effect on the stored representation. Thus, repetitions strengthen representations, which means that frequently used items become entrenched and, therefore, more accessible. However, not only token frequency, i.e. the number of times a unit is used, is important. Type frequency, i.e. the number of distinct items represented by the pattern, has also

been shown to be of paramount importance in language development. To quote Bybee (2007: 15), "a certain degree of type frequency is needed to uncover the structure of words and phrases" due to the fact the construction is experienced with different units occupying a slot. Put differently, diversity of exemplars enables a child to draw analogies and to generalize over the stored instances. Hence, it is argued that token frequency leads to entrenchment, whereas type frequency correlates with productivity (Bybee 2007; Dąbrowska 2004b; Goldberg 2006).

There has been a plethora of studies demonstrating the crucial role of frequency in language processing (Ellis 2002) and acquisition (Lieven 2010). The basic idea is simple: the more frequently children hear a linguistic item the sooner they will acquire it (Majorano, Rainieri, and Corsano 2012; Roy 2009). For example, the order of acquisition of individual verbs was shown to correlate strongly with the frequency of verb use in the input (Naigles and Hoff-Ginsberg 1998; Theakston et al. 2004). In a similar vein, Blackwell (2005) found that cumulative frequencies of adjectives in parental speech are significant predictors of the order in which adjectives are acquired. Goodman, Dale, and Li (2008) report similar results for a range of grammatical categories, including nouns, verbs, adjectives and closed-class words. Furthermore, on a more general level, the more speech children hear, the faster they acquire language (Hart and Risley 1995; Hoff 2003; Huttenlocher et al. 1991).

Frequency is not only important in the acquisition of individual words; the acquisition of grammatical phenomena is influenced by the frequency of use as well. For example, the more often a word is used in the plural form in the input, the faster children will start using the plural marking on that word (Zapf 2004). Input frequencies were also shown to be a crucial determinant in the acquisition of higher-level syntactic constructions. In one such study (Matthews et al. 2005) English-speaking children in two age groups (2;9 and 3;9) heard sentences with a non-canonical (SOV) word order, as in *Bear Elephant dabbed*. The verbs used in the sentences could be of high, medium or low frequency. The children were then asked to describe the scenes introduced by the experimenter. In their descriptions, the younger children were more likely to adopt the non-canonical word order with low-frequency verbs than with high-frequency verbs. Older children had a preference for the canonical word order, which seems to suggest that they had acquired the abstract SVO schema of their target language. In contrast, two-year-olds' knowledge of the English word order appeared to be lexically-specific. For high-frequency verbs they had already received enough evidence of the target SVO order (which enabled them to correct the non-target sentences), whereas in the case of low-frequency verbs they

tended to "trust" the order modelled by the adult speaker. Thus, frequently used items play a major role in forming constructional schemas (see also Pine et al. 1998). Not only token frequencies of individual words are important, also frequency of an item's morphological family plays a role (see Mos, this volume).

Frequency of use can also account for varying paces of acquisition across languages. In a longitudinal study of spontaneous child speech, Rozendaal and Baker (2008) compared the acquisition of determiners by Dutch-, English- and French-speaking children. Children acquiring French were the fastest to acquire determiners and reached Brown's 90% criterion of acquisition (Brown 1973) between 2;6 and 2;9. The English-speaking subjects attained the 90% criterion later, between ages 3;0 and 3;3. The Dutch-speaking participants were the slowest and did not yet reach the 90% criterion by age 3;3. These cross-linguistic differences are consistent with the frequency of determiners in the three languages. Bare nouns are hardly used in the French input, and are more frequent in Dutch than in English. Thus, learners of French receive more evidence favoring the use of an element preceding a noun than toddlers acquiring English and Dutch. The study by Rozendaal and Baker (2008) also demonstrates that the distribution of determiners across pragmatic functions in spontaneous speech of two-year-olds largely reflects input frequencies. For instance, indefinite determiners are associated with non-specific reference in both child-directed speech and early child speech, whereas definite determiners are used for discourse-given referents.

To conclude, input frequencies account not only for the order of emergence and pace of acquisition, but also for usage patterns in child speech. Frequencies with which linguistic items are used by the child appear to be determined by the distributions in the input. However, the influence of parental input decreases as the child grows older and comes to use words more independently, which can be taken as a marker of acquisition (Tribushinina et al. 2013, 2014; Van Veen et al. 2009).

2.2. Other important factors

2.2.1. Detectability and reliability of cues

Children acquiring a language use multiple cues that inform them of the target language structure. The Competition model (Bates and MacWhinney 1987; MacWhinney 2001) posits that cue strength is determined by four

basic properties: detectability, task frequency, availability and reliability. Two of these factors are closely tied to input frequencies: *task frequency* pertains to the frequency of a category, and *availability* involves frequency of a cue within a category. But frequency effects are mediated by two other essential factors – detectability and reliability of cues.

Detectability concerns the possibility to detect the presence of a cue in the input. A cue may be very frequent, but non-salient due to, for instance, phonological factors. In line with this assumption, Smoczyńska (1985) found that the case-inflectional systems in Russian and Polish that are almost identical on paper are acquired at a different pace. The reason is that Russian inflections, unlike the Polish ones, are phonologically reduced to a schwa and, therefore, less easily detectable in the flow of speech. This is why Polish-speaking children acquire noun cases much faster than their Russian-speaking peers.

Cue reliability specifies whether the cue is unambiguously associated with a given category. Greater ambiguity in form-function mappings results in more protracted learning, since there is more competition between the cues. A case in point is the acquisition of grammatical gender in Welsh. The Welsh gender system is fairly opaque, with no one-to-one correspondence between form and function; the same type of mutation can be associated with different gender classes. For instance, soft mutation marks feminine gender in local lexical concord and masculine gender in distant constructs. Therefore, Welsh-speaking children are still acquiring gender at 9 years of age (Thomas and Gathercole 2007). In contrast, children exposed to languages with more transparent form-function correspondences in the gender domain were shown to acquire grammatical gender rapidly and fairly effortlessly (Karmiloff-Smith 1979; Lew-Williams and Fernald 2007; Pérez-Pereira 1991; Rodina 2007; Seigneuric et al. 2007, *inter alia*).

Further support for the crucial role of cue reliability comes from cross-linguistic investigations demonstrating that input transparency may indeed be a significant predictor of acquisition. There is growing evidence that (noun and verb) morphology is acquired faster in languages with a large paradigm (e.g. Greek, Croatian), where separate forms are available for different meanings, than in languages with sparse morphology (e.g. English, Dutch) where the same form can represent several different meanings (Dressler 1997; Gillis 1998; Laaha and Gillis 2007; Xanthos et al. 2011).

2.2.2. Functional load

In addition to the frequency of particular elements in the linguistic input, also the frequency with which these elements bring about meaningful distinctions are thought to determine how soon and how fast they are acquired. In other words, "the more work" an element (e.g., phoneme, feature) does in a language, the sooner it will be acquired. For instance, input frequency has been shown to have an effect on the order of emergence and the accuracy of production of consonants in the speech of children acquiring English and Cantonese (Stokes and Surendran 2005). Intuitively speaking, it is clear that the more a child hears a particular segment, the sooner that segment will be acquired. In other words, *input frequency*, the relative frequency of a particular segment in the ambient language, determines its acquisition order (e.g. Stokes and Wong 2002; Tsurutani 2007). Alternatively, it could be argued that the more a segment is used in the ambient language to differentiate one word from another, the sooner it will be acquired. This notion of relative use, which can be traced back to Martinet (1955), is often referred to as the *functional load* of a particular language element, such as a segment or a segmental contrast. Functional load refers to the extent to which a language makes use of that element (Pye, Ingram, and List 1987; Stokes and Surendran 2005; Surendran and Niyogi 2006). For instance, Ingram (1989) estimates the functional load of the consonant /ð/ in English to be fairly low: if all instances of /ð/ became /d/, communication would hardly be hampered. If English lost the /d/–/ð/ contrast, listeners would not be able to distinguish *then* and *den* out of context, but such minimal pairs are not very frequent in English.

According to Pye et al. (1987) functional load significantly correlates with the order of acquisition of (word-initial) consonants in Quiché-speaking and English-speaking children. Stokes and Surendran (2005) report significant negative correlations between functional load and the order of acquisition in English-speaking children, meaning that segments that carry a smaller functional load tend to be acquired later. Corroborating evidence is also offered by Amayreh and Dyson (2000), Catano, Barlow, and Moyna (2009) and So and Dodd (1995).

Van Severen et al. (2013) investigated the frequency and the functional load of word-initial segments in a large corpus of child-directed speech. The language addressed to 30 toddlers acquiring Dutch between six months and two years of age was investigated relative to the order in which those segments were acquired by the children. In this study a decisive impact of functional load (and input frequency) on the age of acquisition of word-

initial consonants was established as well: the higher the functional load of a word-initial consonant in the ambient language, the sooner that consonant was acquired by Dutch-speaking children. But Van Severen et al. (2013) also established that input frequency and functional load correlate significantly, which means that a segment with a high input frequency tends to have a high functional load. Therefore the question turns up whether input frequency has an additional predictive power for acquisition order when the effect of functional load is partialed out, and – mutatis mutandis – if functional load has an additional benefit once the effect of input frequency is partialed out. The analyses reported in Van Severen et al. (2013) reveal that functional load still correlates significantly with acquisition order when the effect of input frequency is removed from the statistical model. The reverse is not true: there is no additional benefit of input frequency when the effect of functional load is withdrawn: input frequency has only a small, non-significant additional impact on the age of consonant acquisition.

2.2.3. Conceptual salience

Goodman et al. (2008) correlated the age of acquisition of specific lexical categories (common nouns, people words, verbs, adjectives, closed-class words) with frequency of their use in the input. The results show that within each lexical category, there is a negative correlation between input frequencies and age of acquisition, i.e. words that are used more frequently by caregivers are acquired earlier. However, for all classes taken together, the correlation was positive, which means that higher parental frequencies appear to be associated with later acquisition. More specifically, common nouns were the least frequent category in the child-directed speech in the CHILDES corpora used in this study, but learned the earliest. And, conversely, closed-class words were the most frequent in the input, but the slowest to be acquired. In this case, input frequencies obviously fall short of explanatory power. To account for this pattern, we need to appeal to conceptual salience of various word classes. It is widely assumed that nouns are acquired earlier than relational words (e.g. verbs, adjectives, prepositions) because prototypical referents of nouns – objects – are salient and accessible enough for a child (Gentner 1982). Relatedly, Dressler, Lettner, and Korecky-Kröll (2010) argue that the order in which patterns of compounding are acquired is related to the salience of concepts involved – nominal compounds are acquired before verbal ones, which in their turn are acquired faster than adjectival compounds.

Some concepts, such as agentivity, causality, possession and number, are so salient that children may attempt to express them even before they have started acquiring the morphological form associated with that particular meaning (Bloom 1970; Braine 1976; Brown 1973; Clark 2001; Slobin 1985). For example, pre-linguistic babies were shown to have understanding of number, including one, two, three and many (see Dehaene 1997 for a literature review). Interestingly, children look for forms to express the meaning of more-than-one before they discover the plural morpheme (Clark and Nikitina 2009). Such emergent forms include a combination of numerals with bare nouns (e.g. *two duck*), quantifiers (e.g. *more*) and pointing gestures.

2.2.4. Conceptual complexity

Input frequencies appear to be a more consistent predictor of age of acquisition for production than for comprehension (Goodman et al. 2008). Comprehension of linguistic items is more often related to their complexity. For instance, color terms are used frequently by parents and children in the third year of life (Blackwell 2005; Nelson 1976). This does not mean, however, that children acquire color terms at the age of two years. Research repeatedly has shown that even four-year-olds use color terms haphazardly, often applying them to the wrong colors (Bornstein 1985; Cruse 1977). The probable explanation of this production-comprehension asymmetry is that color concepts are conceptually demanding for toddlers (Kowalski and Zimiles 2006).

There is also ample evidence that conceptual complexity determines the order in which linguistic items emerge in child speech (Clark 2003; Clark and Clark 1977). In one such study, Tribushinina (2013) demonstrated that the order of emergence of spatial adjectives is influenced by the conceptual complexity of the words. Overall, spatial terms frequently used by the caregivers are also the first ones to emerge in child speech. Nevertheless, there are also deviations from this pattern that cannot be explained by input frequencies. For instance, the Dutch adjective *dik* 'thick/fat' emerges later and is used by children less frequently than might be predicted on the basis of input frequencies. This mismatch can be presumably attributed to the finding that *dik* is a semantically complex adjective denoting a secondary horizontal dimension (Clark 1973). Thus the effect of input frequency on acquisition is in this case constrained by the conceptual complexity of the linguistic item (cf. Tomasello 2003: 175).

Likewise, Evers-Vermeul and Sanders (2009) present evidence that the order of connective emergence is determined by cumulative cognitive complexity (see also Tribushinina, Valcheva, and Gagarina, this volume; Vermeer, this volume). Connectives denoting positive relations (e.g. *and, because*) are usually acquired before the more complex negative connectives (e.g. *but, although*). Additive connectives (e.g. *and*) are less complex and, hence, emerge earlier than temporal (e.g. *after*) and causal connectives (e.g. *because*). Within the causal domain, the order of acquisition has also been shown to be related to the conceptual complexity of the coherence relations involved. Children are able to understand and mark objective causal relations before they come to comprehend and express more complex subjective relations, such as speech-act and epistemic causality (Evers-Vermeul and Sanders 2011; Spooren and Sanders 2008; Van Veen 2011).

Gathercole et al. (1999) studied the use of verbs in the longitudinal transcripts from two Spanish-speaking children around their second birthdays, and their mothers. The results demonstrate that not all forms frequently used by the mother are acquired early and used frequently in child speech. The verbal forms that are frequently used by both children and their caregivers – imperative, infinitive and third person singular present tense – are all unmarked and, therefore, relatively simple. The forms that are frequently used by the parents, but emerge relatively late in child speech – second person singular present tense, present continuous, imperfect and present perfect forms – are both linguistically and conceptually more complex than the unmarked forms. However, when language offers two or more forms with the same level of complexity expressing similar meanings, the most frequent form will be acquired first. In conclusion, input frequency appears to interact with linguistic and conceptual complexity in intricate ways.

2.2.5. Communicative importance

Some frequent constructions are not used by children simply because the communicative need to produce them does not arise in child speech. A case in point are two types of WH-questions discussed by Steinkrauss (this volume). Using a dense corpus from the German-speaking boy Leo, Steinkrauss demonstrates that the questions *was ist das* 'what's that' and *was ist denn* 'what's+PART' that are both very frequent in the input and very similar in terms of conceptual complexity, are not exploited by the child to the same extent. Leo over-uses the former question type and barely uses the latter. The explanation of this pattern, Steinkrauss suggests, is that *was ist*

denn questions are usually used by the parents after a token of surprise (e.g. *Look!*) aimed to draw the child's attention, or as repetitions of earlier questions not answered by Leo. The need to express these meanings does not arise in Leo's speech; hence he does not produce *was ist denn* questions.

The experimental study reported in Stoll (2005) is also suggestive in this connection. This study revealed that Russian-speaking children acquire Aktionsarten in their prototypical contexts. Telic verbs (e.g. *priexat'* 'come') that have a broad range of applications, both in perfective and imperfective aspects, are acquired earlier than ingressive verbs (e.g. *zaplakat'* 'start to cry') that are prototypically embedded in longer sequences of events. Therefore, in order to comprehend and use ingressives children need to be (cognitively and linguistically) mature enough to be able to represent ordering of events. Furthermore, their narrative ability has to be sufficient to start producing contexts making ingressives communicatively justified. Hence, children do not start producing ingressives before the time the communicative need for this construction arises and before they are cognitively up to it.

2.2.6. Other factors

Maekawa and Storkel (2006) investigated the development of expressive vocabulary in three English-speaking children and found that word length, rather than frequency, is one of the earliest cues used by the children: Shorter words appear in child speech earlier than longer words. Phonotactic probability is another early cue whose influence diminishes over time. Interestingly enough, frequency and neighborhood density (number of similar forms) were among the later cues. This study also found a lot of variability in the use of these cues: Whereas word length was a consistent predictor for all children in this study, there was more variation in the extent to which frequency, phonotactic probability and density could predict the development of expressive vocabulary.

2.2.7. Summary

To recapitulate, although both token and type frequencies of linguistic items have been shown to play a major role in the language acquisition process, some other relevant factors determining patterns of development in child speech are often overlooked in usage-based studies. These factors

include but are not limited to detectability and reliability of cues, functional load, conceptual salience, cognitive complexity and communicative importance of linguistic items. These factors interact with input frequencies in intricate ways. Therefore, it is important to combine quantitative analyses of child speech and parental input with more qualitative analyses informed by broader linguistic theories. Counting linguistic forms without taking into account their meaning and function is likely to give an incomplete or even distorted picture of development. What is more, studying linguistic forms independent of their semantics and communicative functions contradicts the basic premises of the usage-based enterprise.

3. What is input?

Since a leading claim of usage-based acquisition studies is that it is possible to learn language from the speech that children are exposed to, a bulk of research attempts to demonstrate that patterns in child language (output) can be related to distributions in the parental speech (input). In view of the central role that input plays in usage-based investigations, a serious thought should be given to what *input* actually is. Researchers investigating input factors in child language development often assume that there is a unanimous definition of *input*. The matters are, however, more complex than they may seem at first glance. Furthermore, the term *input* as such may be inappropriate given the current state of knowledge in the field, as we will try to show in this section.

3.1. Operationalization and analysis of input

The terms *input* and *child-directed speech* are often used interchangeably, probably because input effects are usually studied in naturalistic longitudinal investigations of spontaneous parent-child interactions. In this type of research a target child is commonly recorded in conversation with the primary caregiver, usually the mother. However, research by Shneidman and colleagues reveals that for families with multiple speakers child-directed speech from *all* speakers, and not just the primary caregiver, is the best predictor of the child's receptive vocabulary (Shneidman et al. 2013). Hence, it is crucial to study input provided by all caregivers and probably also by siblings. What is more, children can also learn from ambient language that is not necessarily directed to them. In other words, they hear not

only child-directed speech (baby talk, motherese), but also a lot of (overheard) adult-directed speech. Researchers barely take that kind of input into account and so far it is not clear how this can be practically done and what effects such input has on language development.

Yet another problem that is insufficiently taken into consideration is that caregiver speech is not stable. Research often relates the order and pace of acquisition to (cumulative) frequencies in the input. But *the input* does not exist, since parental speech changes over time. Many studies demonstrate that parents modify their speech to young children in ways that support language learning (Majorano et al. 2012; Roy 2009; Snow 1972). This is in line with the idea of "audience design" (Clark and Murphy 1982). For example, Tribushinina et al. (2014) demonstrate that the frequency of color terms in child-directed speech increases between ages 2 and 3, as children grow older and become more cognitively and linguistically mature. Likewise, Bellinger (1979) shows that parental directives become less imperative and less explicit as children gradually develop the capacity to understand indirect language. Using a very dense corpus of an English-speaking child Roy (2009) demonstrates that caregivers gradually decrease the length of utterances containing a particular word as the child approaches the zone of proximal development (Vygotsky 1978) for that word. And when the word emerges in child speech, caregivers start gradually increasing the length of utterances containing that word. This finding shows how amazingly sensitive caregivers are to the needs and the capacities of their child and how they fine-tune their speech to scaffold language learning.

Since parents adjust their speech to the maturational level of the child, it is questionable whether relating the acquisition of specific phenomena to cumulative frequencies in the input is the right thing to do (Van Veen et al. 2013). Researchers sometimes try to solve this problem by dividing the investigated period into sub-periods, such as trimesters and by relating child speech to child-directed speech in the same sub-period. Notice, however, that such divisions are purely arbitrary and may therefore obscure developmental patterns and relevant changes in the relation between child speech and child-directed speech.

A method that appears particularly useful in studying input effects is a growth curve analysis (Goldstein 1979; Rogosa, Brandt, and Zimowski 1982; Singer and Willett 2003, see also Van den Bergh and Evers-Vermeul, this volume). In this type of analysis, the occurrence of a language phenomenon is related to age in a regression model. Growth curve analysis allows for a statistical test of growth and differences in growth, not only in general but also with respect to different children. In other words, both average development (generalizations over children) and individual differ-

ences are quantified and tested. Since age is used as a continuous variable, there is no need to divide the investigated period into (arbitrarily defined) sub-periods. Growth curve analysis does not require data from many children, since individual parameters depend on the number of observations for each child. So even case studies of a single child can be statistically analyzed and contribute new insights into the acquisition process (e.g. Robinson and Mervis 1998; Van Veen et al. 2009). Furthermore, if different children (parents) are compared, there is no strict need to have the same number (and length) of the recordings, and these recordings do not need to be made at the same age for different participants.

Differences in growth curves can be related to other types of variables such as parental input. In one such study, Van Veen and colleagues modeled the probability of connective use in a dense corpus of the German-speaking boy Leo. The results suggest that frequency of connective use by the parents in the same recording (short-term input), as well as cumulative frequencies of connectives in child-directed speech of all previous recordings (long-term input) are significant predictors of the probability of occurrence of individual connectives in child speech (Van Veen et al. 2009).

Growth curve analysis can be used in a wide array of domains. For instance, it has already been applied to study growth in the number of word tokens (Evers-Vermeul 2005; Robinson and Mervis 1998; Tribushinina et al. 2013, 2014; Van Veen et al. 2009; Van Veen 2011), growth of expressive vocabulary (Brooks and Meltzoff 2008; Huttenlocher et al. 1991; Rescorla, Mirak, and Singh 2000; Tomblin et al. 2005) and receptive vocabulary (Scheffner Hammer, Lawrence, and Miccio 2008), changes in grammaticality judgments (Rice, Wexler, and Redmond 1999), degree of morphological productivity (Hadley and Holt 2006), morpheme use in obligatory contexts (Rice, Wexler, and Hershberger 1998; Robinson and Mervis 1998), and percentage of correct use (Rice et al. 2000).

3.2. A child is not a computer

It has become very normal to use the term *input* in (usage-based) studies of language acquisition, and its appropriateness is almost never called into question. Very often the counterpart term *output* is used with reference to child language. We would like to argue that the input-output metaphor is intrinsically flawed, since it suggests that a child is a kind of machine that you can feed with input in order to get target language as output. What this mainstream approach seems to ignore is the fact that already from the first

days of life infants are different individuals (McAdams and Olson 2010). For example, even at birth there are differences between babies in the deployment of selective attention, and these differences increase with age (Ruff and Rothbart 1996). There are also differences in dispositional traits – some new-borns are cheerful, others generally distressed. Early differences in attention, mood, response intensity and inhibition herald personal traits under development. Any dispositional trait is determined by a multitude of genes, but genes interact with the environment in complex ways (McAdams and Olson 2010; Sameroff 2010). Phenotypic differences between people influence the way the environment reacts to these people. For example, cheerful babies are more likely to evoke warm responses from other people; and these responses, in turn, create an environment that further reinforces initial temperamental dispositions, resulting in a snowball effect (Caspi, Roberts, and Shiner 2005).

Similarly, child language development is not a unidirectional input→output process. Parents attune their child-directed speech to the child's capacities and dispositional traits. Parental strategies that are congruent with the child's profile seem to reinforce further development. For example, research by Welch-Ross (1997) has shown that parents provide more elaborative conversations about past events with children possessing higher representational skills, and children with higher representational skills are more responsive in these conversations. Likewise, children with larger vocabularies solicit greater maternal responsiveness (Tamis-LeMonda et al. 1996), more frequent book-reading (Raikes et al. 2006) and highly elaborative parental speech (Lazaridis 2013). Maternal responsiveness, book-reading and high-elaborative parental style, in turn, stimulate further development of the child's language ability, showing a snowball effect.

It is of paramount importance to study child language acquisition as a bidirectional process in which the child interacts with the environment in complex ways. This approach would be in line with a basic tenet of contemporary developmental psychology positing a child's dynamic rather than passive relationship with experience (Sameroff 2010). The field is clearly in need of a comprehensive framework for studying such dynamic interactions in the language acquisition process.

4. How domain-general are usage-based studies?

As explained in Section 1.1, cognitive linguistics postulates a domain-general view of language as an integral part of human cognition, hinging on the same cognitive principles as perception, reasoning, memory and motor activity. It is then surprising how seldom usage-based investigations actually study language acquisition in relation to other aspects of child development, such as cognitive, motor and socio-emotional development.

As noticed above, there are huge individual differences between children from early on. For example, there are 16-month-olds with productive vocabularies of over 150 words, but there are also children producing no words at all at this age (Bates, Dale, and Thal 1995). There is, however, a general tendency to look at average tendencies and mean developments, irrespective of the obvious fact that the average child does not exist. Overall, the study of individual differences has not been viewed as critical to understanding fundamental mechanisms underlying language acquisition.

There are, however, a few exceptions. Some studies have sought explanation of individual differences in child-internal factors such as processing speed (Fernald and Marchman 2012) and joint-attentional capacities (Brooks and Meltzoff 2008), whereas other investigations concentrated on child-external factors such as quantity and quality of parental speech (see the review in Topping, Dekhinet, and Zeedyk 2013). The time is ripe for a comprehensive approach unifying these research lines. Only looking at various aspects of child development in tandem would genuinely correspond to the domain-general spirit of usage-based approaches. In the remainder of this section, we will discuss several studies demonstrating that language acquisition is related to other aspects of human development, including the development of executive functions, theory of mind and motor development, and critically assess some of the lacunas in this type of research.

4.1. Predictors of language ability

4.1.1. Executive function

The term *executive functions* is commonly used with reference to a range of cognitive processes that underlie goal-oriented behavior and hinge on the neural systems of the prefrontal cortex. Components of executive function are inhibition, shifting, working memory and planning ability (Best and

Miller 2010). Research on the relation between executive function and language development has by and large focused on bilingual populations (e.g. Carlson and Meltzoff 2008; Poulin-Duois et al. 2011) and various clinical groups including children with specific language impairment (Henry, Messer, and Nash 2012), cochlear-implanted children and adolescents (Kronenberger et al. 2014), patients after head injury (Channon and Watts 2003), as well as individuals with autism (Landa and Goldberg 2005) and schizophrenia (Binz and Brüne 2010).

Less attention has been given to the role of executive functions in typical language development. In one such study, Rose, Feldman, and Jankowski (2009) investigated the relation between four basic cognitive processes – memory, processing speed, attention and representational competence – at 12 months and language skills at 12 and 36 months. Two of these domains (memory and representational competence) were shown to be related to language, both concurrently and predicatively. The specific memory measures that proved related to language development are (immediate and delayed) recognition and recall. Within representational competence, three skills appear to be related to language; these include tactual-visual cross-modal transfer (matching tactual perceptions to visual ones), symbolic play (acting out pretended scenarios) and object permanence (understanding that a hidden object continues to exist).

A disadvantage of such studies – which are usually performed by developmental psychologists rather than linguists – is that they generally use very gross language measures and that operationalization of *language ability* is often restricted to only one or two domains. For example, in the aforementioned study by Rose and collaborators only vocabulary skills were taken into account. Language skills at 12 months were assessed by means of the *CDI: Words and Gestures* questionnaire (MacArthur-Bates Communicative Development Inventories). At the age of 36 months, receptive language was assessed by means of the Peabody Picture Vocabulary Test (PPVT). Productive language was assessed by means of the ETS Test of Verbal Fluency, in which participants are asked to name as many things as possible within three different categories in thirty seconds. It is possible that other cognitive processes prove relevant to other aspects of language use, such as phonology, morphology and syntax.

4.1.2. Theory of mind

It has long been assumed that theory of mind, i.e. the ability to predict and explain other people's mental states, develops very late, around the age of four. However, more recent studies using methods suitable for research with toddlers and infants (such as violation-of-expectation and anticipatory-looking tasks) revealed that even the ability to attribute false beliefs to others, which is seen as one of the most difficult theory-of-mind tasks, is present already in the second year of life (Baillargeon, Scott, and He 2010). Other aspects of theory of mind also start emerging already in infancy.

It has been shown on numerous occasions that language development is related to the development of theory of mind, as it enables children to grasp communicative intentions of other people and to take others' perspectives into account (see, for instance, a meta-analysis in Milligan, Astington, and Dack 2007). A recent study by Norbury, Gemmel, and Paul (2014) reveals that children with specific language impairment (SLI) have as much (if not more) difficulty talking about other people's mental states as autistic children.

4.1.3. Motor development

Relatively little attention in the literature has been devoted to the relationship between language acquisition and motor development. In an overview article Iverson (2010) argues that motor development gives infants myriad opportunities to practice skills that are necessary for language acquisition and communicative development. For example, it is argued that the peak in the frequency of rhythmic arm movements (e.g. rattle-shaking) around the age of 28 weeks facilitates development of reduplicated babbling by providing an infant with an opportunity to practice the production of rhythmically organized actions and facilitates infants' awareness of correlations between their movements and resultant sound patterns. In a similar fashion, Iverson (2010) maintains that there is a close relationship between infants' increasingly sophisticated actions on objects and the vocabulary spurt. Development of object manipulation skills gives an infant an opportunity to learn about progressively more specific properties of objects and thereby to attribute increasingly specific meanings to objects. This process of connecting meaning with a referent is fundamental for word learning.

In the same vein, attainment of motor milestones, such as unsupported sitting and walking, was also shown to predict the acquisition of language

(Oudgenoeg-Paz, Volman, and Leseman 2012). These motor developments change the child's interaction with objects and people in the environment. For example, unsupported sitting frees infants' hands and makes object exploration easier. Crawling and walking allows children to obtain objects that were previously out of reach. These changes also expose children to a new type of linguistic input (e.g. prohibitions) and motivate the acquisition of new communicative skills, such as communicating about distal referents.

Another piece of evidence supporting the relationship between linguistic and motor development is that language-impaired children commonly exhibit concomitant impairments in motor skill (see Hill 2001, for a review). Iverson and Braddock (2011) report that children with SLI perform more poorly than peers with typical language development on measures of fine and gross motor abilities, but make enhanced use of gestures probably as a means to compensate for poor language skills. Remarkably, even though children with SLI have a slower manual response to a stimulus, such as striking a key or touching a response pad (Windsor 2002; Windsor et al. 2001), they do not have a similar problem with eye-movements: When language-impaired children know the meaning of the word being processed, they look at the referent of that word as fast as their unimpaired peers do (Mak et al., 2015) and can even anticipate the upcoming object noun based on the semantics of the predicate verb (Andreu, Sanz-Torrent, and Trueswell 2013). This makes eye-tracking experiments by means of the visual world paradigm an excellent method for comparing language processing in impaired and unimpaired groups of learners.

4.2. What is still needed?

Although studies looking at the relationship between language and other aspects of child development are extremely valuable, we would like to suggest two directions for improvement.

4.2.1. Striving for a complete developmental picture

First, most investigations focus on the relationship between language and one more thing (e.g. working memory or theory of mind). There are hardly any in studies trying to look at child development as a complex process in which various aspects are inter-related. It would be very useful to look at several aspects of child development in tandem, as this could reveal that

relationships between language development and, for example, cognitive development are mediated by a third factor. For instance, there is voluminous evidence that language and theory-of-mind development are closely related. Notice, however, that it is still possible that there is a third underlying factor (e.g. executive function) that brings about the development in both domains (Astington and Jenkins 1999; Hughes 1998).

A case in point is Lazaridis (2013), a study investigating factors that contribute to the child's developing understanding of *Temporally Extended Self*, i.e. understanding that self continues to exist through time despite any internal and external changes. The results of this investigation demonstrate that caregivers' conversational style predicts child language ability. Further, child language ability and caregivers' conversational style have a direct effect on child's cognitive maturity (mental age). In addition, this study shows that theory of mind is the only significant predictor of the emergence of the Temporally Extended Self, although caregiver conversational style partially mediates the effects of theory of mind. Lazaridis' investigation provides a good example of how various aspects of child development and parent-child interactions are intertwined in the maturational process. It is therefore very important to include several facets of child development within one study and scrutinize their complex inter-relationships.

4.2.2. More attention to bidirectional relations

Second, researchers usually try to establish the influence of cognitive abilities on language development. However, there is increasing evidence that the relationship between language and other aspects of human development is bidirectional (see Christie and Gentner 2012 for a recent review). For example, children's linguistic development has been shown to interact with their developing categorization ability. On the one hand, ability to assign objects to categories stimulates learning labels for categories. But, on the other hand, exposure to linguistic labels draws a child's attention to the underlying concept and in this way facilitates categorization behavior (Gopnik and Meltzoff 1987).

A particularly interesting piece of evidence of how linguistic development may stimulate conceptual development comes from the study by Gopnik, Choi, and Baumberger (1996), which shows that categorization abilities arise later in children acquiring Korean compared to children exposed to English. The explanation offered by Gopnik and colleagues is that nouns, i.e. linguistic labels for object categories, are less prevalent in Kore-

an than in English. Hence, English-speaking children get more cues of (at least) nominal categorization than their peers learning Korean. More recently, Borovsky and Elman (2006) presented evidence from computer simulations converging with Gopnik and Meltzoff's idea of the complex inter-relationship between word learning and developing categorization capacity.

Within usage-based approaches to language acquisition, it is well-established that analogical reasoning plays a crucial role in language learning: Semantic and grammatical categories are formed by comparing different uses of a linguistic item and generalizing over them. However, there is much less attention to the fact that relational language can bolster the development of analogical reasoning, because relational terms can "invite attention to a relational construal of a situation" (Gentner and Christie 2010: 273). For instance, Gentner, Anggoro, and Klibanoff (2011) found that children are better able to draw an analogy if relations underlying analogies are marked by relational nouns (e.g. "The first word is *dax.* The knife is the *dax* for the watermelon. Now it's your turn. Which one of these (paper, pencil, scissors) is the *dax* for the paper?") compared to descriptions without relational nouns (e.g. "The knife *goes with* the watermelon. Now it's your turn. Which one of these *goes with the paper in the same way*?").

Similarly, a series of experiments conducted by Loewenstein and Gentner (2005) revealed that pre-schoolers perform better on spatial relational mapping tasks if they previously heard spatial terms describing the task situation. This effect was contingent on the semantics of the spatial expressions involved; the locative nouns *top-middle-bottom* had a greater and earlier effect compared to the prepositions *on-in-under.* Although these two sets of spatial expressions can both be used with reference to the same locations, the nouns *top, middle* and *bottom* highlight an integrated system of relations within a single situation, whereas the corresponding prepositions convey separate figure-ground relations and are in this sense less connected with each other. As a result, children performed much better on the spatial mapping task in the noun condition compared to the preposition condition. Interestingly, even the presence of the word for *like* in children's vocabularies appears to influence the ability to compare and use analogy (Özçalişkan et al. 2009).

In the literature on the relation between language and theory of mind, there is also quite some evidence in favor of bi-directional relationships between language and cognition. Research shows, for example, that exposure to discourse elements related to mental states (e.g. evidentials, mental verbs, complement clauses) may trigger children's attention to other people's desires, beliefs and states of knowledge and thereby to the develop-

ment of theory of mind (see De Villiers 2007 and references therein). For example, Hale and Tager-Flusberg (2003) report that explicit training on sentential complementation leads to an enhanced performance on false-belief tasks (see also De Villiers and Pyers 2002). Interestingly enough, other aspects of complex syntax, such as comprehension of relative clauses, appear to have no influence on the development of theory of mind. The special status of tensed complements can probably be attributed to the fact that they are commonly used to discuss contradictions between mental states and reality. A child needs to understand, for instance, that the sentence such as *Mary thought the earth was flat* can be true even if the proposition of the embedded clause is false. In this way, sentential complements may draw a child's attention to varying perspectives on the same piece of reality and on possible mismatches between reality and the propositions held in the mind.

In a similar vein, De Mulder (2011) has shown that the relation between theory of mind and linguistic development is bidirectional and not the same for different language phenomena. Earlier theory of mind was shown to predict later vocabulary, but earlier vocabulary also predicted later theory of mind. More specifically, children's performance on spatial terms (e.g. locative prepositions) proved to be a particularly good predictor of later theory of mind. De Mulder argues that spatial prepositions may force children to consider multiple perspectives on the same scene (e.g. what is *left* for me is *right* for the person in front of me) and thereby facilitate the development of theory of mind.

Not only specific linguistic elements, but also discourse practices as such may bootstrap the development of theory of mind. For example, Dunn et al. (1991) found that engagement in family talk about feeling states and, to a somewhat lesser extent, about causality was positively correlated with toddlers' performance on false-belief tasks at a later moment.

A recent study by Song, Spier and Tamis-LeMonda (2014) demonstrates that not only child language development, but also changes in child-directed speech involve a complex bi-directional relationship with the child's cognitive development. Mothers' language use at age 2;0 was associated with the growth of children's cognitive abilities between ages 2;0 and 3;0; and children's cognitive status at age 2;0 was in turn related to changes in maternal language use between ages 2;0 and 3;0.

In a nutshell, there is a growing body of research demonstrating the important role of attention to complex bidirectional relations between language acquisition and other aspects of child development. We believe that usage-based studies of language acquisition could benefit greatly from considering various aspects of child development in tandem and from studying

complex interactions between linguistic, cognitive, socio-emotional and sensory-motor development.

5. Conclusion

Usage-based approaches have provided a plethora of useful insights into the process of child language acquisition. A major contribution of usage-based studies is that they have convincingly demonstrated that there is no need to postulate an innate grammar, since it *is* possible to get from here to there. Children *are* able to learn a language from child-directed speech and ambient language; this process is supported by unique social skills of human infants and constrained by the properties of caregiver speech, such as frequency, reliability of cues, functional load and communicative function. The contribution of usage-based studies to our understanding of the fundamental acquisition processes can hardly be overestimated.

However, this chapter has also revealed a number of lacunas in usage-based approaches to language development. An important avenue for future research would be investigations in the truly domain-general spirit of the usage-based approach, with more attention to complex bidirectional relations between language and other aspects of human development. Furthermore, there is a growing awareness that the input-output metaphor commonly used in studies of language acquisition is outdated and fundamentally flawed. Child and environment interact in multiple complex ways and influence each other in the developmental process. The field is in need of more longitudinal studies that would capture such nontrivial dynamic relationships between child and environment and pay more attention to individual differences. It is important to remember: the average child does not exist.

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