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# Building Language Competence in First Language Acquisition

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Most accounts of child language acquisition use as analytic tools adult-like syntactic categories and grammars with little concern for whether they are psychologically real for young children. However, when approached from a cognitive and functional theoretical perspective, recent research has demonstrated that children do not operate initially with such abstract linguistic entities, but instead on the basis of distributional learning and item-based, form-meaning constructions. Children construct more abstract, linguistic representations only gradually on the basis of the language they hear and use and they constrain these constructions to their appropriate ranges of use only gradually as well – again on the basis of linguistic experience in which frequency plays a key role. Results from empirical analyses of children's early multiword utterances, the development of the transitive construction and certain types of errors are presented to illustrate this approach.

## Introduction

Children learn language from what they hear and they are creative with what they have learned from the start. In dispute is what mechanisms they bring to this. Clearly, some of these mechanisms have evolved biologically to support the human speech capacity but this leaves a wide field of possibilities open. The question I address is whether we need to postulate an innate *syntactic* module that has evolved to make the learning of language structure possible. I suggest that more general human social and cognitive capacities may be sufficient to support the learning of syntactic structure.

I start by briefly discussing precursors to language development that are developing in the first year of life: some of these are probably primate-wide skills, for instance, the capacity for distributional learning, others are probably in

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large part human-specific, for instance the highly sophisticated socio-cognitive skills that one-year-olds already show. Next, I outline two contrasting theoretical approaches to language development, the first positing an innate and abstract 'Universal Grammar' that allows children to learn the input language and the second proposing that children start out by learning concrete pieces of language, which become more abstract with development. Most accounts of child language acquisition use as analytic tools adult-like syntactic categories and grammars with little concern for whether they are psychologically real for young children. However, when approached from a cognitive and functional theoretical perspective, recent research has demonstrated that children do not operate initially with such abstract linguistic entities, but instead operate on the basis of distributional learning and initially low-scope, form-meaning constructions.

## Precursors to language development

Research shows a clear path of development during the first 12–18 months of life; as children's experience with language develops so do their segmentation, word recognition and pattern recognition skills.[1–3] These skills are obviously central to the ability to parse the input and to begin connecting it to meaning. However, it is important to note that the results of all these experiments depend on infants discriminating one stimulus from another. Thus, they do not have to understand or use the stimuli in communication, or to connect them to any meaning in the environment.

However, infants also make huge developmental strides in their cognitive and social development during the first 12 months of life. Cognitively, infants (probably from birth) have clear expectations about the ways in which objects will behave and these develop in sophistication over their first year. Before their first birthday they are able to form categories of objects based on both form and, to some extent, function.[4]

During their first 6–8 months, children also develop the ability to interact with others, to make demands and to resist them. Around 8–9 months, there is a major 'step change' as they start to understand that others have intentions that may be different from their own and to incorporate this understanding of other minds into their behaviour.[5] By 12–18 months, infants are clearly starting to distinguish attention-sharing, demanding and assisting others in terms of the gestures and vocalisations that they use, and this is highly correlated with word learning. Thus, by about 10–12 months, infants are ready to put the pattern-making skills that they have developed together with their communicative and meaning-inference skills. It is this combination that is the true start of human language learning.

How many of these developing abilities are unique to humans and how many are shared with the other great apes or primates? This is obviously a contentious

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issue and researchers of different theoretical persuasions have made very different claims. Much more research remains to be done to tease apart the exact nature of the skills and their precise developmental sequence but: (1) a number of experiments have indicated that many of the pattern recognition skills shown by human infants may be shared by other primates; and (2) the intention-reading and communicative skills shown by infants in the last trimester of their first year do seem uniquely human although non-human primates show some precursors of these abilities, especially those few who have been reared in a 'human' environment.[6]

## Contrasting theoretical positions

The arguments for an innate syntax module start from the assumption that constructing sentences involves the algorithmic assembly of abstract symbols. These abstract symbols map onto constituents in the sentence that are manipulated through this algorithmic process.[7] A constituent such as a noun phrase can appear in a number of sentence positions (subject, object, relative clause), can consist of a single or multiple words (*they*, *books*, *those books*, *the red books*, *the red books which I read yesterday*, *the beautiful and very finely bound red books which I read yesterday*) and has internal structure (determiner + noun, determiner + adjective + noun, relative clause). Since a constituent can be of potentially infinite length and these structures are not straightforwardly identifiable when a sentence is being spoken, no learning process that simply depends on the transitional probabilities between adjacent items in the sentence is going to be able to identify constituents. Nativist-linguists therefore posit an innate module for syntax that allows the child to use a biologically given Universal Grammar (UG) to identify the particular features of their ambient language. The critical issue is how children connect this UG to the particularities of the language they are learning, since languages can differ in a vast range of different ways. There are a variety of proposals for this that need not detain us here,[8–10] but I will address the evidence for the initial linguistic abstractness of the child's language from three perspectives: the creativity of their early multiword utterances; the development of transitive syntax (knowing who did what to whom in a sentence) and accounting for the errors that they make.

The alternative constructivist position (also called 'emergentist' or 'usage-based') argues that it is communicative function, as perceived by the child, which is the driving force behind the distributional analysis of the input.[11,12] In this approach, children start by learning low-scope constructions with which they can communicate. These are based around specific words or morphemes. With development, constructions become more complex and abstractions build up (for instance, of tense, agreement, subject and transitive). Initially, a child may have no understanding of the internal structure of a construction (e.g. that the '*s*' in

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'*What's that?*' is a form of the verb BE) but uses it as a whole with a specific meaning. As development proceeds, distributional analysis based on the relation between a form and (child-identified) functions, leads to linguistic representations developing internal structure (e.g. initially 'low-scope' schemas such as *Where's* ***X*** *gone?*, where, depending on the individual child and the stage of development, X might be a category of persons or objects or a wider category encompassing both). Patterns of relationships build up between constructions and their parts, in a process of increasing complexity and schematisation. Constituency becomes increasingly less lexically-based and more schematic. As children's grammar develops, they add constructions to their inventory that are increasingly complex (with more parts) and increasingly abstract (in the scope of the slots).[13] At some point, and for some constructions, children will abstract a fully schematic construction: the English transitive is an example (Subject-Verb-Direct object). Evidence that the construction is fully schematic is that the child can correctly order these constituents with a verb they have never heard before. Two interacting factors may contribute to the development of full schematicity. First the presence of the same form-function mapping across utterances, e.g. the presence of the same noun (*I*, for instance) before a number of verbs may contribute to the abstraction of the 'subject' relation.[14] Second, the child may make an analogy between different, more isolated constructions, for instance, *I hitting it*, *Daddy drop cup*, *Mummy pull box*, and abstract form-function relations of the type: Noun-before-verb = 'do-er', Noun-after-verb = 'do-ee'.[11] Finally the child has to abstract the relations between constructions, through learning to express communicative functions (e.g. reference, foregrounding and backgrounding) in increasingly complex ways. Evidence that this has occurred is that the child is able to transform an utterance in one construction into another construction, for instance a declarative into a *wh*-question or an active into a passive (e.g. *Mary likes John*, *Who likes John?*, *Who does Mary like? John is liked by Mary*, *Who is John liked by?*).

Note that children are capable of abstraction from before the beginning of language. From the moment that a child is able to name a set of non-identical objects using the same label, they are already making an abstraction. What changes over development is the scope of the abstraction. Equally, as soon as a child uses a construction with a slot, they are being linguistically productive – and many of these early constructions with schematic slots can be highly productive. Thus, abstraction and productivity do not depend on a highly abstract, non-meaning-based grammar.

## The role of the input language

The role of the language that the child hears is an important difference between these two approaches. Clearly, all recognise that children learn the specifics of

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their language from what they hear. From most UG perspectives, this ambient language has two roles: first to provide the child with a lexicon (the words of the language) and second, to indicate to the UG how its parameters should be set. While more recent UG approaches put more of the grammar into the lexicon through each word carrying a set of features that determine its possibilities of combination, almost all hold to the idea of parameter setting, although there is much argumentation as to the precise nature of these parameters and their possible settings. However, these parameters are abstract (for instance 'head directedness' which tells the child whether the head of a constituent comes to the left or the right of the phrase; 'pro-drop' which tells the child whether the language allows the dropping of arguments), with a limited range of discrete settings. There are major issues in what the child already needs to know in order to set these parameters and, in addition, they are almost never discussed in terms of the relative frequencies of particular forms or constructions in the input.

By contrast, the constructivist approach is concerned with quantitative features of the input and how these can be related to patterns of learning.[15,16] Let me give two examples. If a particular utterance is heard very frequently with a consistent communicative function, it may initially be learned as an unanalysed, 'frozen' formula (e.g. *What's that?*). However, if 'the same' construction is heard repeatedly with variation in a particular position, this position may become schematised as a slot (e.g. the X slot in *Where's **X** gone?*). Thus, the relative frequency of actual utterances and their contents is seen as central to the process of building up the child's grammar. The second example relates to the question of how children learn the particular forms in their language that mark particular grammatical relations (e.g. word order, case-marking, agreement). Here, too, the frequency of particular cues is an important factor but it is not the only one, the reliability of the cue in terms of its mapping to a particular form also has to be calculated. However, as we shall see, the issue of what it is relevant to count changes with development.

## Building constituency

The ability of speakers to produce – and listeners to understand – utterances that they have never heard before is one of the defining characteristics of human language. Children show this creativity from the outset, using the linguistic meanings they have available to communicate the meanings they wish to convey. In recent studies of four children's early linguistic development, we have attempted to determine how their novel multiword utterances might be constructed.[17,18] We did this by using relatively dense recordings of the children's own speech and their input over a six-week period from their second birthdays – amounting to 30 hours of recording each. We searched the last two hours of

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recording (the 'test corpus') for all non-repeated and non-imitated utterances and then searched in the previous 28 hours of recording (the 'main corpus') for strings said by either the child or adults that matched all or part of these novel utterances. We found that between 20–40% of the utterances in the test corpus were exact repeats of an utterance in the main corpus. A further 20–40% required only a single substitution of a word or previously repeated string in the main corpus to arrive at the novel utterance. Thus, these two-year-olds' utterances could have been constructed through simple processes of repetition and substitution. However, we also found that the degree of repetition, the numbers of operations required to construct utterances and the semantic range of these slots increased with the linguistic sophistication of the children.[19]

Most of the schematic slots into which words or strings were substituted were for referring expressions: people and objects, and this fits with the idea that the linguistic category of 'noun' may be an early abstraction for English-speaking children. Thus, experiments show that they are able to use novel nouns correctly, earlier than they are able to do this with novel verbs. However, in our study these 'referent' slots became more complex with development. Initially they were filled with bare nouns but with increasing linguistic sophistication the children added the two basic English determiners *a* and *the*, and then adjectives and other determiners (e.g. *other*, *some*, *more*). We see these data as showing how children might, starting from low-scope, highly entrenched utterances, build up a noun phrase constituent that itself becomes increasingly complex and abstract with development, and, at the same time, but more slowly, start to abstract other types of constituents, for instance, verb phrases and adjectives.

## Working out argument structure

One area that has received much attention in the child language literature is the question of how children work out basic transitive syntax, i.e. who is doing what to whom. Languages can mark this in a variety of ways: in English, the 'do-er' (subject) goes before the verb and the 'do-ee' (object) after, but this by no means holds for all languages. In addition, subjects and/or objects can be case-marked (we have traces of this in English with the pronoun contrasts such as *he-him*, *she-her*) and/or agree with the verb (in English subject-verb agreement is only marked for third person singular, *s/he laughs* by contrast with *I/you/we/they laugh*). Since languages mark these relations in such a variety of ways, how do children hearing a particular language learn how it is done?

Research suggests that this is a developmental process that takes considerable time and depends crucially on the precise details of how these grammatical relations are expressed in the language that the child is learning. Earlier experiments with known verbs already suggested that children learning different

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languages rely to differing extent on cues such as word order or case-marking as a function of the exact ways that these operate in the language.[20] These findings were extended and systematised in the Competition model, which distinguished between the availability of a cue and its reliability.[21] Cue *availability* refers to the consistency with which a particular form is present when the child understands that the speaker is attempting to express a certain function, e.g. how consistently **Verb+*-ed*** is present when the speaker intends to indicate past tense. Cue *reliability* refers to the consistency with which a particular function is present when the child hears a particular form, e.g. how consistently a speaker intends to indicate the past tense when she uses **Verb+*-ed***.

In a recent experiment on children's ability to act-out transitive sentences with novel verbs in English, German and Cantonese (all languages with basic subject-verb-object word order), we varied whether the preverbal and postverbal nouns were animate (A) or inanimate (I) in three conditions: AI, IA, and AA.[22] The first is the prototype in all three languages, animate beings are more likely to do things to inanimate objects than the other way around, they are therefore more likely to be subjects and subjects are more likely to appear before the verb. Thus, the majority of sentences in all three input languages reflect this prototype. The second condition reverses this (IA) while the third neutralises animacy (AA). We found that, at two and a half, children learning all three languages were significantly above chance in acting out the AI condition by choosing the first noun as agent but all were at chance in the reverse condition (IA). The children appear to be operating not with the abstract grammatical relations of subject and object but with the prototypes of transitive sentences available in their language. However, when it comes to the extent of reliance by older children on word order for choosing the agent in the IA and AA conditions, children learning the three languages differ, with the English children relying earlier and more consistently on word order (i.e. they act out the inanimate noun as agent in IA sentences and the first noun as agent in AA sentences) compared with the children learning either German or Cantonese. We argue that the reason for this lies in the nature of the input: unlike English, which has very rigid word order, German input has object-first word order about 20% of the time, usually with one or both noun phrases case-marked: *Den Bären frist der Tiger* ('The$_{OBJ}$ bear$_{OBJ}$ is eating the$_{SUBJ}$ tiger') meaning that it is the tiger who is doing the eating.[23] In Cantonese the problem is that argument omission is extremely frequent: provided there is an available context, it is possible to drop one or both arguments. While there is considerable debate about the early basis for these types of abstractions in late infancy[24–28] these studies suggest that the precise characteristics of the input are closely related to the development of grammatical abstractions and that, in turn, these take a considerable time to develop, starting from locally-structured prototypes limited to particular types of semantic participants.

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## Accounting for errors

Children make two types of errors as they learn language: they leave things out (omission errors) and they produce a variety of errors of commission. Some errors of both types are systematic in that most children make them, albeit to a greater or less extent. Nativist-linguistic approaches explain these errors in one of three ways: performance limitations (for instance on memory or utterance length), delays in maturation, or problems specific to the particular language being learned. The difficulty with explanations in terms of performance limitations is that these are rarely formulated explicitly enough to be tested and tend to be evoked post-hoc to account for conflicting data (see, however, Refs 29, 30). Here we will consider the other two types of explanation, the first directed at accounting for omission errors and the second towards an explanation for errors of commission in children's wh-questions.

English-speaking children go through a period where they often fail to mark verbs for tense and/or agreement (saying *He going* instead of *He's going* or *He go* instead of *He goes*, thus failing to mark third person singular on the auxiliary or main verb; and *It nice* instead of *It's nice*, failing to provide third person singular of the copula verb BE). The most influential account of this is Wexler's (1994) Optional Infinitive Hypothesis, which has since been developed into the Agreement/Tense Omission model (ATOM).[31,32] According to this model, by the time children begin to produce multiword utterances, they already know how to mark tense and agreement in their speech. However, they are governed by a 'genetically specified' Unique Checking Constraint (UCC) that 'wither(ing)s away in time'.[32] This constraint affects the child's ability to check the subject of the sentence against the abstract features of Tense and Agreement so that these features can be underspecified in the underlying representation of the sentence and therefore sometimes be missing in the surface sentence. The result is that the child sometimes produces non-finite verb forms (forms that are not marked for tense or agreement) in contexts in which tensed verb forms are required, and hence fails to provide tense-marking morphemes in contexts where they would be obligatory in adult speech.

The alternative view is that children build up a fully abstract understanding of tense and agreement marking only gradually and that, before this, their knowledge of tense marking is specific to particular morphemes and to the constructions in which these morphemes occur (e.g. *It's* + ***noun phrase***, *He's* + ***verb***-*ing* and *That* + ***verb***-*s*). In a recent series of analyses, we have shown first that there are correlations between the relative frequencies with which particular types of subjects (e.g. different pronouns, full noun subjects) appear in the input in strings where they are followed by an auxiliary (e.g. *He's* ***verb***-*ing*, *I'll* ***verb***) and where they are not (e.g. *Let's make* *it* ***verb***, *Where's* *he* ***verb***-*ing?*) and children's failure to provide of obligatory finiteness marking.[33] In a second study we have shown that there are systematic differences in children's ability to

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provide copula BE and auxiliary BE with the third person singular pronominal subjects *It* and *He* and the first person singular pronominal subject *I*.[34] In other words, rather than children's errors deriving from the 'mis-working' of an already existing abstraction, they derive from mis-analysis of the input. It is precisely when the child arrives at the relevant abstraction that the errors disappear (see also a similar explanation for cross-linguistic differences in optional infinitive marking).[35]

One well-known place for English-speaking children's errors is in wh-questions. While many are correct, children also make inversion (e.g. *Why he can go?* instead of *Why can he go?*) and other types of errors (e.g. auxiliary doubling: *What can he can do?*). These have given rise to a number of different linguistic-nativist accounts, often based on the particularities of English. In English, copula BE is the only main verb that can be inverted (unlike in German where all main verbs can invert in questions), and the use of 'DO-support' when there is no other auxiliary is also particular to English (*I can see it: What can you see*; *I see it: What do you see?*).[36] Thus, these accounts assume that children's UG has the abstract apparatus to understand the relationship between the *wh*-word and the constituent that it is replacing (often described in terms of 'movement' and 'gapping') but that English has particularities that predict certain types of error.

A very different account comes from the constructivist position. This explains these errors in terms of the relative frequency of *wh* + auxiliary combinations in the input. Thus, English-speaking children's error rate on syntactic questions can be predicted by the relative frequency of initial, lexically-specific, *wh*-auxiliary strings in their mothers' questions.[37] In a subsequent study of both *wh*-questions and inverted *yes-no* questions, it was shown that children were significantly less likely to make errors in questions requiring inversion when these were exemplified by highly frequent lexical strings in the input (i.e. strings in yes/no questions such as *Do you **X**?* and in wh-questions such as *What can **X**?*), even when the frequency of the individual words in the strings was controlled.[38] It is the entrenchment of the frames themselves that is a significant negative predictor of error. Errors occur when children have not yet learned the correct combination and produce a 'groping pattern', for instance by putting together a known *wh*-word and a known declarative.

## Conclusions

The structure of language emerges from language use historically and ontogenetically. Children use what they hear in order to communicate and thus come to share in a language community in terms of the network of form-meaning mappings that comprises their grammar. I do not for a moment mean to suggest that we fully understand all the processes involved in the development of language.

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There are many areas that require intensive research and to my mind, two are of immediate importance. First, we need to study development in languages with radically different types of grammar and, in particular, with complex inflectional systems and/or polysynthesis (languages with a large number of inflections per word). On the one hand, research seems to suggest that the learning of morphology is by no means instantaneous.[39,40] On the other, it is clear that children are sensitive to the basic typological characteristics of their language from an early stage.[41,42] Second, there is much work to be done on relating the precise characteristics of the input to particular aspects of language development. While, as we have seen, relative frequencies play an important part, other characteristics of the input such as saliency, communicative relevance to the child and relationships between items in the network of constructions are also important. These have to be precisely formulated and then tested for their effects, taking account of the fact that, as the child's grammar develops, what counts as an instance of a category or form will change. My aim here has been to illustrate the ways in which constructivist accounts would approach these issues and to argue that because these accounts are more psychologically realistic, they are likely to provide a much sounder theoretical and empirical basis for future research.

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