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The emergence of functional categories in bilingual first language acquisition

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Abstract

This paper explores the role played by cognitive and processing limitations in language acquisition and the relevance of bilingual first language acquisition for the ongoing debate on the ontogeny of functional categories.

1 Defining bilingual first language acquisition

Over the past twenty years the field of language acquisition studies has benefitted enormously from the shift from an English-centred perspective to a broader crosslinguistic approach. In this trend we can also situate the increasing attention paid to issues in bilingual first language acquisition (henceforth BFLA). Bilingual children combine the ideal opportunity of crosslinguistic analysis in a controlled environmental situation: two languages, one mind/brain. Intra-subject variability is eliminated, factors such as cognitive and psychological development, socio-economic status etc. are constant in the bilingual child. It is however important to notice that other variables come into play in BFLA, first and foremost linguistic input and cultural, emotional and social ties associated with it.

The psychological principle that anything learnt has an effect on subsequent learning (Kagan 1984) is particularly relevant in trying to properly define BFLA. In the literature on BFLA some authors make the distinction between *simultaneous* and *successive* acquisition. McLaughlin (1978) defines 'simultaneous acquisition of two languages' as a situation in which the child is exposed to two languages before her third birthday, and 'successive acquisition of two languages' as when the second language is introduced later than 3 years of age. Taeschner (1983) accepts the distinction, while Padilla & Lindholm (1984) reject the third birthday criterion as an arbitrary cut-off point. They suggest that only when the child is exposed to two languages from birth is it acceptable to speak of 'simultaneous acquisition of two languages'; anything else they regard as instances of 'consecutive' or 'successive' language acquisition. De Houwer (1990) proposes yet another definition whereby BFLA is a situation in which a child is first exposed to language B no later than a week after she was exposed to language A, and where exposure to languages A and B takes place on a daily basis. For the purpose of this study I will adopt de Houwer's definition.

2 Theoretical models of language acquisition and the stage-transition problem

If the study of BFLA constitutes a field in itself, in some respects it must also be considered as a subfield of language acquisition studies more in general. Theoretical models developed to account for how children acquire one language should in principle also account for the acquisition of two languages. Several approaches to language acquisition are represented in the literature varying along a continuum which opposes maturation to continuity with adult grammars.

The two fundamental questions any theory of language acquisition must deal with are a) *why* children's grammars differ from the adult target, and b) *how* they develop into adult grammars. Starting from the commonly held assumption of generative linguistics that human beings are biologically predisposed to acquire language, and that all languages share a set of innate universal principles (UG), the problem arises as to *why* language acquisition is not an instantaneous process; in other words, if the genetic instructions are there from the beginning why aren't children born talking? The most obvious answer is that there is more to language than just genetics: in the absence of adequate input the Language Acquisition Device (LAD) cannot be activated.[1] Minimally two variables are therefore involved in language acquisition: UG and input, and it is on the weight of their respective contributions that theories of acquisition have focused so far.

Three main positions are currently represented in generative studies of language acquisition:

The Maturation Hypothesis (MH): functional categories are universally absent from children's early grammars, and their maturation is regulated by a biological schedule (Radford 1990; Guilfoyle & Noonan 1988; Platzack 1990).

The Strong Continuity Hypothesis (SCH): the full range of functional categories is universally present from the onset of acquisition (Hyams 1986; 1994; Pierce 1992; Pinker 1984).

The Weak Continuity Hypothesis (WCH): although functional categories are in principle available throughout acquisition, their instantiation is not independently motivated, but is a function of the properties of the lexical items the children have acquired (Clahsen 1991; Clahsen, Eisenbeiss & Vainikka 1994; Vainikka 1994).

There is however a growing awareness among researchers that neither input-centred models nor maturation models are entirely satisfactory in accounting for the transition from children's initial grammars to the adult target. Attention is increasingly drawn to

[1]The example of feral children deprived of human interaction from birth is a case in point. Unlike the innate ability to walk, for example, the ability to speak does not simply develop due to a biological schedule; input is an essential condition for language acquisition.

extra-linguistic factors such as general cognitive development, memory-size and processing abilities.

The recognition that the notion of input must be revised when shifting from an adult to a child perspective was first recognised by White (1982) who suggested the distinction between *input* and *intake*. Input is adult speech addressed to the child, while intake is the portion of speech the child is actually capable of processing at that particular stage, given her limited cognitive and processing skills and restricted working memory size. Givón (1985) acknowledges that the child's access to actual input and her ability to generalise upon it during successive early stages of language acquisition are severely delimited by cognitive development. Givón emphasises the importance to determine what exactly is the *relevant input* used by the child at any specific 'instance of learning'. Some of the input may be irrelevant, either because the child has already generalised upon it, in which case it can only act as reinforcement, or because the input is too complex at the given instance of learning. This input may be present at high frequency around the child, but is nevertheless irrelevant to what the child can absorb at that particular point in her cognitive and linguistic development. New information that is too remote from what has already been acquired cannot be integrated.[2]

Although a maturational approach is appealing in that it accounts for successive developmental phases, it doesn't do so in a principled way. Proponents of the Maturation Hypothesis (MH) have argued that invoking maturation is the only way out of the paradox created by the Continuity Hypothesis (CH). If principles of UG are available from the onset of acquisition and the input is responsible for acquisition, why do certain constructions develop before others? Why doesn't the input trigger these constructions earlier? Unless the input is strongly ordered, and this does not seem to be the case, then explaining *stage transition* becomes increasingly difficult. This criticism has been answered by supporters of the CH by arguing that, in actual fact, the input which is necessary for the acquisition of certain structures may not be available to the child until she has reached a certain stage of cognitive development. Thus, the assumption that the input the child receives does not change over time is likely to be a misguided notion. The input itself may remain the same, but it is the child's *perception* of it that changes.

If the stage transition problem can be dealt with without postulating maturation of UG principles, then there is no need to do so. In this light the CH is more economical and, therefore, desirable over the MH. Notice also that while in theory any principle can mature, explaining stage transition by resorting to maturation weakens the explanatory power of the theory as it makes a claim which is virtually impossible to falsify.

Postulating the maturation of UG principles also raises the issue of what exactly is the status of child grammars with respect to UG. If UG is only partially available in the early stages of acquisition, then we might expect the emergence of "wild grammars" which violate those principles which have not matured yet. This possibility considerably undermines the role of UG as a set of innate universal principles available as heuristic tools in language acquisition, and places a greater burden on the learner.

[2]Cf. similarities with SLA.

Another serious challenge facing the MH is the lack of crosslinguistic evidence for maturation. If maturation is genetically predetermined, presumably principles should "come on line" approximately at the same time for all children, regardless of the language they are exposed to. The evidence available so far, however, does not seem to point in this direction. In morphologically rich languages, the integration of functional categories in child grammars occurs extremely early (Clahsen 1991; Pierce 1992; Demuth 1992), as opposed to languages such as English and Swedish where early stages are characterised by *lexical-thematic* structures (Radford 1990; Platzack 1990). This crosslinguistic discrepancy is better accounted for by input-driven models of acquisition, where the assumption is that the principles governing the emergence of functional categories are, in theory, always available to the child, but where it is the salience of the input which leads her to integrate them in her grammar at an early stage.

In sum, the answer to the stage transition problem given by the MH is unsatisfactory in two respects: because of the very circularity of the maturational argument, and the lack of crosslinguistic support. My proposal is to shift the attention from the idealised and often static opposition UG-input of generativist approaches, to consider the dynamic role played by language processing and related limitations.

3 The 'Less is More' Hypothesis

The fact that language acquisition takes place effortlessly and successfully during a period of significant developmental changes in the child's general cognitive abilities and processing skills, is too often overlooked in studies focusing on competence models. Children's superiority over adults in language acquisition seems like a paradox: limitations on perceptual and memory abilities should, in theory, hinder the process considerably, but they do not seem to. In fact, what may at first look like a serious deficiency may well turn out to work to the children's advantage. Recent studies using connectionist networks to model the acquisition of morphology and syntax (Plunkett & Marchman 1993; Newport 1991; Goldowsky & Newport 1993) suggest that a more fruitful approach to language learning requires us to consider the learning device (be it a child's mind or a neural network) and the input as dynamic systems. In other words, either can be modified to reproduce changes taking place during development.

The importance of starting small is at the core of Newport's (1991) 'Less is More' Hypothesis. Goldowsky & Newport (1993) consider a simple model of the acquisition of morphological systems whose task is to correlate linguistic *forms* and *meanings* which occur in the environment. Developmental constraints are represented in the model by an *input filter* which regulates the amount of information which is made available to the system. First the experiment is run without input filter to see how the system copes with an unrestrained number of options. Results are similar to those obtained by Elman (1993) in analogous experimental conditions: response is inconsistent, and the data lend themselves to so many different hypotheses that it is very difficult for the system to sort out which ones are the "right ones". However, when an input filter is introduced results improve dramatically. The data are only partially available to the system, the solution space is narrowed down thus simplifying the learner's task. *Data focus* on a subset of the initial input also entails *data loss*, but it is interesting to note that data are not lost evenly. The number of successful mappings remains fairly constant; on the other hand, noise is considerably reduced thus improving the *signal-to-noise ratio.* The input filter *randomly* selects which bits of information are let through and thus made available to the system at any given time. Goldowsky & Newport's reason for adopting this random selection is that, if they can demonstrate that even a random filter models learning with a considerable degree of success, a "smart" filter should no doubt increase the system's chances. The authors themselves recognise that factors such as perceptual biases, and structural constraints particular to the language may determine which subsets of the data the child will attend to in processing the input.

4 The Competition Model: a cue-driven approach to language acquisition

One framework which attempts to model both language processing and language acquisition is the Competition Model (hence CM). At the core of the CM lies the *functionalist* assumption that 'the forms of natural languages are created, governed, constrained, acquired and used in the service of communicative functions' (Bates & McWhinney 1989). Bates & McWhinney have shifted the attention from pure *competence* models to *performance* models, in the belief that languages are not acquired and used in a vacuum, but fulfil communicative purposes. One of their central concerns in creating the CM has been to create a framework which could hold crosslinguistically for the many aspects of natural language use (comprehension and production, first and second language acquisition, the breakdown of language in pathological conditions, speech errors, error monitoring and judgements of well-formedness). The CM is a *cue-driven* approach to language processing; speakers use *cues* to process the input around them. Cues can come from any level of linguistic structure (phonology, semantics, morphology, word order) and the utterance context. These cues are processed simultaneously and many interact with each other, converging if they lead to identical interpretations, and competing if they lead to conflicting interpretations. If there is competition between cues, those cues which are generally most *available* (present, frequent, phonetically salient) and/or most *reliable* (leading to a consistent interpretation, always present for that interpretation) will win out over cues which are less available and/or reliable. *Overall cue validity* is defined as the product of a cue's availability multiplied by reliability, and as such can be measured probabilistically.

Crosslinguistic studies of adult sentence processing have shown that the cues' overall validity varies crosslinguistically, and that there is no universal hierarchy where word order is ranked higher than phonological salience, for example. In fact, given this crosslinguistic variability speakers of different languages will rely on a different hierarchy of cues ranked according to their overall validity in that specific language. The powerful prediction the

CM makes for language acquisition is that cue validity determines the order in which grammatical devices are acquired. In other words, children are sensitive from the beginning to the information value of the input and will focus on the form-function mappings which present the highest overall cue validity. It follows that, in languages where the surface realisations of functional categories is higher in cue validity; they will be acquired earlier and faster than in languages where the surface realisations of functional categories is lower in cue validity. For example, languages where verbal agreement paradigms are morphologically and/or phonologically highly available and reliable, children will master subject-verb agreement earlier and more consistently than in languages where the overall availability and reliability of agreement is lower.[3]

However, although cue validity is a good predictor of the strength the child will attach to a given piece of information, *cue strength* is not always necessarily a direct function of cue validity; in first language acquisition processing limitations must be taken into account. In the CM two major types of processing limitations, or *cue costs*, are integrated in the framework: *perceivability* and *assignability*. Perceivability and availability are related notions in as much as a cue is available only when it is perceived, but the fact that a cue is available does not necessarily mean that it is also perceived.

As for assignability, this cue cost refers to the amount of material that must be held in memory before an assignment is made. Limitations on working memory size are such that information involving "local" cues, such as case marking in a language with an unambiguous case system, is higher in assignability and therefore stands greater chances to be processed than information involving long-distance relationships. Input low in assignability will be more demanding to process and therefore discarded in favour of information whose assignability is higher. In the CM, the weight of cue costs in acquisition is a function of the child's *functional readiness*, which, in turn, is related to the child's developing cognitive and processing capacities. A high level of cognitive development correlates with high functional readiness and with low impact of cue costs in acquisition. The term 'cue cost' has a rather negative connotation in the CM, suggesting that the child's limitations are somehow holding her back, preventing her from achieving a level of functional readiness which would guarantee optimal processing.

Both the CM and the 'Less is More' Hypothesis (LMH) offer extremely useful insights to the stage-transition problem. However, I believe that it is necessary to bring them together to integrate the two central ideas which they contribute separately. The CM recognises the effect of the load imposed on the learning device by processing limitations, but the positive and adaptive potential of such limitations is not fully recognised. On the other hand, the LMH focuses on the fundamental role of incremental cognitive capacities, but does not satisfactorily address the issue of *selective attention* (Hyams 1986). It is not entirely clear what exactly is the child's criterion when "filtering out" the input. Goldowsky & Newport (1993) mention the importance of replicating their findings with the introduction of a 'smart

[3]Indeed, grammatical morphemes appear and are mastered much earlier in Italian than they are in English (cf. Guasti 1993; Hyams 1986; Pizzuto & Caselli 1992). In languages like Turkish or Hungarian, with unambiguous case systems, case morphology is mastered at an earlier age than in a language like Serbo-Croatian where case contrasts are frequently ambiguous (cf. Bates & McWhinney 1989).

filter' which would not select the input *randomly*, but *selectively*, thus reflecting children's perceptual biases. A convincing account of what these biases may be is provided by the cue system of the CM. In principle, it should be possible to construct a language-specific hierarchy of overall cue validity which, combined with cue costs such as perceivability and assignability, should predict order of acquisition. The underlying assumption is that children will initially focus on those form-function mappings which offer a higher "payoff"; subsequently, access to expanding memory size and cognitive abilities will decrease cue costs and increase "transparency" of the input until cue strength and cue validity converge.

The appeal of the integration of the LMH and the CM is considerable in at least two respects: maturational constraints on the development of UG are redundant; the combined effects of hierarchical cue validity and cue costs can satisfactorily explain *why* children's grammars differ from the target, and *how* they develop into adult grammars.

The other advantage of this approach is its crosslinguistic potential. Language-specific hierarchies of cue validity have a testable, empirical base which can be probabilistically measured. Discrepancies in the emergence of functional categories across different languages can therefore be explained by checking them against the predictions that the language-specific hierarchies of cue validity make for a given language. As we have already shown, maturational approaches to language acquisition do not stand the crosslinguistic test. If the hypothesis states that UG and functional categories are subject to maturation, and all human beings are equipped with the same innate universal knowledge (UG), then it should logically follow that the maturational schedule must be the same for all first language learners, regardless of the language they are learning. Evidence available so far seems to disprove this claim; in fact, functional categories emerge at different times for children learning different languages.

5 BFLA and the emergence of functional categories

The role of BFLA in the current debate on the ontogeny of functional category is particularly illuminating. Bilingual children make excellent subjects for crosslinguistic research because they eliminate intra-subject variability. Growing evidence that bilingual children at the one-word stage possess translation equivalents in their lexicon provides some support to the hypothesis that they do in fact have the ability to discriminate words in the input and assign them to two separate systems (Pearson *et al.* 1995; Quay 1995). Recent studies have also suggested that, although code-switching is attested in young bilinguals' multiword utterances (Redlinger & Park 1980; Taeschner 1983; Volterra & Taeschner 1978; Vihman 1985), bilingual children as young as two do not code-switch profusely within utterances and can already separate their languages at the pragmatic level (Genesee *et al.* 1995; Paradis & Genesee 1996; Lanza 1992). Although pragmatic separation does not unequivocally prove that the underlying syntactic representations are also separate, pragmatically constrained code-switching without such separation would be difficult to achieve. Provided that language separation is in place by the age of two, the question still remains as to whether development in the two languages proceeds autonomously, parallel to the monolingual acquisition of each of the two languages, or whether some sort of interdependence can be observed (Paradis & Genesee 1996).

Studies on French-German bilingual children have shown that from the emergence of functional categories, around 2 years of age, they have separate verb placement, agreement, tense, and case marking in their two languages (Meisel 1990; Parodi 1990). In a study of three French-English bilingual children between the ages of 2;0 and 3;0, Paradis & Genesee (1996) have investigated the acquisition of finiteness, negation and pronominal subjects. Their results suggest that the children's pattern of development follows that of their monolingual peers. The delay in the acquisition of finiteness in English with respect to French, and the absence of PF verb raising to preverbal negation in English, seem to indicate that these children's acquisition is not significantly affected by the fact that they are learning two languages simultaneously. Rather, the two syntactic systems seem to develop fairly autonomously. At interval I (age range from 1;11 to 2;0) 51% of French utterances are finite, and the correct placement of the negator and the presence of subject clitics strongly support Paradis & Genesee's claim for the projection of an IP node. During the same interval there is little or no evidence that an IP node is present for English; finite utterances occur in 10% of obligatory contexts, and negation is in preverbal position indicating the absence of subject raising. As for pronominal subjects, the children have correctly identified French weak pronouns as clitics, and French and English strong pronouns as DPs. The authors' conclusions is that the children were acquiring French and English separately and autonomously.

Similar findings have been reported by Schelletter & Sinka (1996) for two German-English and Latvian-English bilingual children. Inflectional and case morphology is already well attested in the early phases of acquisition for German and Latvian, two highly inflected languages, while at the same time their development in English is still in a pre-functional phase. Here again the discrepancy between the emergence of functional categories in the two languages seems to suggest that development takes place autonomously in their two linguistic systems, and that the rate of acquisition in the two languages can be compared to that of monolingual peers. This position has far-reaching implications for a theory of language acquisition: neither a strong continuity approach, nor a maturational one are compatible with these data. If functional categories are available to children throughout acquisition, then the delay of the morphosyntactic development in English must be accounted for. Under a strong continuity approach, it has been argued that phonological constraints on children's production are responsible for the omission of unstressed syllables. By this rationale, inflectional affixes and auxiliaries are not perceived by the child as they are unstressed. However, while the three children in Paradis and Genesee's (1996) study had difficulties with unstressed affixes and auxiliaries in English, at the same time they did produce unstressed subject clitics in French. Moreover, phonological limitations cannot be invoked to explain the instability of subject-raising.

The lack of phonetically realised material raises the issue of whether functional categories are actually present and underspecified in early stages of acquisition. If this is the case, the presence of an underspecified T node lacking $\pm$Tense features would account for why initially the Tense variable is not bound in English child grammar. Unfortunately, this would allow the existence of vacuous projections which serve no real purpose other than just existing for continuity's sake. Moreover, the postulation of vacuous projections is in open contradiction with the UG Principle of Economy of Projection:

> **Principle of Economy of Projection**
> Project XP only if its head X or its specifier XPSpec has independent semantic or phonetic content. (Roeper & Rohrbacher 1994)

It follows directly from the above principle that a maximal projection can never be vacuous. In a structure in which both the specifier and the head of a projection are radically empty such a projection is indistinguishable from its complement and considerations of economy dictate that it be not projected. In other words, an empty IP selecting a VP cannot be distinguished from a simple VP; they are both compatible with a sentence like *Want apple*. However, a syntactic representation which strictly includes the minimal amount of structure needed to account for the data is more economical, and therefore desirable.

This "economy" approach is very much in the same spirit as Grimshaw's (1993) application of *Optimality Theory* (OT) to syntactic phenomena. In an OT framework a series of ranked constraints interact to select the *optimal* form among a number of competitors (the 'candidate set'), i.e. one which is grammatical and most economical. In this framework 'A clause always has the minimal structure consistent with its well-formedness' (Grimshaw 1993:5). In other words, a clause is only as big as it needs to be, an "extra" projection is only licensed as long as it makes a contribution to the functional representation of the clause:

> **Minimal Projection Principle**
> A functional projection must be functionally interpreted.
> (Grimshaw 1993)

6 Conclusion

To conclude I would like to propose that the only theory of language acquisition compatible with the above principles of economy and minimal projection is a structure-building approach like the Weak Continuity Hypothesis. Functional categories are in principle available to the child, but their instantiation is subject to a number of empirical and theoretical constraints: availability, reliability and perceivability of the input, satisfaction of the principles of economy and minimal projection. The language learner's task is therefore to achieve maximal linguistic well-formedness and maximal communicative effect with the minimal amount of effort, inevitably violating some constraints during the acquisition process. Increased cognitive abilities and expanding working memory size extend the availability of the data, thus enabling the child to integrate new information into her linguistic system and to upgrade her performance.

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