Poverty of the stimulus and yes-no interrogatives in English

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POVERTY OF THE STIMULUS AND *YES-NO* INTERROGATIVES IN ENGLISH [*]

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Cet article traite de l'exemple classique de "pauvreté du stimulus" en linguistique, qui concerne la formation des phrases interrogatives fermées en anglais. Les jeunes anglophones acquerraient une règle d'inversion sujet-auxiliaire (ISA) sans être exposés aux données qui en permettraient l'apprentissage, la conclusion traditionnelle étant qu'il existerait un principe de "dépendance structurale" inné, inscrit dans la Grammaire Universelle. Nous montrons d'abord que les jeunes anglophones ont bien accès à certaines des données supposées "pertinentes" dans cet exemple et qu'il ne faut pas exclure l'importance potentielle d'autres données. Nous examinons ensuite la nouvelle analyse "minimaliste" des interrogatives fermées proposée par N. Chomsky. Le principe de dépendance structurale y est abandonné, mais au prix de nouvelles hypothèses tout aussi problématiques. Enfin, nous arguons que les études sur les questions produites par les jeunes anglophones ne s'accordent pas avec l'hypothèse de l'acquisition précoce d'une opération générale telle que ISA et qu'elles sont davantage compatibles avec une approche constructionnelle et fondée sur l'usage du savoir-faire linguistique.

Acquisition du langage, pauvreté du stimulus, interrogatives fermées en anglais, modèle linguistique constructionnel et fondé sur l'usage, grammaire cognitive

This article deals with the classic example of "poverty of the linguistic stimulus", which concerns the formation of *yes-no* interrogative sentences in English. Young children have been claimed to acquire a subject-auxiliary inversion rule (SAI) without being exposed to the data necessary to learn it. According to the traditional conclusion, that acquisition is made possible by an innate structure-dependence (SD) principle. We first show that young English-speaking children do have access to some of the supposedly "relevant evidence" in this example and that other kinds of data might be just as important. Next, we examine Chomsky's recent "minimalist" analysis of *yes-no* interrogatives, which abandons the SD principle but introduces new equally problematic hypotheses. Finally, we argue that the early acquisition of a general question-formation operation such as SAI is not compatible with the results of studies on young children's questions and other linguistic productions. Those results are instead shown to be consistent with a constructional and usage-based approach to language.

Language acquisition, poverty of the stimulus, *yes-no* interrogatives, usage-based models of language, cognitive grammar

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1. Introduction

In its most general formulation, the so-called 'Argument from the Poverty of the (linguistic) Stimulus' (APS) is that the native speaker's linguistic knowledge is *underdetermined* by the linguistic data (s)he has been exposed to. That formulation, however, is too vague, for it is possible to recognise at least two very different versions of the argument: one weak, the other strong. The weak version of the APS is that linguistic knowledge is underdetermined by linguistic experience insofar as the ability to acquire and use a human language requires certain biological, presumably genetic, predispositions. It is a truism – cats do not 'talk' and human language is specific to human beings – although the exact nature of those predispositions remains unclear. Indeed, what is traditionally called the human 'language faculty' might be a unique combination of domain-general abilities, none of which is specifically or uniquely linguistic (cf. Croft & Cruise 2004: 2; Langacker 2008: 8). By contrast, the strong version of the APS or 'APSs' – the only version that will be considered in what follows – is a controversial hypothesis that has been popularised by N. Chomsky and other proponents of generative grammar. One of its clearest formulations was given by Hornstein & Lightfoot (1981: 9): 'People attain knowledge of the structure of their language for which *no* evidence is available in the data to which they are exposed as children.' This strong version of the APS has long been used as the fundamental argument for the existence of a richly specified innate linguistic system called 'Universal Grammar' (UG). Recently, however, Chomsky (2004, 2005, 2012) has come to suggest a radically 'minimalist' version of UG whose compatibility with the APSs seems, at best, unclear.

This paper will focus on what may be called the 'classic' example of the APSs, which was first introduced by N. Chomsky in the late 1960s. It concerns the formation of independent *yes-no* (polar) interrogative clauses in English and originally boils down to the following claim: young English-speaking children acquire a particular kind of question-formation operation traditionally known as Subject-Auxiliary Inversion (SAI) for which there is no evidence in their linguistic input; they do so because UG contains a special 'structure-dependence' principle which guides children towards that acquisition. As will be argued, this classic example does not establish the validity of the APSs, nor, consequently, the existence of innate syntactic knowledge or UG. Quite typically, the 'logical problem' which this example is supposed to raise results from a certain conception of how interrogative clauses are formed in English and simply disappears when linguistic facts are analysed differently.

After giving a more detailed presentation of this classic example (§2), we will show that the linguistic input to young English-speaking children does actually contain data on the basis of which they might be able to learn how to form complex *yes-no* interrogatives (§3). Then, some recent developments in the presentation of the classic example of the APSs will be considered, especially Chomsky's abandonment of the structure-dependence principle and his new solution to the old problem (§4). In the final section (§5), some data coming from acquisition studies will be presented which suggest that young English-speaking children do not actually use a general question-formation operation such as SAI. We will argue that the data in question is more consistent with a constructional and usage-based account of *yes-no* interrogatives along the lines of Cognitive Grammar (Langacker 1987, 1990, 1991, 1999, 2008).

2. The classic example of the APSs: *Is the boy* (*who is smiling*) *happy*?

What may be called the classic example of the APSs – the 'parade case' (Crain 1994[1991]: 374) – was first presented by N. Chomsky in the late 1960s and has been mentioned in dozens of

publications since then.[1] The facts considered in this example are sentences such as (1) and (2), and the two possible question-formation rules shown in (3):

(1) a. The boy is happy.
b. Is the boy happy?

(2) a. The boy who is smiling is happy.
b. Is [the boy who is smiling] _ happy?
c. *Is [the boy who _ smiling] is happy?

(3) a. R1: 'move the first auxiliary of the declarative sentence in initial position'
b. R2: 'move the main auxiliary of the declarative sentence in front of the subject NP'

Given examples such as (1a-b), according to Chomsky (1975: 30-33), children might be expected to acquire an 'extremely simple' question-formation rule, which, leaving many details aside, may be formulated as (R_1). This rule, however, is incorrect: if it is applied to a declarative sentence such as (2a), in which the first auxiliary is in the subject NP, it yields the ungrammatical (2c). Yet, children 'never' make such mistakes according to Chomsky (1975: 31), a claim reasserted in Chomsky (2012: 10): 'It never happens in English or any other language that a child ever makes that kind of mistake. So something serious must be going on.' For Chomsky (1975), this shows that children acquire the 'far more complex' rule (R_2), a rule traditionally known as Subject-Auxiliary Inversion (SAI).[2] This second rule, unlike (R_1), is a 'structure-dependent' operation in that it makes reference to the hierarchical structure of the underlying declarative – its organisation into phrases – and not just to the linear order of its individual elements.

The poverty-of-stimulus 'problem', according to Chomsky (1975), is that children are *not* exposed to what he calls 'relevant evidence', i.e. questions such as (2b) which – alone, it seems – could disconfirm the supposedly simpler, structure-independent, rule (R_1). His solution is to posit that UG contains an innate structure-dependence (SD) principle which stipulates that *all* grammatical rules are structure-dependent. As a result, children might be guided towards the acquisition of SD rules such as (R_2) and ignore the possibility of purely linear, structure-independent, rules such as (R_1):

> 'The only reasonable conclusion is that UG contains the principle that all such [grammatical] rules must be structure-dependent. That is, the child's mind (specifically, its component LT(H,L) [i.e. Learning Theory for Human Language]) contains the instruction: Construct a structure-dependent rule, ignoring all structure-independent rules. The principle of structure dependence is not learned, but forms part of the conditions for language learning.' (Chomsky 1975: 32-33)

[1] E.g. Chomsky (2006[1968]: 54-55, 1971: 29-30, 1975: 30-33, 1988: 41 sq., 2012: 10), Chomsky in Piattelli-Palmarini (1980: 39-40, 113-5), Crain (1994[1991]: 374-75), Pinker (1994: 40-42), Radford (1997: 13-15), Laurence & Margolis (2001: 222-3), Legate & Yang (2002), Boeckx & Hornstein (2003), Berwick *et al*. (2011).
[2] Chomsky's (1975) 'Hypothesis 2' (corresponding to our rule R_2) is formulated in slightly different terms and the subject NP is called 'the first noun phrase' of the declarative sentence. In any case, H_2/R_2 are very simplified versions of the operation which is actually assumed by many generative grammarians (cf. §3).

3. Direct and indirect evidence in children's input

Despite its numerous mentions in the literature, the classic example of the APSs is surprisingly anything but a clear case of poverty of the stimulus. First, even assuming that the generative theory of question formation is psychologically real, which there is reason to doubt (cf. §5), this example is demonstrably *not* a case in which children may be said to attain knowledge of a grammatical operation for which there is 'no evidence' in their input. Secondly, the idea that children could not learn to produce questions like (2b) unless they were exposed to similar questions ('relevant evidence') is arguably simplistic, for it fails to take into account the indirect evidence for such structures which is contained in their input.

To begin with, it appears that questions like (2b) are indeed truly exceptional in the input to young children. MacWhinney (2004: 889) reports that he found only *one* question of that type in the whole CHILDES database, out of approximately 3M utterances addressed to English-speaking children. Such questions, he concludes, may be considered to be essentially unavailable to children younger than 5;0, although they might not be so uncommon in adult-directed language.[3] However, as also noted by Pullum & Scholz (2002), other kinds of sentence should presumably count as 'relevant evidence' for the question-formation operation which is actually posited by generative grammarians and which is not (R_2). A rule like (R_2), indeed, is clearly inadequate since it could not be used to derive *Do you work*? from *You work*, which does not contain an auxiliary. In generativist textbooks (e.g. Haegeman & Guéron 1999, Radford 2004, Freidin 2012), the subject-auxiliary inversion rule is in fact a sort of 'subject-inflection' inversion operation: what is fronted or raised is basically the inflectional head of the underlying declarative – the head of the Tense Phrase (TP), the former I(NFL)P. If the underlying declarative contains an auxiliary, then the (main) auxiliary and the finite inflection marker are merged in T and the resulting form is raised to Complementizer position ('T-to-C movement'). Otherwise, the inflectional head is raised on its own, but since it is a bound morpheme (or 'feature complex') it requires some appropriate host. The 'empty' auxiliary *do* is then supposedly inserted in the derivation and merged with it – 'a language specific rule of *do*-Support to avoid a violation of the No Free Affix Condition' (Freidin 2012: 169). This analysis applies to both *yes-no* questions (e.g. *Is he smiling*? / *Do you work for them*?) and 'non-subject' *wh*-questions (e.g. *Why is he smiling*? / *Who do you work for*?), which involve the additional raising of a *wh*-word to the position of CP 'specifier'. As a point of secondary importance, it might be noted that in recent generative works there is no longer any movement properly speaking. With the introduction of the so-called 'copy theory of movement', an element *x* does no longer literally move from one position to another, say, from position A to position B. Instead, *x* stays in position A but is copied in position B (via 'internal merge') and the original is afterwards 'deleted' in the phonological (PF) component, i.e. it is not phonetically realised.[4] This sequence of operations may be represented, in a simplified form, as (4a) > (4b) > (4c). When the

[3] Pullum & Scholz (2002) note that they found many questions like (2b) in a search of the Wall Street Journal database. Their search was too superficial for any definite conclusion to be drawn, but it minimally suggests that Chomsky's (1975: 32) claim that an English speaker 'may go through a considerable part of his life without ever facing relevant evidence', or again 'might go through much or all of his life without ever having been exposed to relevant evidence' (in Piattelli-Palmarini 1980: 40), was excessive, not to say simply false, perhaps even without taking into account sentences like (6), (7) and (8).

[4] 'Internal merge' consists in merging a composite syntactic object with part of itself, as opposed to 'external merge', which merges two distinct objects (cf. Chomsky 2004: 110). The mechanism behind the systematic deletion of the lower copy (or copies) in the PF component is currently unclear. Several scholars have argued that there might be a 'choice' about which copies are to be deleted (cf. Bošković & Nunes 2013).

underlying declarative does not contain an auxiliary, its inflectional head is similarly copied in C where it is merged with *do* after the *do*-insertion rule is applied.

(4) a. [CP [C __] [TP the boy Twas smiling]]
b. [CP [C was] [TP the boy Twas smiling]]
c. [CP [C was [TP the boy T~~was~~ smiling]]

For ease of exposition, we will keep referring to the question-formation operation posited by generative grammarians as the SAI rule or operation.[5] Terminological considerations aside, what matters here is that given the generative account(s) of question formation, the relevant evidence for the SAI rule should presumably include every sentence in which the main finite auxiliary AUX_F (including *be*-copula) precedes a subject SUBJ containing a finite verb-form which is *either* an auxiliary AUX_F *or* a plain lexical verb V_F. Hence, very schematically, a structure of the type (5a) or (5b):

(5) a. [. . . AUX_F [$_{SUBJ}$ . . . AUX_F . . .] . . .]
b. [. . . AUX_F [$_{SUBJ}$ . . . V_F . . .] . . .]

The relevant evidence for the SAI rule, then, should include, not only questions like (2b), but also sentences like (6), as well as (7) and possibly even (8):

(6) a. Are [those you mentioned] any better?
b. Can [a person who works] go on holiday?

(7) a. Where's [the little red duck that Nonna sent you]? (nina02)
b. Where are [the kitty cats that Frank sent you]? (nina03)
c. What is [the animal that says cockadoodledoo]? (nina04)
d. Where's [the little blue crib that was in the house before]? (nina05)

(8) a. Here's [a birthday card that Nonna sent to Nina]. (nina03)
b. Here's [the man who's driving the airplane]. (nina20)

Examples (7) and (8) were found in the 'Nina' corpus of the CHILDES database.[6] In other words, even if questions like (2b) are not available to young children, some of those other sentence types are. MacWhinney (2004: 890) notes that there are 'hundreds' of *wh*-questions similar to (7) in the CHILDES database and that they are 'highly frequent in the input to children [younger than 5;0]', which may be more questionable.[7] In any case, the proponents of

[5] Generative grammar is supposed to have evolved into a theory without transformational rules and, indeed, without rules (cf. Chomsky 1995). However, an independent *yes-no* interrogative is still basically described as a simple declarative structure which is transformed into a polar interrogative by means of certain formal operations. Generative grammarians such as Legate & Yang (2002) speak of an 'operation for question formation', but little is gained by replacing the word *rule* with *operation*, *mechanism*, *procedure*, etc., or the remarkably confusing *pairing* used by Berwick *et al*. (2011).

[6] The Nina corpus consists of transcripts of 52 hours of verbal interactions between Nina and her mother or other caregivers (cf. http://childes.psy.cmu.edu/browser/index.php?url=Eng-NA-MOR/Suppes). Nina was aged 1;11 for the first recording session and 3;3 for the last. The corpus contains 35,563 adult utterances representing 197,368 word tokens.

[7] 'Highly frequent' seems a bit excessive, but we found c. 20-25 similar *wh*-questions just in the Nina corpus. The exact number of supposedly 'relevant' *wh*-questions in that corpus is debatable, partly because

the APSs cannot keep claiming that in this example 'the child has no evidence at all' (Berwick & Chomsky 2016: 103).

As an alternative, Legate & Yang (2002) have argued that although there *is* direct evidence for the SAI operation in children's input, there is *not enough* of it. That is a different and much weaker claim, which requires demonstrating how much is (not) enough. Following a logic internal to generative grammar, Legate & Yang (2002) contend that for SAI to be learnable, the frequency of questions like (2b) or (7) in children's input should be close to that of *there*-existential sentences.[8] Needless to say, sentences such as *There's a problem* are much more frequent in children's (and adults') input than interrogative sentences whose subject NPs contain relative clauses. The authors conclude that 'the original APS$_{[S]}$ stands unchallenged' (*id*., p.159), but one begs to differ.

Taking a far more radical stance, other proponents of the APSs have insisted that the SAI operation simply *cannot* be learned, whatever the input: 'no amount of positive evidence, 'exotic' or not, would suffice,' according to Lasnik & Uriagereka (2002: 148). That third version of the argument, which has also been developed by other scholars, is partly based on the claim that question-formation operations other than (R_1) and (R_2)/SAI are theoretically possible, so that if children did infer SAI from their input, the latter should suffice to eliminate all conceivable operations but the 'right' one. In fact, some of the other operations or rules that have been proposed are clearly incompatible with children's input.[9] More importantly, however, such a strictly logical argumentation presupposes that children do acquire the SAI operation, while there is empirical evidence to the contrary which supports an alternative constructional account of question formation (cf. §5).

As a second point, the claim that children could not learn to produce questions like (2b) unless they were exposed to similarly formed questions is arguably simplistic. Part of the problem here is the notion of 'crucial' or 'relevant' evidence, which usually figures prominently in presentations of the APSs. What counts as relevant evidence may be rather straightforward when considering the acquisition of particular words or expressions, but it is far less obvious when considering more general grammatical phenomena. Chomsky's (1975) argumentation is quite typical in that it focuses on the absence of a very specific piece of *direct* evidence in children's input, but completely ignores the wealth of *indirect* evidence which is contained in that same input (cf. Reali & Christiansen 2005). For instance, the fact that even young children very rarely produce ungrammatical questions such as (2c) **Is the little boy who smiling is happy*? might be for reasons which are largely independent of the issue of question formation. It might be, for instance, because **the little boy who smiling* is itself ungrammatical, as are more generally sequences such as *who*/*that*/*which* + V_{NF} (where 'V_{NF}' stands for a non-finite verb-form), leaving aside cases such as *which*, *broken*, *would be useless*; or again because sequences such as **who* + vV-

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when the initial *wh*-word is *who* or *what* as in (7c) it is sometimes unclear whether it should be considered as subject or subject complement.

[8] Using data presented by Crain & Nakayama (1987), whose study is described in §5 below, Legate & Yang (2002) assume that children aged 3;2 know how to produce complex *yes-no* interrogatives such as (2b), which is quite debatable (cf. §5), and that they have acquired the SAI operation. Secondly, the authors assume that by about the same age children have learned that English is not a null-subject language on the basis of their exposition to *there*-sentences. For SAI to be learned in time, the authors claim, the frequency of questions like (2b) or (7) in the input to children under 3;2 should thus be close to that of *there*-sentences.

[9] For instance, 'Front the last auxiliary' (Legate & Yang 2002: 152-3) is disconfirmed by questions in which the verb's complement contains an auxiliary (or again simply a finite verb-form), e.g. *Are you saying that she won't come*?

ing + is never occur in their input. While children aged about 3 to 4 may have heard relatively few questions whose subject NPs contain relative clauses, they have been very largely exposed to various kinds of NP, including NPs containing relative clauses. At the same time, they have also heard thousands of questions exemplifying the auxiliary-subject-verb order with different kinds of NP in subject position.[10] In addition, by the age of 3-4, children have been largely exposed to pronominal 'substitutions', which are indifferent to whether or not the antecedent NP contains a relative clause, e.g. {*The picture* / *The picture that she gave you* / *The picture with the elephant*} *is very nice*, *isn't it*? *Where is it*? Such substitutions might further help children understand that complex NPs behave like simple ones. Those remarks are admittedly speculative but in recent years many studies have emphasized the importance of statistical learning in language acquisition (e.g. Saffran *et al*. 1996, Saffran 2001, Mintz 2006, Thiessen 2009, Romberg & Saffran 2010) and other domains (e.g. Kirkham *et al*. 2002). They have shown that children, even infants, are surprisingly good at extracting all kinds of patterns and distributional regularities from their linguistic input, notably transitional probabilities between adjacent or non-adjacent units. It seems reasonable to assume that those abilities might help children learn how to form *yes-no* interrogatives, 'including' those with complex subject NPs.

4. Recent developments and the abandonment of the SD principle

In recent years, Chomsky has proposed a new solution to the 'logical problem of language acquisition' raised by complex *yes-no* interrogatives in English (cf. Berwick *et al*. 2011, Chomsky 2012). In this new solution, the long-upheld claim that UG contains a structure-dependence principle is abandoned. It is claimed instead that the structures of the I-language are *hierarchically* but not also *linearly* organised. [11] As a result, linear grammatical operations such as (R_1) are presumably never considered by children. The linear organisation of linguistic expressions is presented as a mere by-product of their externalisation: 'linear order is simply not available to the operations of the I-language […] it is a secondary phenomenon imposed by the sensory motor system' (Chomsky 2012: 11).

This proposal comes as part of a larger attempt, within the framework of the Minimalist Program (Chomsky 1995), to minimise UG and 'reduce any language-specific innate endowment, ideally to a logical minimum' (Berwick *et al*. 2011: 1210). Chomsky, who used to describe UG as a 'very richly structured innate system' (Chomsky 1984: 429), now evokes a 'Strong Minimalist Thesis' according to which UG might be literally 'empty' (Chomsky 2004: 106). In order to minimise UG, Chomsky has tried to increase as much as possible the weight of a 'third factor' in language design (in addition to experience and genetic endowment, the two other factors), viz. 'language-independent principles of data processing, structural architecture, and computational efficiency' (Chomsky 2005: 9). In so doing, Chomsky is implicitly adopting part of the philosophy of (cognitive-)functional linguistics – 'minimalism is functionalism', as Golumbia (2008) ironically put it. However, Chomsky's linguistics remains radically formal, which makes the attempted 'trade-off' between genetic endowment and so-called third-factor principles seemingly impossible. The particular case of question formation in English – supposedly only one among 'innumerable' examples of stimulus poverty (Smith 2004: 39) – provides a good illustration of this dilemma.

[10] Questions are particularly numerous in child-directed speech. In the Nina corpus, for instance, there are 20,641 questions in the utterances addressed to Nina, i.e. more than half of the total number of adult utterances, but not all of them are interrogative clauses (e.g. *This is a book*? / *One rabbit*? / *Pink*?).

[11] This claim about the I-language was already made in Chomsky (1995: 334-5) but its explicit connection with the classic example of the APSs is more recent.

Firstly, the claim that the structures of the I-language are not linearly organised involves a theory of linearisation which raises serious problems. The basic idea behind that theory is that the linear order of a sentence might just be a projection of its hierarchical structure which is achieved by means of a mapping principle known as the 'Linear Correspondence Axiom' or LCA (Kayne 1994). The LCA states that an element α precedes (is spelt out before) an element β iff α 'asymmetrically c-commands' β, i.e. if α c-commands β and β does not c-command α.[12] However, there are many cases in which the LCA does not seem to be applicable. To give just one example, whenever a syntactic node only dominates lexical items, which seems bound to happen in every sentence, the mapping principle fails because neither of the lexical items asymmetrically c-commands the other. While this might be regarded as a fatal flaw in the theory, the general tendency so far has been instead to try to make facts fit with the theory. As discussed by Hornstein *et al*. (2005: 229), for instance, given a VP such as [VP [V *visit*] [N *Mary*]], one solution is to posit (i) that *Mary* is part of a null-headed DP, i.e. [VP [V *visit*] [DP [D ø] [N *Mary*]]], so that *visit* 'does' asymmetrically c-command *Mary*, and to further posit (ii) that the LCA ignores phonologically empty categories, so that *Mary* can be spelt out even though ø and *Mary* c-command each other. Similarly, [DP *the boy*] can be made compliant with the LCA if it is analysed as [DP [D *the*] [NP [? ø] [N *boy*]] (where '?' remains to be determined). As Hornstein *et al*. (*id*.) boldly put it, 'maybe phonetically empty functional heads exist because they allow syntactic objects to be linearized'. Beside multiplying zeros, another possibility is for one of the troublesome lexical items to move to some appropriate position, assuming that it originates in a position which is not its final surface position. Still another possibility, mentioned in a number of publications (e.g. Barrie 2011, Gelderen 2013), is that lexical items might 'self-merge' (Guimarães 2000): given [XP α β], in which α and β c-command each other, if β merges with itself so as to produce [XP α [β β']] for instance, then α now asymmetrically c-commands β. Having served its purpose, β' can afterwards be deleted.

When (psychological) plausibility is not a constraint, any hypothesis can be made to work provided that certain other hypotheses are made. Yet, it should be noted that none of the possibilities mentioned above actually say *anything* about how words or constituents should be ordered. It is still necessary, for instance, to somehow specify that verbs normally precede their complements in English but follow them in Japanese, and that they may either follow or precede them in many other languages depending on various factors, e.g. in German, whether the clause is independent or subordinate; in French, whether or not the object is a personal pronoun and the verb-form is in the indicative or the imperative mood. Similarly, it is still necessary to specify the general tendencies in the way noun-premodifiers are ordered in English (e.g. *a beautiful small white cat* / ?**a white small beautiful cat*), etc.

Secondly, while Chomsky (2012) abandons the claim that UG contains a structure-dependence principle, he introduces a 'third-factor' principle of *minimal structural distance* (MSD), which is presented as a 'natural law' of computation. Here again, however, this new principle cannot work without positing an additional and very dubious hypothesis. According to Chomsky (2012), one should try to explain why questions are formed by raising to C position the head of the TP rather than some other element, such as the head of the subject NP or some auxiliary

[12] A common definition of c-command is that α c-commands β iff (1) α does not dominate β; (2) β does not dominate α; (3) the first branching node dominating α also dominates β. Kayne (1994: 7) actually used a different definition of c-command, in which α c-commands β if the first node, rather than the first branching node, dominating α also dominates β. In addition, Kayne's proposal was based on X-bar theory but his LCA has been integrated into the new 'bare phrase structure' framework, which has required certain adaptations and raised new difficulties (cf. Song 2012: 119 *sq*.).

contained in the subject NP, etc.[13] The reason which is offered is that the head of the TP is *structurally closer* to C than the head of the subject NP, so that this movement is based on the principle of MSD. A non-trivial difficulty here is that structural distance is far less objective than linear distance. Structural distance is intrinsically dependent on the way sentence structure is represented, which has constantly and considerably evolved in the generative literature since the 1950s, especially with the introduction of X-bar theory and then with its recent replacement by bare phrase structure. In fact, the measurement of structural distance has become an almost impossible task with the multiplication of functional projections in recent years, many of which are not consensual even among generative grammarians. The most obvious problem, however, is that in a basic declarative clause the subject NP precedes the main auxiliary or verb-form (TP head) and is thus seemingly *closer* to C than the latter. To solve this problem, Chomsky is led to propose that the subject NP is not in its final surface position *when* the TP head is raised: the subject NP originates in the VP, where it is more distant from C than the TP head, and it is raised to its surface position *only after* the TP head is itself raised to C. In other words, Chomsky suggests resurrecting the so-called 'VP-internal subject hypothesis' which had been proposed in the 1980s 'but without very much evidence. However, this seems to give substantial evidence for it' (Chomsky 2012: 14-15).

To sum up, Chomsky's new 'minimalist' treatment of the classic example of stimulus poverty arguably raises more problems than it solves. Chomsky (1995, 2004, 2005) has repeatedly stressed that the MP is an attempt at replacing the artificial 'stipulations' of earlier models with new principled 'explanations', but this new account can hardly be considered to be any more principled than the previous one(s). The hypothesis of a language-specific structure-dependence principle written in the human genome may never have sounded very plausible and its abandonment is probably for the better. However, the new hypotheses about linear order and question formation can only be made to work if additional and largely *ad hoc* hypotheses are made. Besides, the new presentation does not eliminate what is perhaps the most fundamental problem: as we are going to see, children do not seem to acquire the kind of general operation which is characteristic of generative accounts of question formation.

5. A constructional and usage-based approach to *yes-no* interrogatives

The classic example of the APSs is entirely predicated on the assumption that English-speaking children acquire a general question-formation operation – SAI – and that they do so quite early on, e.g. by age 3;2 at the latest (cf. n.8). However, there is a rather large body of evidence from acquisition studies which undermines such hypotheses (cf. *infra*) and is more consistent with a constructional and usage-based account of *yes-no* interrogatives along the lines of Cognitive Grammar (cf. Langacker 1987, 1990, 1991, 1999, 2008).

In a nutshell, Cognitive Grammar ('CG') is a non-derivational model of language in which grammatical and lexical knowledge are both represented by conventional symbolic units of varying degrees of complexity, schematicity (abstraction), and psychological entrenchment. The units are linked by different kinds of relationship, thus forming vast and intricate networks. In particular, they may be connected by categorisation relationships such as 'elaboration', i.e. some units are instances of other, more schematic, units, which they 'elaborate'. For instance, *acceptable* is an instance of the unit [V-*able*], which may be noted [V-*able*] —> *acceptable*. Similarly,

[13] That is, of course, assuming that questions are formed that way. Why questions should be formed by raising anything to C position in the first place is not discussed. It may also be noted that Chomsky (2012) adopts the copy theory of movement (cf. §3).

give me a break is notably an instance of [*give* NP NP]. In CG, as Langacker (1999: 120) puts it, 'language acquisition […] in essence […] reduces to reinforcement of the commonality inherent in expressions that actually occur', which may be regarded as a form of statistical learning. Specific units such as *acceptable*, *give*, *give me a break*, *by the way*, *what's up*?, etc. arise through the same process of schematisation as more abstract units such as [V-*able*], [*give* NP NP], [V NP NP], [*by* NP], [PREP NP], etc. Such complex and more or less schematic units, called *constructional schemas*, represent 'grammatical' generalisations of different levels. Once learned, they function as templates for producing and interpreting new expressions of the same type, although they may also be extended to new uses.[14] The whole linguistic network – the 'internal language' – proposed by CG is thus thought to develop in an essentially 'bottom-up' fashion, with all units ultimately abstracted from actual utterances or 'usage events'.[15]

In such a model of language, the ability to produce and understand independent *yes-no* interrogative clauses is not represented by a general formal operation such as SAI, but by a relatively extended network of constructions, as tentatively pictured in Figure 1:

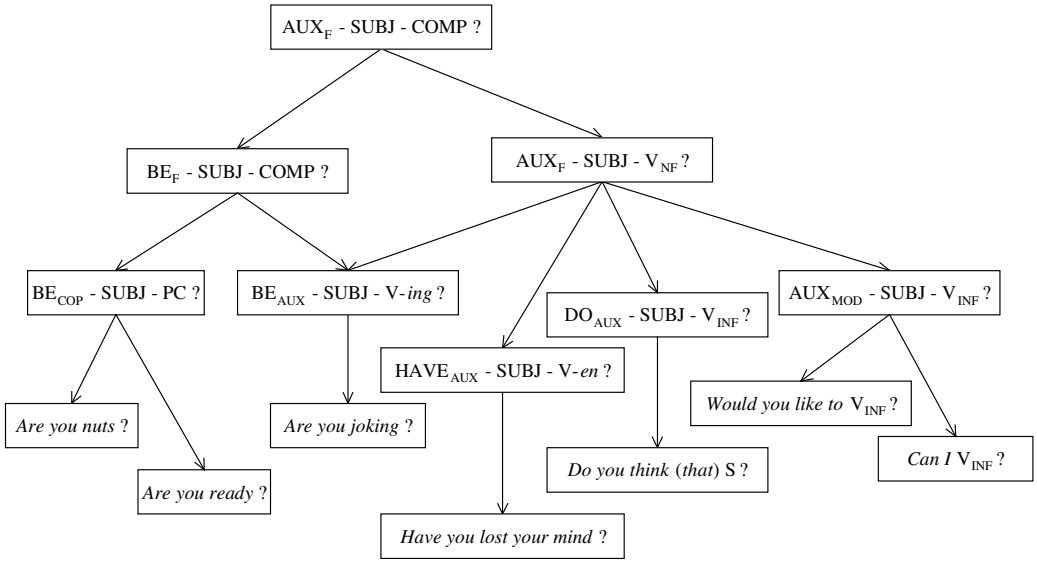

Figure 1

Figure 1 is a fragment of the network of symbolic units which might represent an adult native English speaker's knowledge of *yes-no* interrogatives. This figure, of course, is extremely rudimentary, incomplete, and necessarily erroneous in certain ways. It is understood that the full complexity, the great richness, and the essentially dynamic nature of linguistic knowledge cannot be represented by a few boxes and arrows. The solid arrows (of arbitrary length) represent relations of elaboration (Schema —> Instance), which are the only relations represented in Fig. 1. In addition, the semantic structures of the symbolic units shown in Fig. 1

[14] Considerable extensions might take place in the early phases of language development, leading to occasional overgeneralisation, but more modest extensions are constant in everyday speech and are probably only perceived (as 'anomalies') when a certain threshold is crossed. As Bloomfield (1933: 407) observed, 'one could say that every utterance of a speech form involves a minute semantic innovation'.

[15] In CG terminology, a usage event is 'the pairing of a vocalization, in all its specificity, with a conceptualization representing its full contextual understanding' (Langacker 1999: 99).

are not represented in any way. Going more or less from bottom to top, the units of this partial network range from (*a*) specific expressions which are recurrent enough to be memorised as units, e.g. [*Are you joking*?], [*Have you lost your mind*?]; to (*b*) low-level constructional schemas representing generalisations of a rather limited scope, e.g. [*Would you like to* VINF?] and [*Can I* VINF?]; and on to (*c*) higher-level schemas describing broader generalisations, e.g. [AUXMOD - SUBJ - VINF ?] and [AUXF - SUBJ - VNF ?]. At the very top of Fig. 1 is a hypothetical 'super-schema' [AUXF - SUBJ - COMP] of which all the other structures are instances, whether directly or indirectly.[16] However, the recognition of this, and other, very high-level schemas may not be necessary. Indeed, it seems quite possible that speakers mainly – perhaps only – use specific expressions and fairly low-level constructional schemas ('chunks', 'patterns', etc.).[17] At any rate, there is no guarantee that speakers internalise the most abstract constructions or rules that linguists may posit.

A constructional approach to *yes-no* interrogatives offers several advantages over the formal and derivational account which was described in §3. First, it eliminates the 'logical problem' of how children might acquire the SAI operation: in this approach, they simply don't. This may sound trivial but it underlines the extent to which the problem in question is dependent upon certain theoretical orientations. Secondly, this approach is more parsimonious: it does not posit underlying structures and invisible 'transformations', e.g. movements (or copy-paste-and-cut operations) potentially accompanied by the insertion of 'empty' *do*. Nor does it require positing innate syntactic (language-specific) knowledge, which is far from negligible for that is a strong genetic hypothesis for which there does not seem to be any serious evidence.[18] There is nothing 'unlearnable' in this approach: abstraction, association, categorization, are all general cognitive abilities, and the units that are abstracted might mostly reflect statistical regularities in speakers' input.

In a constructional and usage-based model of language such as the one considered here, children might start producing questions using only memorised chunks of language – specific expressions, set phrases or 'formulas' like *Whassat*? (cf. Dąbrowska 2000) and low-level schemas (*Can I…*?) – from which higher-level constructions might progressively be abstracted afterwards, leading to a richer and more structured representation of language. Such a scenario happens to be much more compatible than the competing generative account with the results of a number of empirical studies on language acquisition.

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[16] The simplified notation [AUXF - SUBJ - COMP ?] is intended to indicate that a finite auxiliary (AUXF) functioning as the grammatical head of the interrogative clause is followed by its subject and then by its complement, which is a non-finite verb-form (VNF), except in the case of the copula *be* (on the left), which may take a Predicative Complement (PC).

[17] In CG, units 'compete' for activation or use. One of the key factors that determine the activation of a unit is its 'cognitive distance' from the target which is to be linguistically encoded. As a general rule, the more schematic the unit, the greater the distance, for a highly schematic unit will share only few features with the target. In other words, fairly specific structures should generally prevail over very schematic ones. That is why, according to Langacker (1990: 285), 'for the most part, specific structures and low-level schemas are more important than high-level schemas expressing the most inclusive generalizations'. See also Dąbrowska (2006, 2008).

[18] In recent years, the hypothesis of innate syntactic knowledge of the kind which has been suggested by generative grammarians has been described as 'hardly plausible' ('très peu plausible', Rondal *et al*. 2000: 151), 'extremely unlikely' (Evans 2014: 106) or, more radically, as 'excluded' by neurobiological data (Lieberman 2003: 4). See also Dąbrowska (2004: 58 *sq*.). As noted in §4, Chomsky himself has become very reticent about positing such innate knowledge.

Studies on children's early multiword utterances tend to suggest that young children have only a very low-level, 'lexically-based' or 'item-based' knowledge of language. Rather unsurprisingly, young children do not seem to know the general syntactic categories and rules or operations that are often posited for adults (cf. Braine 1963, Tomasello 1992, 2000, 2003, 2011, Lieven *et al*. 1997, Dąbrowska 2000, Pine *et al*. 2013). The questions naturally produced by, or experimentally elicited from, young English-speaking children are quite revealing in that respect and the mistakes or errors made by children are particularly interesting.

To begin with, it appears that young children *do* occasionally make the kind of structure-dependence (SD) errors which, according to Chomsky (1975, 2012), they 'never' make. For many years, however, the experimental evidence on that matter was mostly limited to a study by Crain & Nakayama (1987, hereafter 'CN'), which seemed to confirm Chomsky's claim. Using a puppet named Jabba the Hutt, CN told their young subjects – 30 English-speaking children aged 3;2 to 5;11 (mean age 4;7) – to '*ask Jabba if* [S]', with [S] being one of six declarative sentences such as (9a) below:[19]

(9) a. The boy who is watching Mickey Mouse is happy.
b. Is the boy who is watching Mickey Mouse happy?
c. *Is the boy who watching Mickey Mouse is happy?
d. *Is the boy who is watching Mickey Mouse is happy?
e. *Is the boy who is watching Mickey Mouse, is he happy?

CN noted that none of their subjects produced ungrammatical *yes-no* interrogatives such as (2c), that is, in the case of test-sentence (9a), no questions like (9c). However, CN also noted that other errors were made, such as (9d), a case of 'auxiliary doubling' (cf. *infra*), and (9e), a 'restarting' error (CN, p.530). The 30 subjects of the experiment were organised into two age groups of 15 children: the younger children (G1), aged 3;2–4;7 (*M* = 4;3), and the older children (G2), aged 4;7–5;11 (*M* = 5;3). In the particular case of (9a), 47% of the questions produced by the children were ill-formed, with an error rate of 80% for G1 and 13% for G2. All in all, 40% of the children's questions were ungrammatical, with a general error rate of 62% for G1 and 20% for G2 (cf. CN, p.529). Thus, while CN's study seemed to confirm the claim that children do not make SD errors, it also showed that children under five have considerable difficulty producing (grammatical) polar interrogatives with relative clauses in their subject NPs.[20]

Since then, Ambridge, Rowland & Pine (2008, hereafter 'ARP') have provided evidence that children do sometimes make SD errors. Following a procedure similar to that of CN, ARP first tried to elicit singular and plural-subject versions of eight different '*can* … *can*' interrogatives from 22 English-speaking children aged 6;3–7;9 (*M* = 6;9), such as (10b) elicited on the basis of (10a):

[19] CN's study comprised three experiments, only the first of which is considered here. In that first expriment, the test-sentences were all of the type [[*The* N_{sg} *who/that is/was* X] *is* Y]. Examples included (9a) as well as *The dog that is sleeping is on the blue bench* and *The boy who was holding the plate is crying* (cf. CN, p.528).

[20] According to CN (p.529), the complexity of the target questions might explain many and perhaps most of the errors made by their subjects, especially the younger ones. While that may well be the case, claiming that these errors were 'failures in performance, not competence' (p.531) is obviously problematic and makes error rates meaningless (cf. also Ambridge *et al*. 2008: 245).

(10) a. Ask the dog if the boy who can run fast can jump high.
b. Can the boy who can run fast jump high?
c. *Can the boy that run fast can jump high?
d. *Can the bird that swim can fly?
e. *Can babies who crawl can walk?

ARP's subjects, who were older than CN's, all completed the 16 (8 x 2) trials, yielding a total of 352 trials, although some of those were not considered as valid responses and were afterwards excluded. Sixteen of the questions produced by the children were classified as SD errors by the authors, among which (10c-e). These errors represented a mean rate of 5% of all the children's responses and 8% of all their valid (i.e. non-excluded) responses according to ARP, who added that 'over a quarter of the participants made at least one such error' (p.233).

ARP afterwards carried out a second experiment with 33 younger children, aged 4;7 to 5;7 (*M* = 5;1) in which they tried to elicit complex polar interrogatives of the type [*Is*/*Are* [*the* N *that is*/*are* V-*ing*] ADJ?] such as (11a-b) below.[21] Leaving aside some details, ARP found about the same rate of SD errors in their second experiment, i.e. about 5% of all questions or 7% of all valid responses, with again more than a quarter of the subjects making at least one such error (*id*., p.239). Examples of SD errors (*id*., p.254-55) included utterances such as (11c-e):

(11) a. Is the cat that is chasing the mouse naughty?
b. Are the boys that are washing the elephant tired?
c. *Is the cat that chasing the mouse is naughty?
d. *Are the boys who washing the elephant are tired? [3 children]
e. *Are the cats that chasing the mice are naughty? [2 children]

While the results of ARP's experiments seem to demonstrate that children occasionally make SD errors, it might probably be argued that they do not clearly falsify the hypothesis that children acquire something like the SAI operation. However, there is much stronger evidence against SAI. It has been repeatedly observed that many children go through a stage during which they produce both well-formed and ill-formed questions, whether closed or open (cf. Stromswold 1990, Rowland & Pine 2000, Rowland *et al*. 2005, Ambridge *et al*. 2006, Rowland 2007). Several main types of error have been identified, including so-called 'non-inversion' errors (12a-a'), 'tense doubling' errors (12b-b') and 'auxiliary doubling' errors (12c-c'):[22]

(12) a. #She called him?[23]
a'. *Who she called?
b. *Who did she called?
b'. *Does she calls him?
c. *Who did(n't) she didn't call?
c'. *Did(n't) she didn't call him?

[21] The elicited questions were more precisely of the following types: [*Is* [*the* N_{sg} *that is* V-*ing the* N_{sg}] ADJ?], [*Is* [*the* N_{sg} *that is* V-*ing the* N_{pl}] ADJ?], [*Are* [*the* N_{pl} *that are* V-*ing the* N_{sg}] ADJ?], [*Are* [*the* N_{pl} *that are* V-*ing the* N_{sg}] ADJ?]. Four questions from each type, thus sixteen in all, were elicited from each subject, yielding a total of 528 responses, only 361 of which were finally considered as valid.

[22] While children make errors of commission, they also make errors of omission – in this case, auxiliary omission: e.g. **What she doing*? instead of *What is she doing*? (cf. Rowland *et al*. 2005).

[23] Sentence (a) is not ungrammatical but it may constitute a non-inversion error in an experimental setting in which *Did she call him*? was expected.

A remarkable fact about those errors is that they lack the general character which the use of a general question-formation operation would seem to make inevitable. Many studies have suggested (cf. Ambridge *et al*. 2006: 521-3 for a review) that errors in children's questions may predominantly, and sometimes only, involve certain auxiliaries (e.g. *do* vs. *be*), certain auxiliary forms (e.g. *are* vs. *is*), certain *wh*-words (e.g. *what* vs. *why*), or certain combinations of *wh*-words and auxiliary forms (e.g. *what is* vs. *what does*). As a more general tendency, errors have been found to be much more common in negative questions than in positive ones.

Ambridge *et al*. (2006) offered a striking illustration of the complexity of this phenomenon. The authors elicited 'non-subject' *wh*-questions (e.g. *Who/Why did she call*?) from 28 English-speaking children aged 3;6 to 4;6 (*M* = 4;1), using four different *wh*-words (*what, who, how, why*) and three auxiliaries (*be, do, can*) in both 3sg and 3pl forms or uses (*is/are, does/do, can/can*). Twenty-four questions were elicited from each participant, each question being a unique *wh*-word + auxiliary + number combination, e.g. *What is she drinking*? / *What are they drinking*? / *Who does she like*? / *What can they draw*? / *Why do they like the bear*? While this study was not about *yes-no* questions, it is relevant here since, from a generative perspective, non-subject *wh*-interrogatives involve the same movement operation (SAI) as *yes-no* interrogatives (cf. §3). One of Ambridge *et al*.'s interesting findings was that 'rates of non-inversion error were significantly different for different *wh*-word+auxiliary combinations, and did not pattern in any systematic way by *wh*-word, auxiliary or number alone' (p.538). For instance, non-inversion errors were, on the whole, found to be significantly more frequent with 3pl *do* than 3sg *does*, while no such discrepancy was found between 3sg and 3pl uses of *be* or *can*. However, the errors with 3pl *do* mostly occurred in *what*- and *who*-questions (i.e. *what do…*? and *who do…*?). In *why*- and *how*-questions instead the authors found slightly more errors with 3sg *does* than 3pl *do*.

Such complex patterns of error in the questions produced by four-year-olds seem to be fundamentally incompatible with the hypothesis that young children use a general question-formation operation such as SAI – especially so if the latter is supposed to be acquired by age 3;2 at the latest. At any rate, it seems quite clear that the SAI hypothesis does not account for those facts. By contrast, those same patterns of error are quite compatible with the kind of constructional and usage-based model of language which was briefly sketched above. A low-level schema such as [*what is…*?] might be fairly well entrenched in a young child's mind while another such as [*who do…*?] is (still) not. In that case, an elicited question such as *What is she drinking*? would predictably attract fewer errors than *Who do they like*?, since the first involves a well-known pattern while the second does not.

6. Conclusion

Despite certain assertions to the contrary, the classic example of the APSs, bearing on the acquisition of *yes-no* interrogatives in English, does not stand unchallenged. In fact, there seems to be little that still stands in this example.

First, there is the issue of the supposed 'poverty' of the stimulus itself. Young English-speaking children may not have access to *yes-no* interrogatives whose subject NPs contain relative clauses, but their linguistic input contains direct evidence of *wh*-questions and other 'inverted' structures with such complex subject NPs. So, even assuming that children need to be exposed to such structures to be able to produce similarly formed structures, it is not the case that they have 'no evidence at all'. Besides, children's input also contains what is probably a wealth of indirect evidence on the basis of which they might be able to deal with structures they have never encountered before. The notion of 'relevant' evidence should therefore be taken with

great caution when considering such general aspects of language acquisition as question formation.

Secondly, Chomsky's 'minimalist' proposals in recent years have had the strange effect of nullifying the whole argument. The poverty of the stimulus, in its 'strong' interpretation, was originally an argument *for* the existence of innate language-specific knowledge. However, it is now suggested that UG might be empty and there is admittedly little point in trying to demonstrate the existence of an empty UG. In addition, the Strong Minimalist Thesis makes it necessary to find new solutions to the old problems, but the results so far in this case are neither elegant nor convincing. The hypothesis of a structure-dependence principle written in human DNA may never have looked plausible, but neither do those which are now involved in Chomsky's new account of question formation.

Finally, the questions which are naturally produced by, or experimentally elicited from young children contain different very specific kinds of error which suggest that broad linguistic generalisations are not so easily made and, indeed, that children probably do not acquire a general question-formation operation such as SAI. The growing body of data coming from acquisition studies seems to be much more compatible with a constructional and usage-based model of language, whose plausibility is thus reinforced. Children might first learn specific expressions and low-level, partially specified, constructions or patterns before they progressively abstract higher-level schemas and develop a more structured, adult-like representation of language.

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