

Cognitive Prerequisites for the Development of Grammar

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Editors' note: The first section omitted from this paper (see page 241) lists references to publications on the acquisition of 40 different languages. The second omitted section (see page 244) draws on Hungarian and Serbo-Croatian data to argue for a developmental universal: "Post-verbal and post-nominal locative markers are acquired earlier than pre-verbal and pre-nominal locative markers." This example lays the groundwork for Slobin's Operating Principle A (page 244). Finally, in the third omitted section (page 246), Slobin presents five additional "Operating Principles."

Every normal human child constructs for himself the grammar of his native language. It is the task of developmental psycholinguistics to describe and attempt to explain the intricate phenomena which lie beneath this simple statement. These underlying phenomena are essentially cognitive. In order for the child to construct a grammar: (1) he must be able to cognize the physical and social events which are encoded in language, and (2) he must be able to process, organize, and store linguistic information. That is, the cognitive prerequisites for the development of grammar relate to both the *meanings* and the *forms* of utterances. This paper represents a preliminary attempt to explore these cognitive prerequisites in the light of cross-linguistic comparison of the ontogenesis of grammar.

The past decade in developmental psycholinguistics has brought a vast increase in our knowledge of how English-speaking children acquire their native language. The present decade promises to place those findings in broader perspective. Developmental psycholinguists are beginning to reach out to other language communities, in order to study children acquiring other native languages and in order to make contact with the findings of foreign colleagues. At the same time we are beginning to relate our work to the psychology of perceptual and cognitive development (see papers in Hayes, 1970). Developmental psycholinguistics is thus moving from particularism to universalism in two significant ways: from the particularism of English to the acquisition of language in

general, and from the particularism of linguistic development to cognitive development in general. We are just beginning to sense the intimate relations between linguistic universals and cognitive universals, and are far from an adequate developmental theory of either.

The psychology of cognitive development promises an eventual universal theory of the growth of the mind (see, for example, papers in Mussen, 1970). The psycholinguistic aspects of this theory will require detailed information on the acquisition of a variety of native languages. The value of cross-linguistic comparison, of course, is to avoid drawing conclusions about child language development which may, in fact, be limited to the acquisition of languages like English. The hope is to find similar developmental processes in different sorts of languages.

Language-definitional Universals

In order to begin at this point, therefore, it is necessary to take as given what may be referred to as "language-definitional" universals. That is to say, children (and adults) everywhere have the same general definition of the form and function of language. Everywhere language consists of utterances performing a universal set of communicative functions (such as asserting, denying, requesting, ordering, and so forth), expressing a universal set of underlying semantic relations, and using a universal set of formal means (such as combinable units of meaning, made up of combinable units of sound, etc.). Furthermore, language – everywhere – is grammatical, in the sense that the meaning of a message is not fully determined by any combination of the meanings of its elements. In all language which I will consider – child and adult – there is a non-direct relation between the surface, acoustic form of messages and their underlying meanings. It is in no way surprising that children should define language in the same way as adults: indeed, they could not learn language if they did not share this definition. In fact, one could argue that human language could not be so defined if it were not so defined by children, because, in a profound sense, language is created anew by children in each generation. Language-definitional universals are what David McNeill calls "strong linguistic universals," and I follow his proposition that such universals reflect "a specific linguistic ability and may not be a reflection of a cognitive ability at all" (1970, p. 74). While much argument has centered on the issue as to whether language-definitional universals are innate, I will avoid this issue here, and merely point to them as basic linguistic capacities which are prerequisites to the questions which I want to consider (cf. Bever's "basic linguistic capacities" [1970]). We will meet the child at the point when he knows there are meaningful words which can be combined to produce meaningful utterances. And at this point we will pose the question advanced above: Are there common orders of acquisition of different linguistic features across languages?

Content and Form in Child Speech

The first and most obvious point that comes to mind is that language is used to express the child's cognitions of his environment – physical and social – and so a child cannot

begin to use a given linguistic form meaningfully until he is able to understand what it means. It should be possible, then, to rank linguistic forms in terms of the psychological, or cognitive complexity of the notions they express. For example, no one would expect a child to be able to form conditionals before he could make assertions, to make statements about time before making statements about place, and so on. Is it possible, then, to trace out a universal course of linguistic development on the basis of what we know about the universal course of cognitive development? (Can one take Piaget as a handbook of psycholinguistic development?)

In fact, many such expectations (including those suggested above) are supported by data. The earliest grammatical markers to appear in child speech seem to express the most basic notions available to the child mind. For example, in languages which provide a vocative inflection, this is typically one of the earliest grammatical markers to emerge in child speech (Hungarian, Serbo-Croatian [Miktès, 1967; Mikeš and Vlahović, 1966]; Polish [Shugar, 1971]). One of the earliest semantic relations to be formally marked in child speech is that of verb-object. In order languages, like English, this relation is marked early by consistent word order. In languages which provide an inflection for marking the object of action (accusative), this is typically an extremely early inflection to emerge – often the first (Finnish [Argoff, 1976], Latvian [Rūķe-Draviņa, 1959, 1963], Russian [Gvozdev, 1949; Imedadze, 1960]). In Luo the first inflections are subject and object affixes on verbs (Blount, 1969). In every language for which relevant data are available, there is an early form of negation in which a negative particle is affixed to a simple sentence. In languages as diverse as English, Arabic, Czech, Latvian, Japanese, and Samoan, early yes-no questions are formed by rising intonation.

Numerous findings such as these offer support for the notion that the first linguistic forms to appear in child speech will be those which express meanings consistent with the child's level of cognitive development. But striking surprises occur in some languages. For example, yes-no questions in adult Finnish are not formed by rising intonation, but by attachment of a question particle to the word questioned and movement of that word to the front of the sentence. And, strangely enough, Melissa Bowerman, in her recent dissertation on Finnish acquisition (1973), reports that little Finnish children simply do not ask yes-no questions – at least not in any formally marked way. And Margaret Omar, in a recent dissertation on the acquisition of Egyptian Arabic (1973), reports that the noun plural “is the most difficult and latest aspect of the language structure to be mastered; older children in this study erred in pluralizing even familiar nouns.” And older children, in her study, meant children as old as 15! The reason apparently lies in the extreme complexity of plural marking in Arabic. Briefly: there is a small class of regular plurals, but most nouns fall into a large number of fairly irregular classes in regard to plural formation. There is also a special dual form; a distinction between pluralizing “counted” and “collected” nouns (for example, “trees” as a group, or “trees” as a collection of individual trees); what is more, the numerals 3–10 take the noun in the plural, while numerals above 11 take the singular.

So although one can talk about order of acquisition in terms of semantic or cognitive complexity, there is clearly a point at which formal linguistic complexity also plays a role. I think we can learn a good deal from discovering just what constitutes formal linguistic complexity for the child. If we can order linguistic devices in terms of their acquisition complexity, we can begin to understand the strategies used by the child in

arriving at the grammar of his language. To put it the other way, a definition of what is simple for a child to acquire is a definition of the child's first guess as to the nature of language. The child must successively modify such first guesses until he ends up with the conception of language shared by the adults in his community.

Studies of bilingual children yield valuable suggestions as to what sorts of formal devices may be simpler to acquire than others. If a given meaning receives expression at the same time in both languages of a bilingual child, this suggests that the formal devices in the two languages are similar in complexity. For example, Imedadze (1960), studying the linguistic development of her Russian-Georgian bilingual daughter, noted the simultaneous emergence of the genitive and the instrumental in both languages. She concludes that: "The ease of acquisition and the simultaneous appearance of these forms of the genitive and instrumental cases can only be attributed to the fact that these forms express the very same semantic relationships in analogous fashion [in Russian and Georgian]."

If a given semantic domain receives expression earlier in one of the two languages, a difference in formal complexity is suggested. A useful example comes from studies by Melanie Mikeš and Plemenka Vlahović of Serbo-Croatian-Hungarian bilingual children in Northern Yugoslavia (Mikeš, 1967; Mikeš and Vlahović, 1966). Well before they were two years of age, two bilingual girls were productively and appropriately using a variety of Hungarian case endings on nouns indicating such locative relations as illative, elative, sublative, and superessive – that is, in plain English, the children were using inflections to express the directional notions of "into," "out of," and "onto," and the positional notion of "on top of." At the same time they had barely begun to develop locative expressions in Serbo-Croatian, which requires a locative preposition before the noun along with some case inflection attached to the end of the noun.

Now, the fact that this cross-linguistic discrepancy occurs *within* a single child speaking both languages, rather than between two monolingual children, poses a central question in clear focus: When the child speaks Hungarian, she appropriately uses directional and positional locative inflections, and one is confident to credit her with the semantic intentions to express such notions as "into," "onto," and so forth. What are we to say of the same child, however, when she fails to grammatically signal such intentions with the corresponding prepositions when speaking Serbo-Croatian? It seems clear to me that if, for example, she puts a doll into a drawer, saying, in Serbo-Croatian, "doll drawer," we must credit her with the same semantic intention as when, describing the same situation in Hungarian, she adds an illative inflection to the word for "drawer."

The point I am trying to make, of course, does not depend on the child's bilingualism. The example merely illuminates the general proposition that a child's underlying semantic intentions can contain more information than his surface utterance. The speech of very young children is nearly always interpretable in context, and the very young child is neither able nor feels constrained to express his total intention in a single utterance. Lois Bloom (1970) has made this point abundantly clear in her recent book describing early grammatical development in three American children. For example, a child said "Mommy sock" in two different situations: when mommy was putting a sock on her, and when she picked up mommy's sock. Bloom is confident in labeling the utterance in the first situation as "subject-object," and the second as "genitive," and I think she is right. Previous descriptions of children's grammar were too bound to surface

characterizations of word distribution, and failed to differentiate between the several meanings of homonymous utterances, such as "Mommy sock" (e.g., Braine, 1963b; Brown and Fraser, 1963; Miller and Ervin, 1964). More recent approaches to child language (and to linguistic theory) pay increasing attention to the semantic substratum of speech, and to the functions of utterances (e.g., Antinucci and Parisi, 0000; Bloom, 1970; Blount, 1969; Bowerman, 1970; Brown, 1973; E. Clark, 1970, 1971; H. Clark, 1970; Cromer, 1968; Ervin-Tripp, 1970a,b, 1971; Kernan, 1969; Parisi and Antinucci, 1970; Schlesinger, 1971; Slobin, 1970; Talmy, 1970).

To sum up thus far: Cognitive development and linguistic development do not run off in unison. The child must find linguistic means to express his intentions. The means can be easily accessible (as, for example, the Hungarian locative), or quite unaccessible (as, for example, the Finnish yes-no question or the Arabic noun plural). The problem is: What makes a given linguistic means of expression more or less accessible to the child?

In posing the question in these terms, I am assuming that there is a fairly autonomous development of intentions to express various semantic notions. This claim must be defended before answering the questions of relative accessibility of formal linguistic devices, for one may be tempted to pose the counterargument that grammar plays a leading role in cognitive development. . . .

Phrased roughly, one can say that the following is one of the basic "self-instructions" for language acquisition:

OPERATING PRINCIPLE A: Pay attention to the ends of words.

We have seen this operating principle reflected in data on word imitation and in the acquisition of locative expressions. It is also evident in the acquisition of other inflectional systems. For example, accusative and dative inflections are very early acquisitions in inflected languages like Russian, Polish, Serbo-Croatian, Latvian, Finnish, Hungarian, and Turkish – where they are realized as noun suffixes. But these inflections are relatively late in the acquisition of German (Stern and Stern, 1907), where they are realized as forms of pre-nominal articles. English articles are also lacking at early stages of development. It is not the semantic nature of articles which accounts for the omissions in German and English, because the Bulgarian article, which is a noun suffix, appears early in child speech (Gheorgov, 1908). Apparently Operating Principle A is at work here as well, making it relatively difficult for the child to detect German inflections. The principle also accounts for the finding (Grégoire, 1937) that the first negative element in early French speech is *pas* – the final member of the separated pair *ne . . . pas*.

All of these findings taken together suggest a general developmental universal, based on the supposition that Operating Principle A is one of the first operating principles employed in the ontogenesis of grammar:

Universal A1: For any given semantic notion, grammatical realizations in the form of suffixes or postpositions will be acquired earlier than realizations in the form of prefixes or prepositions.¹

In order for this universal to be manifested, a number of language-definitional universals must be taken for granted (e.g. that there are words, that the meaningful unit is

smaller than the word, that sounds can express grammatical relations as well as make reference, and so on). In addition, the emergence of inflections requires at least one other basic operating principle:

OPERATING PRINCIPLE B: The phonological forms of words can be systematically modified.

Numerous observers have reported a period of playful modification of words which precedes the emergence of inflections. Werner and Kaplan, reviewing the European diary literature, note (1963, p. 155):

there are some indications reported in the literature which suggest that long before the child grasps the role of form-changes as grammatical devices, he grasps the fact that forms of vocables may be modified to express some qualification of, or affective reaction to an event.

They cite many examples of playful reduplication, suffixing, and so forth. In languages which provide inflectional diminutive or affectionate forms, such inflections are among the first to emerge. Shugar (1971), for example, cites early Polish diminutives for names (e.g., *tatunia* [= *tata* "father"] and *mamunia* [= *mama*]) and for other words (e.g., *śliweczka* [= *śliwka* "plum"] and *jabluszcza* [= *jablko* "apple"]). Pačesová (1968, p. 216) gives remarkable examples from the early speech of a Czech boy who inserted extra syllables into adjectives in order to intensify their meanings. For example, the child had the following series for the adjective *veliký* "big": [velikej] – [velika:nskej] – [velikana:nskej] – [velikanana:nskej]; and *malý* "little" was changed to: [malí:] – [malijki:] – [malinejki:] – [malililinejki:].

Children frequently experiment with the forms of words before they discover the meanings of particular formal changes. For example, Rūķe-Draviņa (1959) gives numerous examples of the early noncomprehending use of linguistic forms in Latvian: –

The inflections *-a/-e* (nominative) and *-u/-i* (accusative) are used in free variation as alternative pronunciations of nouns at age 1; 6, not being differentiated for the two case meanings until 1;8.

The plural ending is occasionally attached to nouns referring to singular objects before the acquisition of the pluralization rule.

Masculine and feminine adjectives are first used indiscriminately, ignoring the gender of the associated noun.

In all of these Latvian examples the form in adult speech is salient (according to Operating Principle A) and is fairly regular. A similar example is the English plural, which sometimes appears in early child speech as an alternative pronunciation of nouns.²

Operating Principles A and B present part of an explanation for the relative ease of acquisition of Hungarian locative inflections: the inflections are presumably perceptually salient, and the child is presumably prepared to manipulate the forms of word

endings in his production. These principles both relate to ongoing speech processing – the deployment of attention in speech perception and the production of grammatical markers in speaking, although they also have implications for the kinds of linguistic rules which will be formed. Another set of determinants of ease of acquisition has to do more directly with rule organization factors – both simplicity and consistency of rules from a formal point of view, and semantic consistency. In the Hungarian system the locative marker is directly bound to the noun, while in the Serbo-Croatian system it is divided between a pre-nominal preposition and an inflection. In addition, the choice of formal markers for locative expression is semantically consistent and non-arbitrary in Hungarian, but is much less principled and orderly in Serbo-Croatian. A full answer to the question posed in our test case, therefore, will require operating principles for rule formation as well as for language processing. Principles of this sort will be advanced later in the paper, in connection with broader ranges of data. The test case has played its role in demonstrating the types of cognitive prerequisites to grammatical development which can be revealed by the method outlined above.

Broadly speaking, there are three classes of such prerequisites: (1) those related to the underlying semantics of utterances, (2) those related to the perception and production of speech under short-term constraints, and (3) those related to the organization and storage of linguistic rules.³ The first class of prerequisites falls within the domain of the general psychology of cognitive development; the remaining prerequisites must be elaborated by developmental psycholinguistics. These are essentially *language processing variables* which can be conceptualized in terms of *operating principles* such as those proposed above. A number of such operating principles, and the predicted developmental universals which flow from them, will be proposed in the last section of this paper. Such operating principles guide the child in developing strategies for the production and interpretation of speech and for the construction of linguistic rule systems. The operating principles function within a framework of constraints on linguistic performance. These constraints must be considered before enumerating specific operating principles in more detail.

Conclusion

What has been sketched out on the preceding pages is only an outline of what some day may evolve into a model of the order of acquisition of linguistic structures. It has several major components, all of which must be elaborated. The first component, I have argued, is the development of semantic intentions, stemming from general cognitive development. The child, equipped with an inherent definition of the general structure and function of language, goes about finding means for the expression of those intentions by actively attempting to understand speech. That is to say, he must have preliminary internal structures for the assimilation of both linguistic and non-linguistic input. He scans linguistic input to discover meaning, guided by certain ideas about language, by general cognitive-perceptual strategies, and by processing limitations imposed by the constraints of operative memory. As in all of cognitive development, this acquisition process involves the assimilation of information to existing structures, and the accommodation of those structures to new input. The speech perception strategies engender the formation

of rules for speech production. Inner linguistic structures change with age as computation and storage space increase, as increasing understanding of linguistic intentions leads the child into realms of new formal complexity, and as internal structures are interrelated and re-organized in accordance with general principles of cognitive organization. All of these factors are cognitive prerequisites for the development of grammar. While we can disagree about the extent to which this process of developing grammars requires a richly detailed innate language faculty, there can be no doubt that the process requires a richly structured and active child mind.

Notes

- 1 Greenberg (1957) presents a closely related argument in terms of the psycholinguistic bases of linguistic change. He explores Sapir's observation, corroborated by his own experience, "that prefixing is far less frequent than suffixing in the languages of the world" (p. 89). Greenberg adduces a number of possible psychological causes for a regular historical development away from prefixes to suffixes and finally to isolating linguistic systems. Greenberg examines this phenomenon as an example of the role of psychological factors in language change. The suggestions made here about attention to suffixes in child language development provide an important link to his chain of reasoning. (Of course, additional sorts of psycholinguistic factors will have to be introduced to account for development of an isolating language into either a prefixing or a suffixing one. In consonance with the present argument, however, Greenberg notes that the latter course of historical development is more frequent [p. 93].)
- 2 It should be noted that there are considerable individual differences between children in their propensity to play with form when not expressing meaning. For example, of the two girls studied by Roger Brown, Eve had a period of free variation of singular and plural forms, whereas Sarah did not use the plural inflection until she could use it correctly. The problem of individual differences between children in their approaches to language acquisition has not been addressed frequently in developmental psycholinguistics, but is obviously of great importance – especially in light of the typically small samples required by longitudinal research methods. Wick Miller (1964a) has made a valuable observation in this regard:

There are individual differences in grammatical development . . . some children are more prone to invent their own grammatical patterns, patterns that have no relationship to adult patterns. The early grammatical rules for some are limited and quite regular, and for other children they are more variable and more difficult to define. Some children are quite willing to speak at almost any time, whether or not they have the appropriate grammatical structures at hand to express their thoughts, whereas others are more reserved in this regard, and will avoid talking at all, or will use a clumsy circumlocution. . . . I am inclined to think that the variations that are closely tied to formal features of language reflect innate individual differences.

- 3 Cf. the distinction made by Braine (1971) in his recently-proposed "discovery-procedures" model of language acquisition between (1) concept learning, (2) the scanner, and (3) the memory component. The operating principles proposed here are aimed at specifying some of the properties to which the scanner is sensitive and some of the organizational features of the memory. In addition, Braine's model posits a preferential order or hierarchy among the properties noticed by the scanner. The property hierarchy (cf. Chomsky's "simplicity metric") for a given language would result from the application of the operating principles (e.g., the suggested preference for word-final markers), as well as a possible preferential order of application of some operating principles.

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