

CHAPTER SEVEN

DISCUSSION SUMMARY-DEVELOPMENT OF CONCEPTS UNDERLYING LANGUAGE¹

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Until about 6 years ago, studies of the child's acquisition of syntactic knowledge focused primarily on formally defined categories and relationships. Only recently have the cognitive bases for the development of language begun to be extensively explored. In considering the old but still challenging problem of the causal relationship between linguistic and cognitive development, recent investigators of language acquisition have tended to stress the primacy of cognitive growth (e.g., Antinucci and Parisi, 1973; Bloom, 1970, 1973; Bowerman, 1973a, b; Brown, 1973; Schlesinger, 1971; Sinclair-de Zwart, 1969, 1971, 1973a,b; Slobin, 1973). For example, Slobin (1973, p. 184) has postulated that "the pacesetter in linguistic growth is the child's cognitive growth, as opposed to an autonomous linguistic development which can then reflect back on cognition."

The current emphasis on cognition and the postulation of some specific ways in which cognition and language are related allows a cautiously optimistic answer to the question, posed in this conference by Menyuk, of whether there may be "prerequisites to the teaching of language" to retarded and language-delayed children "which would help the learning of language when you got there."

The following discussion is organized around five major themes which figure prominently in recent literature on the relationship between linguistic and cognitive development and which were dealt with in this section of the conference. The contributions of the Clark, Schlesinger, and Morehead papers, the discussions they engendered, related materials, and implications for intervention are presented within this framework. The first three topics to be considered are related in that they all derive from the postulate that language is deeply rooted in more general cognitive abilities and from its corollary that an adequate explanation of language acquisition must take into

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account the development of the relevant cognitive structures and processes in the child. Briefly, the topics are:

1. The hypothesis that language is only one manifestation of a very general ability to represent or symbolize experiences which may not be perceptually present.
2. The hypothesis that for given linguistic structures or operations there are analogous or formally equivalent nonlinguistic structures and operations, and that it is the achievement of the more general cognitive skills which makes acquisition of those aspects of language possible.
3. The hypothesis that children use consistent or rule-governed strategies in processing language to arrive at the relationship between meanings and the linguistic structures by which meanings are expressed, and that these strategies may in many instances derive from the child's nonlinguistic interactions with and understanding of the world.
4. Attempts to determine what concepts, categories, and relational or structural meanings are functional or "psychologically real" in children's early linguistic rule systems.
5. How the relationship between language and cognition should be handled in giving formal representation to children's knowledge of linguistic structure.

LANGUAGE AS A MANIFESTATION OF THE SYMBOLIC FUNCTION

Much of the recent interest in the cognitive underpinnings of language can be attributed to the "discovery" of Piaget by developmental psycholinguists, who are increasingly appreciating the implications of his work for a theory of language development. Thus, many of the ideas discussed in this paper either can be directly traced to his theories, or are in large measure compatible with his views on linguistic and cognitive development.

In their paper, Morehead and Morehead outline Piaget's view of language development as closely linked to the emergence of the symbolic function in the child's development. This refers to the ability to make something stand for or represent an object or event which may not be perceptually present. The symbolic function is manifested not only in language but also in several other behaviors or processes which begin to appear at about the same time, such as deferred imitation, symbolic play, drawing, mental imagery, and gestures.

The ability to represent one thing with another can be regarded as one of the most fundamental cognitive prerequisites for language acquisition. A child who has trouble with the basic process of symbolizing must inevitably experience difficulties with language. Several studies have indeed indicated that the problems of at least some language-delayed children can be related to a general deficiency in representational ability (e.g., Morehead and Ingram, 1973). In particular, some children with language difficulties were found to

do poorly in tasks involving imagery, while their basic intellectual or logical development appeared adequate (Inhelder, 1966; Ajuriaguerra, 1966).

In discussion, Morehead observed that when one views language development as rooted in a general representational ability, one is led to the investigation of methods for the diagnosis and treatment of language delay which focus not on the child's language ability itself but upon related abilities such as symbolic play and imagery. In this connection, he noted that many children with little or no speech seem unable to play symbolically; they are unwilling to substitute one play item for another, *e.g.*, a shoebox for a doll bed (see Morehead, 1972). One such child, an autistic boy, was given training strictly on symbolic play. At the same time that he began to use objects symbolically to represent cars, he began to use the word "car," previously restricted to a single toy, to refer to a variety of carlike objects.

According to Piaget, the symbolic function does not appear suddenly in final form but rather builds gradually upon the achievements of the sensorimotor period. In view of this, it would be important to investigate a language-deficient child's level of functioning with regard to possible preconditions for the acquisition of the representational ability. Mehrabian and Williams (1971) have developed a cognitive developmental scale designed to allow one to identify and assess the preverbal skills most directly related to representation, such as the concept of object permanence, the ability to imitate actions, etc. As Morehead and Morehead note in their paper, such tests can aid in determining, for a particular child, where to enter into the development sequence leading to the symbolic function in order to help the child reach this goal.

FORMAL SIMILARITIES BETWEEN COGNITIVE AND LINGUISTIC STRUCTURES AND PROCESSES

The development of the symbolic function, or the ability to symbolize, is an important precondition for the acquisition of language, but this general cognitive ability cannot in itself account for the structure of language or for how language is acquired. In this section and the next, some efforts to specify more closely the cognitive structures and processes involved in the "what" and "how" of language acquisition are investigated.

Clark's proposals about the existence of cognitive strategies for acquiring language touched off much discussion among conference participants, with the debate focusing primarily on the method by which children acquire language and how it can be investigated. However, Clark (1973), along with several other investigators of child language, has argued that there is a close relationship between what is learned—the structure of language—and the way in which it is acquired. What follows in this section is a consideration of the possibility that the formal structure of language is ultimately derived from

more basic cognitive structures and processes. It is provided to put the subsequent discussion of cognitive strategies for acquiring language into a broader perspective.

The possibility that the structural characteristics of language can be traced to the characteristics of more fundamental cognitive abilities is an intriguing one. Lenneberg (1971) has recently argued that "man's language ability is due to a more general, deep-seated cognitive ability characteristic of the species," which also underlies mathematical ability. The basic elements common to both language and mathematics are processes of *relating*; these processes combine into integrated systems. Piaget approaches the problem from a different perspective, but has come to a similar conclusion. According to Sinclair-de Zwart (1973a), who summarizes his position, Piaget believes that during the first 2 years of life children establish "very general cognitive structures composed of systems of actions." These constitute the basis for many different types of more specific cognitive structures like those which underlie both logicomathematical thinking and ideas about aspects of the physical world such as force, movement, time, and causality. Thus, "there are links between knowledge in one field and that in another." Piaget has suggested that linguistic structures themselves "may well be yet another symptom of the very general universal cognitive structures" (Ferreiro, 1970, quoted in Sinclair-de Zwart, 1973a).

Although little is yet known about the nature of these hypothesized deepest and most basic cognitive structures, there have been some proposals concerning the relationship between language and better understood aspects of cognition such as the practical intelligence acquired during the sensorimotor period. For example, as Schlesinger notes in his paper for this conference, Sinclair-de Zwart (1971) has argued that certain abilities which are achieved by the end of the sensorimotor period are reflected in Chomskian deep structures. The ability to order temporally and spatially corresponds to the concatenation of deep structure elements; the ability to classify in action by using a whole category of objects for the same action schema or a whole category of action schemas for the same object corresponds to syntactic categories like noun-phrase and verb-phrase; the ability to embed action patterns into each other corresponds to recursive rules for sentence embedding in deep structure; the ability to apprehend relations among objects and actions corresponds to basic grammatical relations; the child's first concept of invariance, that objects have continuing existence across a variety of perceptual conditions, corresponds to the concept of deep structures which preserve meaning despite the application of transformational operations which can result in surface structures which are superficially unlike each other.

There exists a small amount of experimental evidence for the cognitive foundations of particular linguistic structures. For example, Sinclair-de Zwart (1969) found that the far-reaching cognitive restructuring which takes place

with the establishment of the first concrete operations (e.g., conservation of liquids and seriation) is paralleled by striking linguistic developments in the use of certain lexical items and syntactic structures. (She also presented evidence that the cognitive advances are not caused by the linguistic developments.)

In an experimental study, Greenfield, Nelson, and Saltzman (1972) explicitly explored Piaget's hypothesis that there is a "general isomorphism between language and other forms of cognition" by looking for a direct formal parallel between action and grammar. They found three distinct strategies for making constructions with nesting cups which seem formally similar to certain grammatical structures. Moreover, the cup strategies and the acquisition of the grammatical structures are developmentally ordered in the same way. For example, the ability to treat a single cup as an acted upon object and then as an actor in the same structure is acquired later than the ability to make multicup constructions in which each cup plays a single role, just as the ability to form relative clauses in which a single noun phrase functions in dual grammatical roles as both object and subject follows the ability to use "and" to coordinate sentences or noun phrases within sentences. The authors do not view the cup strategies as causing the corresponding linguistic capacities or *vice versa*, but rather view both as "behavioral manifestations of underlying internal forms of organization which may have many other concrete applications as well."

Working outside a Piagetian framework, H. Clark (1973) has argued that there is a formal parallel between linguistic and cognitive structures in another domain, one which is directly relevant to E. Clark's (this volume) proposal that children use cognitively based strategies in hypothesizing about the meaning of spatial terms (e.g., dimensional adjectives and locative prepositions). According to H. Clark's analysis, the properties of spatial terms in English and probably all languages correspond directly to man's nonlinguistic structuring of the space around him. More specifically, man's biological endowment, including in particular his perceptual apparatus, leads him to develop a particular kind of "perceptual space" which is characterized by (among other things) a concept of man's canonical or normal position, three reference planes, and several associated directions which have naturally definable positive or negative values: 1) a plane at ground level with upward positive; 2) a vertical left-to-right plane through the body with forward from the body positive; 3) a vertical front-to-back plane with leftward and rightward both positive. H. Clark argues that these properties of the nonlinguistic structuring of perceptual space coincide exactly with the properties of English spatial terms. He hypothesizes that the child acquires spatial terms by learning how to apply them to his prior understanding of perceptual space, with the order of acquisition determined by the cumulative complexity of the spatial information they encode (e.g., location words like "in" and "on"

being learned earlier than location-plus-direction words like "into," "onto"), and possibly also by the order in which the child learns the properties of perceptual space.

STRATEGIES FOR LANGUAGE ACQUISITION DERIVED FROM THE CHILD'S COGNITIVE STRUCTURING OF THE WORLD

With the above sketch of certain proposals concerning the relationship between linguistic and cognitive structures, we are in a better position to consider some related hypotheses about strategies for language acquisition.

The term "strategy" has appeared in a number of articles in recent years (e.g., Bever, 1970; Slobin, 1973; Ervin-Tripp, 1973; Greenfield *et al.*, 1972; Sinclair and Bronckardt, 1972) with somewhat varying meanings. Most frequently, it is used to indicate either consistent methods children use in processing sentences to arrive at their meanings or, more generally, consistencies in the way in which children go about mapping language onto their nonlinguistic understanding of the world, *i.e.*, the way in which they construct a linguistic rule system for both producing and interpreting speech.

Strategies relevant to a number of different aspects of language processing have been proposed (see especially Bever, 1970; Slobin, 1973). Following Clark's lead, we shall be concerned here with a particular subset of these. Clark, along with Sinclair-de Zwart (1973a,b) and (within a more restricted domain) Greenfield *et al.* (1972), has hypothesized that in interpreting speech and constructing linguistic rule systems children employ strategies derived from their prelinguistic or general cognitive experiences with and understanding of the world.

In Clark's view (this volume), much of the cognitive basis for early language consists of the *perceptual* information which the child "has successfully interpreted and organized by the time he starts to work on language." In particular, she proposes that in acquiring the meanings of words, children employ strategies based on their perceptual understanding of the world. In learning the meaning of ostensibly definable words like "doggie," children attend to salient perceptual attributes involving shape, movement, size, sound, and texture. For inherently relational lexical items such as locative prepositions and dimensional adjectives, they rely on their nonlinguistic interpretation of perceptual space. Because the properties of space encoded by spatial terms correspond closely to the child's nonlinguistic organization of space (see H. Clark, 1973 and above), his hypotheses will often be correct. For example, in making hypotheses about the meanings of locative prepositions such as "in" and "on," the child initially refers to his perception of the usual or canonical spatial relations which hold between objects in the world and thus will make few errors in normal situations.

Sinclair-de Zwart and Greenfield *et al.* differ from Clark in emphasizing

not perception but rather *action* as the source for interpretive strategies. For example, in their discussion of developmentally ordered strategies for combining nesting cups, Greenfield *et al.* (1972) speculate that "the existence of action structures formally similar to grammatical structures may provide a cognitive base for language learning itself. A known action pattern could provide a strategy for decoding a linguistic description of that action."

Arguing in a more general way, Sinclair-de Zwart suggests that the child's construction of grammar is linked to his previous construction, through action on the environment, of sensorimotor or practical intelligence. In her view, the structural properties of sensorimotor intelligence (or, more accurately, of the "universal cognitive structures" underlying both sensorimotor intelligence and language) provide the child with a set of basic assumptions about the structural properties of language (1973a, b). The process by which the cognitive structures are initially constructed through action converts, in some as yet unspecified way, into a "heuristic model for language learning" which gives rise to basic strategies for building up knowledge of language structures (Sinclair-de Zwart, 1973b).

In formulating these proposals, Sinclair-de Zwart (1973a) follows Piaget's postulates that "higher-level knowledge involves a reconstruction of already acquired concepts and patterns," and that the formation process is "isomorphic to that by which earlier knowledge was acquired." Thus, she hypothesizes that the acquisition of particular linguistic structures parallels on the representational level the way in which the relevant sensorimotor cognitive structures were initially constructed on the action level. She has presented some experimental evidence which appears to support this view (Sinclair-de Zwart, 1973a,b). Young French-speaking children were asked to act out anomalous sentences representing all possible permutations of two nouns and a verb or two verbs and a noun. The children interpreted them according to consistent patterns, different for different ages; these patterns suggested that the sequence in which a child builds up links between linguistic elements representing agent, action, and object mirrors the sequence in which he previously differentiated on the action level between actions and objects acted upon and between himself as agent and others as agent.

Although Clark emphasizes perception rather than action as the source of the child's linguistically relevant cognitive knowledge, she, like Sinclair-de Zwart, has suggested that in acquiring a given aspect of language the child in a sense recapitulates the developmental sequence he went through in establishing the nonlinguistic knowledge underlying it. She cites evidence that in the development of perception the child progresses from attending to individual features (*e.g.*, high contrast edges, spots, moving parts) to attending to configurations or bundles of features (such as define a face). This progression in perceptual development from the use of single features to sets of features appears to be repeated, she observes, when children begin to

interpret their perceptual input in order to use it in attaching meanings to words (Clark, 1973).

In the discussion of Clark's paper for this conference, Morehead noted the difference between Clark's position and the Piagetian one on the relative importance assigned to perception as a source of word meaning. He observed that according to Piaget, perception alone cannot be the basis for early word meanings because it is too transitory, too dependent upon temporary conditions, to confer meaning. In Piaget's view, the acquisition of word meaning depends upon the prior establishment of relatively stable internalized representations of the referents, and these representations or "preconcepts" which the early words mark are internalized *actions* rather than perceptual images. In an effort to reconcile Clark's data on the way in which children overextend words with Piaget's theory, Morehead pointed out that the particular perceptual attributes which appear to serve as the source of early word definitions have "tactile-kinesthetic" correlates which may in fact contribute to the formation of the relevant preconcepts.

Morehead's observation in this regard suggests a way in which we may be able to resolve the apparent differences between Clark's and Sinclair-de Zwart's positions on perception vs. action as the source of language processing strategies. In Piaget's view, the perceptual model of the world which the child has attained by the end of the sensorimotor period is neither a "given" nor an autonomous development. Rather, it is constructed by the child out of his actions and interactions in the world. Thus, perceptual concepts such as "shape," "size," "canonical position," and "extent," which Clark has shown may be relevant for the acquisition of various ostensibly definable words and relational words, are perhaps acquired through the child's action upon objects rather than by passive observation, and it might be that strategies for acquiring word meanings are based primarily on the way in which the child's organization of perceptual input is build up rather than on the final characteristics of the organization itself. The proposals by H. Clark mentioned above, on determinants of the order in which spatial terms are acquired, suggest some lines along which this hypothesis might be elaborated.

In considering Clark's proposals about cognitively based strategies for language acquisition, several conference participants wondered whether the various response patterns found in Clark's experiments and taken by Clark as evidence of cognitive strategies could not be explained in some other way. Menyuk, for example, suggested that the construct of "cognitive strategy" may actually be made up of a number of variables. One is *perceptual saliency*. The perceptual cues children use in classifying are evidently hierarchically organized, such that while children may initially tend to use color or shape in classifying, they are able to use function as well, provided that the former two criteria are blocked. Another set of variables involves *motivation*. For example, Mehler and Bever (1967) found that certain children who gave nonconserving responses when faced with two rows of clay pellets of differ-

ent lengths were able to assess amount accurately when clay was replaced by M&Ms and the children were told to select one of the rows and eat all the M&Ms in it. A third factor which may influence the behavior which has been ascribed to cognitive strategies is the *task variable*, which involves how the child's apparent understanding of a situation or a sentence may be affected by the materials present in the testing situation.

A different approach to the question of how Clark's data should be interpreted was pursued by Premack and Baer. They suggested that Clark's study of the way in which children comprehend "in," "on," and "under" might actually be a developmental study of a shift in *preferences* rather than of the acquisition of word meaning. As Premack elaborated it, Clark's study involved looking at the probability that subjects would respond in certain ways. Response probabilities have a number of determinants, only one of which is language, *i.e.*, the instruction to the child. If, *prior* to linguistic instruction, the possible responses (*e.g.*, putting something into as opposed to on top of an object) have different probabilities of occurring, then it is impossible to determine the role of language. Thus, for example, children could start out with strong preferences for dealing with objects in certain ways. Even if they understood an instruction like "put the doll *on* the glass," their preference, or response bias, for using things as containers whenever possible might lead them to ignore the instruction and follow their own desires.

The crucial question, then, said Premack, is "to what extent does the existing response bias *compete* with the language instruction?" Clark's data could be accounted for by saying that children at first have strong preferences and later none. Thus, at some point the language instruction begins to compete actively with the existing response biases and the child will do as he is told, thus appearing to have just learned the meanings of the words, even though in fact he may have known them earlier. Premack acknowledged that in principle his interpretation of Clark's data as due to preferences and hers as due to cognitive strategies were not incompatible. Thus, a child might have an initial preference and use it as the basis of a strategy for word interpretation. However, his point was to demonstrate that in the experiment, alternate interpretations were confounded.

Clark felt it was unreasonable to assume that an 18-month-old child really understands all the instructions but has simply decided to please himself rather than the experimenter. She noted that the children she worked with had been in several other experiments, appeared to be very cooperative, and were upset if they got negative feedback. Baer observed that even under these circumstances, children don't necessarily prefer to win the experimenter's approval over the opportunity to put something into something else.

Various methods of getting around the problem were considered. Staats suggested that one could overcome the initial response biases and get the child to attend to instructions by reinforcing him for doing so. Clark noted

that one cannot give feedback on correct and incorrect responses in studies of what the child knows semantically, since this might change his response to particular terms in the course of the experiment and thus defeat the purpose of the experiment. Premack felt that it is impossible to answer questions about responses to language instructions in young children unless initial response probabilities are equal. Since this is evidently not the case for "in," "on," and "under," questions about the acquisition of comprehension cannot be answered for these words. Chapman wondered whether the confounded variables could not be separated even when response biases are unequal by determining what the biases are in advance. Premack answered that in such a situation, only a special kind of outcome, that which goes *against* the known probabilities, would be interpretable. Most outcomes would not be interpretable.

In this section and the last, we have examined studies of the possibilities that 1) particular linguistic structures may depend upon more basic underlying cognitive structures which are in some sense isomorphic to them and 2) the child may make use of either the characteristics of his existing cognitive structures or the developmental process he went through in acquiring them in deriving strategies for the interpretation of linguistic data. Investigations like these may lead to new tools for diagnosing and treating children who do not acquire language normally.

First, it is clearly relevant to find out how far along in the sensorimotor construction of reality a language-delayed child is, and, if necessary, to intervene to help him acquire the requisite nonlinguistic structures. The language intervention program outlined by Bricker and Bricker in this conference looks promising in this respect: they investigate a child's functioning in a number of linguistically relevant cognitive areas such as object permanence and the functional motoric classification of objects, and train where necessary.

Second, and more difficult, is the need to investigate a linguistically deviant child's methods of analyzing linguistic input. Studies of strategies for language acquisition highlight the fact that it is not enough for a child to control the cognitive structures or basic meanings which are prerequisites for language; he must also have methods of determining the relationship between meanings and the linguistic structures by which meanings are encoded in his language. The deficits of some children may be primarily in this area rather than in that of the basic sensorimotor cognitive structures. Such a child could perhaps be aided to acquire language with training situations specifically designed to help him notice formal similarities between linguistic structures, on the one hand, and action patterns, perceptions, and the like, on the other, and on this basis to formulate hypotheses about what aspects of language might correspond with what aspects of experience. Beyond this, as Clark pointed out in discussion, we need to find out more about how children who

have adopted a given hypothesis go about determining whether or not it is correct.

WHAT ARE THE FUNCTIONAL CONCEPTS AND CATEGORIES UNDERLYING EARLY MULTIWORD UTTERANCES?

In an influential 1971 paper (originally circulated in 1968), Schlesinger proposed that the basic concepts underlying sentence construction are not syntactic relations like subject, predicate, and direct object, but rather semantic notions like "agent," "action," "object," and "location." He hypothesized that children acquire language by learning "realization rules," such as those for ordering elements within the sentence, which map underlying semantic concepts directly onto surface structures.

Schlesinger's suggestion that a fairly small set of relational meanings such as "agent action" and "action-object" can account for the large majority of children's early word combinations has since been supported by data from children in many different language communities (Brown, 1973, p. 182; Slobin, 1970, p. 175; Bowerman, 1973a). Brown accounts for the apparent universality of these basic semantic meanings by reference to the child's accomplishments during the sensorimotor period which immediately precedes word combination (see Schlesinger's paper).

Brown (1973, p. 173) cautions, however, that the kinds of semantic concepts discussed by Schlesinger (and others) may be nothing more than convenient categories for data reduction, analysis, and comparison. They may or may not actually correspond to aspects of the structural knowledge which enables children to produce and comprehend utterances.

In his present paper, Schlesinger has undertaken the important task of trying to characterize more exactly the relational concepts which are psychologically functional for children and adults. The problem is not a purely theoretical one. It has empirical consequences in that the breadth and makeup of the categories upon which rules operate are important determinants of the way in which the child will use his rules in new situations, and thus what kinds of novel utterances are available to him. For example, if the child follows a rule such as "agent precedes action" in producing utterances like "Johnny ride" and "mommy go," he should be able to apply the rule immediately to any previously unknown action word and produce appropriately ordered agent-action strings involving that word. It is possible, however, that early sentences classifiable as "agent-action" strings are produced with a number of different rules based on the individual lexical items involved (e.g., "the name for one who rides (goes, jumps) precedes the name for the action of riding (going, jumping).") In other words, the child might see no similarity among the initiators of diverse actions and make no use of the agent concept at all. In this case, upon learning a new word for an action, the

child would be unable to use it in combination with a name for the initiator of the action until he had specifically learned a new rule for that purpose. Still another possibility is that the child has a nonlinguistic concept of agent, but that this does not figure explicitly in his linguistic rule system.

In considering the nature of the functional relations underlying sentence production and comprehension, Schlesinger has somewhat modified the position he took in his 1971 paper. In his conference paper and the discussion of it, he clarified his present view on the relationship between cognitive and linguistic development as basically interactional. Whereas earlier he had proposed that the concepts underlying the early utterances do not reflect specifically linguistic knowledge but rather are determined by the "innate cognitive capacity" of the child, or the way in which the child views the world regardless of whether he acquires language or not, he now felt that the child's initial cognitive structures might be rather amorphous and develop not only through experience with the world of objects and events but also through linguistic experience. The way in which various concepts are treated linguistically suggests to the child what belongs together and influences the formation of given cognitive concepts. For example, a child may not begin language acquisition with a clear cut agent-action concept. He may instead have only an understanding of specific instances of the relationship, such as that between one who throws something and the act of throwing or between one who cuts something and the act of cutting. But his language, by giving identical formal expression to all such relationships between initiators of specific actions and the actions initiated, would lead the child to collapse these varied concepts into the more abstract concept of the relationship between agent and action. Alternatively, a child might initially form an overextended agent concept in which animate agents and instruments like knives are regarded as equivalent, and gradually, through observation of the way these are treated linguistically, he would differentiate agent and instrument into two separate concepts.

Premack was dubious about the influence of language upon basic "case grammar" concepts like "agent," "action," and "location." He felt that an understanding of the relationship between agent and action, for example, comes built-in and does not need to be learned through language. However, he agreed with Schlesinger that linguistic and cognitive development interact at points. He suggested that not only does language influence cognitive development in some ways, but also that there may in fact be some linguistic distinctions such as those made by the logical connectives ("and," "either-or," etc.) which simply lack nonlinguistic counterparts (e.g., do not admit of visual representation) and are therefore introduced into the cognitive structure solely through language. The reason for this speculation, said Premack, was that he had found it virtually impossible to devise nonlinguistic tests for the existence of such concepts, whereas other concepts such as perceptual categories and the notion of "different" can easily be tapped by language-free

techniques. Schlesinger noted that difficulty in constructing language-free tests for the presence of cognitive concepts underlying the logical connectives does not necessarily mean that the concepts are absent. He suggested that this was a technical problem. Some concepts are more easily represented in one medium than another. However, Premack still felt that the problem might be one of substance rather than simply technical.

Bowerman observed that Clark's approach to the way in which children assign meanings to particular lexical items could provide information essential to the accurate specification of the nature of the concepts functional in children's early rule systems. Words like "want," "need," "see," and "hear," as they are understood by adults, are not actions and thus do not take agents in the role of subject but rather experiencers or "persons affected" (*cf.* Fillmore's (1968) dative case). It is possible, though, that children do not understand "want" and the like as adults do, but rather define them essentially as actions such that "want" might be equivalent to the adult's "demand" or "give," "see" to "look," "hear" to "listen," and so on. If so, children who purely on the basis of the lexical items they use in sentences might appear to control a semantic notion like "person affected" and rules for ordering it may in fact be producing utterances like "Johnny want cookie," and "mommy see dog" with the same linguistic mechanisms used in producing sentences with agents. While Schlesinger also suggests that the agent concept may absorb concepts which are really not agents, such as persons affected and instruments, Bowerman's proposal differs from his. In Schlesinger's view, the agent concept may be overinclusive for adults as well as for children, whereas, according to Bowerman's suggestion, this would be true only for children as a result of their incomplete lexical entries. Once children acquired the adult understanding of verbs like "want," sentences including them could no longer be generated by rules based on the concept of agent.

A second possibility suggested by Clark's work is that just as an adult understanding of lexical items appears to develop gradually, feature by feature, items in a child's "vocabulary" of functional relational concepts may develop over time. It has been suggested that Fillmore's case roles can be defined in terms of combinations of semantic features such as "cause," "instigator," "intent," "control," "goal," etc. (McCoy, 1969, cited in Cook, 1972). In establishing a linguistically relevant semantic concept like "agent," a child may initially attend to only one or two features rather than the entire set of features which define the concept for an adult; the features he attends to may or may not be criterial for the adult. As in the case of the child's use of single words, a lack of correspondence between the adult's concepts and those of the child would be revealed in overextensions or other inappropriate usages. For example, the childish version of the adult agent concept might be defined only by the feature "that which is capable of independent movement." This would result in the child's treating cars, machinery, and the like

as agents. Alternatively, he might form an agent-like concept defined by the feature "that which physically interacts with an object." Such a concept would exclude some things considered agents by adults, such as the subjects of "sit" and "run," but include other things which adults may distinguish from agents, such as instruments.

Theoretical debates about the relational meanings of early sentences and the nature of the linguistic knowledge underlying the production of these sentences have important implications for language intervention. Miller and Yoder (1972, this volume), for example, have constructed a language training program around the premises that 1) the content of a program should be taken from normal developmental data in an effort to approximate *what it is* that normal children learn in acquiring language and 2) what is learned appears to be how to express various semantic concepts or functions. Miller and Yoder derived their list of semantic functions to be taught from recent studies which make use of familiar terms such as "agent," "action," "location," "recurrence," etc.

While this is a promising starting point, the above discussion should make it clear that such terms may or may not actually correspond to constructs in the normal child's own rule system. As our methods of investigation become more ingenious, it should be possible to specify more closely the concepts which are actually functional for the normal child early in linguistic development and how these change over time. This will provide training programs such as Miller and Yoder's with a more principled guide for grouping utterances to be trained and sequencing these groups in such a way as to engage the child's own sense of what constitute meaningful concepts at various stages of linguistic development. This should facilitate the child's induction of general rules for sentence production and comprehension.

REPRESENTING CHILDREN'S KNOWLEDGE OF LINGUISTIC STRUCTURE

A generative grammar written for a language is in essence a hypothesis about the native speaker's internalized rule system, or his knowledge of language structure (Chomsky, 1968, p. 23). Hence, speculations about the nature of the knowledge children draw upon in comprehending and producing utterances lead naturally to questions about the best method for formally representing this knowledge in grammars.

Much discussion was devoted to the way in which the relationship between language and cognition should be handled in linguistic representations. Schlesinger emphasized that in writing grammars for children, general knowledge about the world should be carefully distinguished from linguistically relevant knowledge. At the time of speech, the child may know a great deal about the nonlinguistic situation, but only part of his understanding comes into play in his linguistic production. Schlesinger's concept of the

I-marker, or intention-marker, was developed to represent those aspects of the child's cognitive structure which not only are present at the time of speech but also are used in the formulation of the utterance. Unlike cognitive structures, which may be rather elaborate and elusive, I-markers are probably a finite and fairly small number of categorized relations, those relations which make a difference linguistically.

There was much discussion of whether Schlesinger's system of I-markers and the realization rules by which the child learns to link I-markers to surface structures provide an adequate account both of what is learned and of the learning process itself. Cromer questioned whether syntactic deep structures can be dispensed with in favor of semantic I-markers in a theory of language acquisition. He noted that the reason deep structures were postulated in the first place was to represent aspects of language which are abstract and cannot be explained solely by reference to surface structures. But because I-markers are linked to surface structures by purely associative mechanisms, they are not abstract and thus cannot account for certain features of language structure. If many aspects of language are abstract, moreover, it is impossible to account for language acquisition by stimulus/response theory, because much of what the child must acquire is never directly observable in speech (*cf.* Bever, Fodor, and Weksel, 1965). And there is developmental evidence, Cromer noted, that children do acquire abstract structures rather than simply picking up aspects of the surface structures they hear—for example, the way in which negation is acquired. In the light of these arguments, Cromer felt that Schlesinger's theory was unable to account for either the abstractness of the system which is acquired or the way in which it is acquired.

Schlesinger responded that while indeed I-markers can be linked to surface structures by associative principles, this does not imply a one-to-one relationship such that for each I-marker there is one surface structure. The system does admit of abstract rules mapping I-markers into surface structures. Many of the things children say which are errors from the standpoint of adult surface structures result from their wrong application or overgeneralization of these rules.

Nevertheless, added Schlesinger, the theory of I-markers is not simply a terminological revision of deep structures. Unlike deep structures, I-markers are formulated in semantic terms. In addition, they do not posit an abstract underlying order for sentence elements. Finally, they are not universal but can develop differently in different languages. For these reasons they seem more accessible to experience than deep structures.

As for the proposal that learning theory is incapable of accounting for language acquisition because much of what must be acquired is abstract, Schlesinger considered it to be based on faulty arguments. In actual language-learning situations, he pointed out, deep structures are not abstract in the sense that Bever *et al.* posited because they are tied to the situation. The child witnesses the event, *e.g.*, Johnny giving a ball to daddy, and hears a sentence

describing it. Thus, he can code the elements of the event into an I-marker, a deep structure, and associate it with the observed sentence.

Cromer broached a different line of inquiry into the adequacy of I-markers by asking whether they had to be entirely semantic or whether they might not contain some purely linguistic elements. He thought that the latter might be necessary to account for the difference between the ability to entertain certain concepts or meanings nonlinguistically and the ability to express those meanings in language. He added that if I-markers do contain any specifically linguistic mechanism, this might be disturbed or damaged in some children. Schlesinger replied that the I-markers could be considered linguistic in a sense, in that experience before language does not come parceled into agents, actions, instruments and so on. Rather, experience with language itself teaches the child that these things go together in the I-markers. Beyond that he was uncertain about any purely linguistic properties of I-markers.

A related line of thought, pursued by Bowerman, was whether Schlesinger's attempt to describe the kinds of concepts underlying speech production and comprehension in purely semantic terms was psychologically accurate. She noted that the subjects of many sentences resist interpretation as agents, or even as extended agents which might include instruments and persons affected—for example, “the situation justifies taking drastic measures,” “caution outweighed the need for action,” “health legislation continues to be a problem,” “John benefited from the assignment,” “the boat trip resulted in several deaths,” etc. It is difficult to pinpoint specific cognitive concepts (aside from whatever nonlinguistic correlates the meanings of the specific lexical items have) which could serve as the structural components to which rules for ordering and other operations could apply. To achieve any kind of economy in the rule system, it would seem to be necessary to depart at points from a purely semantic specification of structural relations. Possibly some children experience problems with language not because they lack the requisite underlying cognitive concepts which language encodes, but because they are unable to perform the feats of abstraction necessary to arrive at an understanding of the purely formal linguistic relationships which hold between parts of sentences (such as subject-predicate, verb-direct object) and which cannot be mapped directly onto underlying semantic concepts.

SUMMARY

The variety of approaches to the cognitive prerequisites for language which have been discussed in this chapter and the three preceding ones point strongly to the conclusion that cognition plays multiple roles in the acquisition and use of language. Accordingly, delays in acquiring language might

have as their source deficits in one or more of a number of different cognitive abilities. To recapitulate briefly, the following kinds of nonlinguistic knowledge and skills were suggested, each one having an associated potential for deficit. This is by no means an exhaustive list of all the cognitive factors which are involved in language acquisition:

1. The general ability to use symbols to represent objects and events which may not be perceptually present.
2. The development of basic cognitive structures and operations which are in some sense prerequisites to and isomorphic with specific aspects of language structure (*e.g.*, the ability to order spatially and temporally, the ability to classify in action, the ability to embed action patterns into each other, the establishment of concepts of basic invariance underlying superficial changes of state (object permanence, conservation), the ability to assign dual roles to an object in a single action sequence, the construction of a model of perceptual space with certain properties).
3. The ability to derive strategies for processing linguistic material from general cognitive structures and processes which are isomorphic to aspects of language structure, and/or from the developmental sequence in which language-relevant cognitive knowledge is acquired on the nonlinguistic level.
4. The ability to formulate appropriate concepts or categories to serve as the structural components upon which linguistic rules such as those for ordering sentence elements can operate. Neither the exact nature of the early categories nor the way in which they change over time is as yet known. In particular, it is unclear whether, as Schlesinger suggests, relational semantic concepts like "agent" (or "extended agent") are the basic building blocks of the linguistic knowledge not only of children but also of adults, or whether instead semantic concepts must eventually be supplemented with or supplanted by an understanding of more abstract syntactic relationships which hold between parts of sentences and which can be defined solely in linguistic terms.

The cognitive abilities represented above are clearly not independent of one another, but their relationships are complex and little understood. In addition, the abilities are not unitary but can be broken down into a number of components. Nevertheless, even a rough outline such as this of some of the major ways in which cognitive factors appear to figure in the acquisition of language may suggest lines along which the development of language intervention procedures might profitably progress. Implicit in such listing is the notion that it may be possible to develop diagnostic techniques sensitive enough to detect deficiencies in particular language-relevant cognitive abilities and to design training programs specifically aimed at improving certain target nonlinguistic skills.

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