

COMPREHENSION, PRODUCTION, AND LANGUAGE ACQUISITION

Eve V. Clark and Barbara Frant Hecht

Department of Linguistics, Stanford University, Stanford, California 94305

CONTENTS

INTRODUCTION	325
COMPREHENSION AND PRODUCTION.....	328
<i>Comprehension Does Not Match Production</i>	328
<i>Is Comprehension Systematically Ahead of Production?</i>	330
<i>Is Production Ever Ahead of Comprehension?</i>	332
<i>Comprehension vs Production: A Qualitative or Quantitative Distinction?</i>	334
<i>Strategies for Comprehension and Production</i>	335
COORDINATING COMPREHENSION AND PRODUCTION.....	338
<i>Matching Representations</i>	338
<i>Monitoring Production</i>	340
<i>Coordination in Acquisition</i>	341
IMPLICATIONS AND CONCLUSIONS	342
<i>Memory Representations</i>	343
<i>Language Input and Language Acquisition</i>	344
<i>Assessing Acquisition</i>	345

INTRODUCTION

Some of the skills we acquire during childhood require that we be able to coordinate what we understand or perceive with what we produce or encode. Others do not. Consider our ability to reach out and pick up an object a few inches away. To do this successfully, we must link what we can see with the fine motor adjustments possible for our hands. This hand-eye coordination is often taken for granted until one observes an infant who has yet to attain it. Or consider the ability to imitate someone else's actions. One has to be able to represent and then reproduce the motor activities observed.

In contrast, consider two other activities: bicycling and swimming, both of them skills typically mastered before adulthood. When we say someone can bicycle or can swim, we usually mean he is able to produce the pertinent actions so as to meet some basic criterion, say, staying upright on a bicycle and staying afloat in a swimming pool. These abilities, though, do not require coordination with the ability to recognize that someone else is riding a bicycle or swimming. One can perceive and recognize activities on different occasions as instances of bicycling or swimming without ever learning to bicycle or swim oneself. And one could learn to ride a bicycle or swim without necessarily having seen anyone else doing so. Our point is that producing some behavior and recognizing it in others are two distinct processes, and there is little need in many cases to coordinate them in any way.

Language, however, does require coordination. Since it is a conventional system, its very use demands that two distinct processes—production and comprehension—be coordinated. Without such coordination, speakers would be unable to use language to communicate and to infer intentions. And this in turn suggests that one part of acquisition consists of coordinating what one can produce with what one can understand.

As adults, we tend to take such coordination for granted. Closer inspection, though, reveals many areas of language use in which comprehension and production remain distinct. For example, most speakers of English (and of other languages) understand a range of dialects and accents but can only produce one or two themselves. Many speakers may also understand a second or third language quite well but be unable to produce it. Conversely, in some settings speakers may produce language they cannot understand, for instance Hebrew prayers learned for recitation at a bar mitzvah or (prior to the introduction of vernaculars) the Latin mass. Such examples of production without comprehension are typically tied to specific, often ritual, settings. Nonetheless, such examples show that production can in some sense occur without comprehension, just as comprehension can without production.

The absence of coordination between comprehension and production in such instances suggests that we may represent things linguistic in one way for the process of understanding—essentially recognizing what the speaker intends—and in another for talking—essentially retrieving from memory the necessary elements for constructing an utterance. At the same time, as mature speakers of a language, we have learned to coordinate most of what we can produce with what we can understand. For example, Californians recognize that the word *right* pronounced by an Australian, a South African, a Texan, and a Bostonian are all to be represented as variants of the same linguistic element, and that all these variants are to be coordinated

with a Californian production of *right*. And the latter in its turn will be recognized as the word *right* by Australians, South Africans, Texans, and Bostonians even though it doesn't precisely match their productions.

Coordination, then, is part of what children must work on as they acquire language. And the fact that comprehension and production have to be coordinated in itself raises a critical question about how comprehension and production should be defined. In the case of adults, we normally assume full comprehension, regardless of context, and fully appropriate production. Such assumptions simply do not hold for children still acquiring their first language. Children may show some comprehension of an utterance simply by looking toward the object named, or demonstrate greater comprehension by carrying out a series of contrasting instructions. And they may produce a word appropriately in only one context or do so across a range equivalent to the adult's. Since children acquiring a first language start with only partial knowledge of the sound system, the meanings, and the structural forms they are using, one has to establish their degree of comprehension or production in assessing what they have acquired.

Yet investigators typically have not provided explicit criteria for the degree of comprehension or production, from near zero to fully adult-like performance, that children control. Different investigators have relied on different criteria for attributing presumably adult-like performance to children. These criteria often depend on a single observational or experimental setting, and children are usually said to have acquired a particular structure on the basis of comprehension alone, or production alone. A few investigators have tried to compare performance in comprehension with performance in production, but most of these studies have been flawed. Methodologically, the tasks tapping the two processes have made quite different kinds of demands on the children doing them. Theoretically, there has been little attempt to consider why the processes of comprehension and production might differ, or what the developmental consequences of any differences might be.

These methodological and theoretical shortcomings, we suggest, arise in large part from the tendency of most investigators in the field to focus on the *product*—the language itself—rather than on the *processes* language-users rely on. In the present chapter, we will begin by reviewing some of the studies that have looked at both comprehension and production, and claims made about the relations between the two processes. In doing this, we will focus on some of the methodological problems these studies have raised. We will then turn to an approach that starts from processes rather than product, and give a brief account of how production becomes coordinated with comprehension during the course of acquiring a language. This framework can accommodate both discrepancies and similarities in perfor-

mance tested in comprehension and production. Finally, we will discuss some of the implications of looking at language acquisition in terms of processes instead of in terms of the more traditional product, the language itself.

COMPREHENSION AND PRODUCTION

Anecdotal reports have long favored the view that young children understand more than they produce. This is a common observation in many of the classic diary studies as well as in much of the more recent observational and experimental research (e.g. Huttenlocher 1974, Rescorla 1980). Very young children just beginning to produce recognizable words themselves seem to attend to and respond appropriately to many more words around them. Nonetheless, the question of whether one system is more advanced is complicated by the problem that measures of both comprehension and production may be somewhat overestimated. Adults often forget how many clues to what the child is expected to do may be offered by the actual setting. A small child, told *Now would you put your blocks away* as the adult holds out the box in which the blocks are normally kept, is very likely to put the blocks in the box, but the reasons for his actions may not require any comprehension of the linguistic forms in the request just made (e.g. Shatz 1978). Observers also overestimate what children understand by treating what they say as if their words were equivalent to the adult's in meaning. Children often echo the ends of utterances addressed to them and use stock phrases fluently without understanding the individual words or morphemes. Thus they may appear to have adult-like comprehension both when they respond to adult utterances while actually relying on contextual cues and when they themselves make use of complex constructions that are no more, for them, than unanalyzed routines.

Observers commonly overestimate children's abilities in production too. Children make use of many words and routines that at casual glance may suggest much greater sophistication than they actually possess. For example, a child might use a Wh question like *Where is it?* with the appropriate inversion of subject and auxiliary verb, and be credited with knowledge of the structural properties of Wh forms. Yet the same child, on other occasions, may use forms like *Where is it goes?* or *Where is it the dog?*, both forms that show up the earlier, apparently correct production as an unanalyzed routine.

Comprehension Does Not Match Production

Even a fairly casual glance through the recent acquisition literature reveals a number of studies that report discrepancies between what children seem

to understand and what they produce, both in their spontaneous speech and in situations designed to check on comprehension or elicit production.

Recent vocabulary studies offer a case in point. Goldin-Meadow and her colleagues (1976) found that 1- to 2-year-old children often seemed to have different repertoires for the two modes. In a comprehension test of vocabulary, they noted that a child would appear to understand the word *dog*, for example, just as an adult would, and respond appropriately upon hearing it (by pointing to the right picture on a page full of animals, picking up an appropriate toy, and so on). But when the same child was asked to name a picture of a dog, he would only say *wuf-wuf*.¹ At this stage, such children seemed to understand the adult meaning of *dog* but produced only a "child word," or no word at all (see also Rescorla 1980). They also produce some words or phrases they seem not to fully understand. A child may say *bye bye* only when other people leave a particular room, but fail to say it in other appropriate contexts, or say *hi*, initially picked up from an adult making finger puppets speak, only when the child has something covering her hand (Bowerman 1976).

Comprehension does not match production in early overextensions of words either. Like Moore (1896), Thomson and Chapman (1977) found that children aged 1;9 to 2;3 (1 year 9 months to 2 years 3 months) who overextended words like *doggie* to pick out all kinds of four-legged animals or *ball* to pick out all kinds of spherical objects in production, consistently chose only appropriate referents for the same words in comprehension. Thomson and Chapman concluded that the children's production was probably limited because they had difficulty in retrieving the right words, words that may in fact have been known to them.² The reliance on overextensions in production, then, marked a lag in production compared to comprehension.

Differences between performance in comprehension and production have also shown up in studies of the acquisition of inflections. Anisfeld and Tucker (1968) looked at 6-year-olds' ability to produce and to understand the various plural morphemes for nouns in English—/—s/, /—z/, and /—iz/—used on words like *cat*, *dog*, and *house* respectively. Although the different tasks they used showed no overall advantage for comprehension over

¹It is possible in such cases that the child's production reflected a routine that had emerged as part of reading—the routine of making the appropriate animal noise upon being shown a picture—but the child presumably understands *wuf-wuf* as well as *dog*. However, reliance on routines does not explain the discrepancies noted, for instance, between comprehension and production of simple verbs.

²Unfortunately, Thomson and Chapman did not test the children's comprehension of the words that would have been appropriate for the various categories included in the domain of each overextension, nor try to elicit them in other settings.

production, they found different patterns of performance in the two modes. In production, plural /-s/ and /-z/ were the easiest [replicating previous studies such as Berko (1958)], and the syllabic /-iz/ was more difficult. But in comprehension, /-z/ was the easiest and /-s/ and /-iz/ were both more difficult. Anisfeld and Tucker accounted for the different patterns by pointing to the different requirements for production and comprehension. In production, the children had to depend on whatever information they had stored about the forms of noun plurals for English, but in comprehension they could also draw on other generalizations about the forms of English words, for instance, that few singular nouns end in /-z/ so such words must be plural, or that most plurals are longer than singulars.

Finally, comprehension does not match production in studies of children's acquisition of terms like *same*. Karniloff-Smith (1977) found that young French-speaking children usually interpreted *same* (*même*) in phrases like *the same duck* to mean "same kind" rather than "same one." Only later did they arrive at the "same one" interpretation. Another group of slightly older children, asked to describe the same situations used in the comprehension task, consistently reserved such expressions as *the same duck* (*le même canard*) for "same one," and created separate forms to express the notion "same kind" (e.g. the ungrammatical *le même de canard* "the same of duck" or *un de même de canard* "one of same of duck"). Thus, the earlier preferred interpretation of phrases like *the same duck*, (*le même canard*, taken as meaning "same kind") did not match the forms produced to express that meaning.³

These studies, however, do not show whether comprehension is systematically ahead of production or the reverse. Rather, they suggest that the two processes are different. But are there cases of comprehension without production? The answer to this appears to be "yes."

Is Comprehension Systematically Ahead of Production?

Studies of early language in children tend to suggest that children perceive and understand more about the sound structure and meanings of words than they themselves can initially produce. A number of studies have described children who have some comprehension of a term or a construction but still lack productive control over the pertinent forms. Clark and Hecht (1982) found that most of the 3-year-olds they studied understood the suffix *-er*, used to form agent and instrument nouns in English. In production, though, few of these children produced *-er* consistently when forming such

³It is possible, though unlikely, that the age difference between the children might account for the discrepancy. A more stringent demonstration would call for testing the same children on both comprehension and production.

nouns. They often relied on other linguistic options too. Such data suggest that children attain some comprehension of a form before they start to gain productive control over it (see also Winitz et al 1981). Comprehension, however, need not be complete prior to production. Given data like these, one would simply expect that where there were differences between the two processes, comprehension would be ahead.

Although this pattern of findings has been widely reported, its interpretation has often been difficult. Fraser, Bellugi, and Brown (1963) explicitly compared 3-year-olds' ability to imitate, comprehend, and produce a variety of morphological and syntactic forms in English. In the comprehension task, children were shown pairs of contrasting pictures to test their understanding of the singular-plural distinction and told, say, "One of these pictures is called 'The boy draws' and the other is called 'The boys draw.' " The experimenter then offered one of the two sentences and asked children to identify the appropriate picture, and then did the same with the other sentence. In production, the experimenter elicited descriptions for the same picture pairs. Fraser and his colleagues found that children consistently performed better on the comprehension task than they did on production. (They did better still on an imitation task with the same sentences, thus showing that articulatory demands could not explain the lag in production.) These findings were replicated (e.g. by Lovell & Dixon 1967) and seemed to offer strong support for a general advance of comprehension over production.

This conclusion has been challenged on methodological grounds. Baird (1972) argued that it was inappropriate for Fraser, Bellugi, and Brown to compare raw scores on the different tests directly because the probability of a child's giving a correct response by chance was not equal across tasks (see also Fernald 1972). This problem clearly is a very general one in any comparison of different processes.

More cogent perhaps is the argument that logically comprehension must precede production. To produce an utterance, one must choose the words and structures best suited to conveying one's intention as speaker. But to make the appropriate choices, one must understand the linguistic elements in order to know how they will be interpreted by someone else (see Ingram 1974). Notice that these logical requirements should make some tasks easier than others. In many comprehension tasks, the addressee, the child, listens to and then carries out instructions, an everyday occurrence. But production tasks, especially those that rely on imitation, omit a critical ingredient, namely the speaker's intention. And several investigators have noticed that young children spontaneously produce utterances that they are subsequently unable to imitate (e.g. Slobin & Welsh 1973, Bloom et al 1974). Production relies on the child's own intentions in ways comprehension does

not, and such differences between the processes have to be taken into account in studying them.

Direct comparisons of comprehension and production in experimental studies have often been flawed because the tasks are not easily equated. This, of course, may simply reflect the different demands made by the processes of understanding versus producing an utterance. Nonetheless, the logical priority of comprehension over production appears supported by recent studies that have looked at both processes and found that children consistently seem to understand something of a construction before they start to produce it appropriately themselves (e.g. Winitz et al 1981, Clark & Hecht 1982). Where there is a difference, then, comprehension seems to be ahead of production.⁴

Is Production Ever Ahead of Comprehension?

Some investigators have argued for there being production without comprehension. However, what they actually seem to be arguing for is production without full comprehension. Their data are not incompatible with the view that some comprehension must always precede production. What appears critical in these studies are the definitions of production and of comprehension and the criteria used for acquisition.

Keeney and Wolfe (1972) argued from data on English number agreement that children could produce forms in spontaneous speech that they did not yet understand. Keeney and Wolfe looked at 3- and 4-year-olds' imitation, comprehension, and production of subject-verb agreement. In their spontaneous speech, these children usually observed number agreement by producing a singular verb with a singular subject and a plural verb with a plural subject. In comprehension, the children had to select one of a pair of pictures depicting singular or plural referents for nouns. In one task, they heard full sentences to match to a picture (e.g. *The bird flies*), and they all performed nearly perfectly, but as Keeney and Wolfe pointed out, they could have based their responses on their knowledge of plural marking on nouns alone (e.g. *bird* vs *birds*). In the other comprehension task, they heard only the verb (e.g. *flies* or *fly*) and performed very poorly. On the basis of this task alone, Keeney and Wolfe concluded that the children did not yet understand the relation between verb form and singular-plural

⁴Further evidence for comprehension taking precedence over production can be drawn from case studies of abnormal language development. Both Lenneberg (1962) and Fourcin (1975) documented instances of language development through comprehension in the complete absence of production. Fourcin's study is particularly compelling since the true degree of language mastery subsequently became accessible for study when, at age 30, the patient was introduced to a special typewriter and after only a few days began to write in fluent, syntactically perfect English. Prior to this, he had had no medium for producing language.

meaning, and that production of number agreement was therefore ahead of comprehension.

But as Keeney and Wolfe themselves suggested, the verb-only task was a difficult one (see also Bloom & Lahey 1978). What seems critical is its judgmental nature. Inferring that the subject of a verb must be singular or plural from hearing the verb alone could simply be beyond the capacity of 3- or 4-year-olds. A better test would presumably be one more like that in Fraser et al (1963), with irregular nouns, e.g. *the sheep jump* vs *the sheep jumps*. This study, then, gives only the most tenuous support to the view that production precedes comprehension.

Superficially, production may seem to be ahead of comprehension in several domains in early acquisition. Children will produce whole phrases or quite complex utterances at a time when they appear to respond appropriately to—to understand—only single words. However, closer examination reveals that many of these utterances are unanalyzed, well-practiced routines picked up as single chunks from adults. R. Clark (1974) observed one child who would copy whole phrases from adult utterances and maintain them intact, with no substitutions of other lexical items in any slot for several weeks. The same child, aged 2:9 to 3:0, also appeared to rely on well-practiced but unanalyzed chunks such as *Baby Ivan have a bath* and *Let's go see*, to form longer utterances, as in:

Baby Ivan have a bath, let's go see + baby Ivan have a bath

I want + I eat a apple

I don't know + where's Emma gone.

The initial routine character of such chunks gradually became apparent as the child later broke them down and analyzed the constituent parts. Johnson (1981) found a similar reliance on routines in children's early questions. A phrase like *what's that*, for example, would be combined with *the dog* to produce a question, *what's that the dog?*, in contexts where the child seemed to be asking "where's the dog?" or "what's the dog doing?." The child's analysis of the internal structure of such forms—the relation of the auxiliary or copula verb to the subject noun phrase, for example—was very slow to emerge.

Much the same goes for children acquiring their second language. Fillmore (1979) reported extensive initial reliance on unanalyzed routines such as *I wanna play*, *lemme see*, *let's go*, *I dunno*, *it's my turn*, and so on. Early question routines from these children, e.g. *How do you do dese?*, were gradually analyzed and modified over time, first by the addition of noun phrases or prepositional phrases, as in *How do you do dese + little tortillas?* Next, the routine was reduced to *How do you* with different verbs substituted for *do*, as in *How do you make the flower?*, or *How do you gonna make these?* With the addition of further question routines or "frames," the

children's analysis of these previously routine chunks led to errors such as lack of inversion not obvious at earlier stages of production (see also Hakuta 1976).

Children's reliance on such ready-made chunks or routine utterances in both first and second language production shows clearly why children's utterances often should not be taken at face value. Apparently perfect utterance forms can result from reliance on routines; they do not necessarily signal that the child has fully appropriate productive control over the structure in question. Assessing the relation between what children produce and what exactly they understand may be difficult, but the point is that there is no evidence in such productions that *appropriate* production is occurring in the absence of comprehension, much less ahead of comprehension.⁵

Comprehension vs Production: A Qualitative or Quantitative Distinction?

Findings like these have led many researchers over the last decade to argue that comprehension and production are necessarily distinct. But are they distinct qualitatively or quantitatively? Bloom and Lahey (1978) have argued for a quantitative difference. Asymmetries between the two processes, they suggested, are analogous to those between perception and production in other domains: for example, in memory, recognition is more extensive than recall because it is harder to retrieve the details needed for the reproduction required in recall (Maccoby & Bee 1965). These differences in memory appear quantitative rather than qualitative in nature: people can recognize more instances of stimuli they've seen than they can list in a recall task. In the comprehension and production of language, however, the differences appear to be qualitative as well. Anisfeld and Tucker (1968), for instance, did not find any general difference in the level of difficulty children had in comprehending versus producing plural endings on nouns. What they did find were different patterns of errors in the two modes, and from that they argued that comprehension and production tasks tap different aspects of children's linguistic knowledge.

⁵Certain rare language disorders, though, appear to provide evidence for production without or ahead of comprehension. Some brain injuries to adults result in what has been called "pure word deafness" in patients with otherwise normal hearing. They appear to understand nothing but are said to produce normal fluent speech (Rubens 1979, Damasio 1981). It is not clear, however, that their speech is or could be fully appropriate. Another rare type of injury results in alexia where patients can write but not read (Geschwind 1972). Among children, such reports are even rarer but see Yamada (1981). These cases are particularly difficult to evaluate because spontaneous (at times inappropriate) productions are compared to performance on comprehension tasks. As Yamada pointed out, comprehension requires a test-taking ability that production does not.

Qualitative differences were also uncovered by de Villiers and de Villiers (1974) in children's uses of word order to mark subject, verb, and object. They wished to characterize children's tacit knowledge of the rule assigning these relations on the basis of word order in English. In different tasks, however, they arrived at different characterizations of what children (aged 2 to 4) knew. Early production was limited in two-word utterances to potential subject-verb, subject-object, or verb-object sequences. However, it is impossible to tell whether these utterances reflect a syntactic rule or not (Bowerman 1973). In comprehension, children at this stage tended to take the first noun phrase as the subject provided it was human or animate. They therefore still seemed to be relying on semantic rather than syntactic factors in interpreting word order. A little later they began to show good comprehension of subject-verb-object sequences even with reversible active sentences (e.g. *the dog chased the boy* vs *the boy chased the dog*). By now they also produced some subject-verb-object sequences, but these tended to observe the semantic constraints observed earlier in comprehension: subjects were human or animate and objects usually inanimate. The ability to make judgments about whether word order was correct or not emerged even later (see also Gleitman et al 1972), as did the ability to make corrections following such judgments.

As de Villiers and de Villiers pointed out, such data do not provide any simple answer to the question of when children acquire the subject-verb-object word order rule in English. Different kinds of performance—comprehension, production, judgments, and corrections—each yield different points of acquisition for the same rule of grammar. De Villiers and de Villiers concluded that one cannot set up a model for the child's linguistic knowledge in which each rule can simply be “checked off” as it is acquired.

Prior to the acquisition of a linguistic rule, children are usually said to rely on heuristics or strategies for comprehending or producing language. But such strategies may often be isomorphic with the adult's “rules,” except in that they apply only in one kind of task, in imitation, say, but not in production, or in comprehension but not in elicited judgments of anomaly or grammaticality, instead of in all domains of language use (see Hecht 1983). This raises two questions: What kinds of heuristic strategies do young children use in comprehension compared to production? And, for those strategies that appear isomorphic with the adult's, how can one tell when children have really acquired the adult-like “rules”?

Strategies for Comprehension and Production

Where children either do not understand what someone says to them or lack the appropriate means to make their own intentions known to someone else, they rely on a variety of heuristics or strategies to get by. Strategies for

comprehension, predictably, differ from those for production. The differences between them can be related fairly directly to what has to be represented in memory and where the process in question may break down through incomplete knowledge. For comprehension, children need to be able to locate word shapes in a recognition store that allows considerable latitude in the acoustic forms relatable to particular word shapes. Once word shapes have been located, children can then "look up" what they have stored of the word meanings and how these are linked to each other, to conceptual categories, and to generic knowledge about those categories. For production, children have to be able to retrieve words appropriate to their intentions (words with the relevant meanings) together with the articulatory programs they require (directions for pronunciation) and only then try to produce the words in question.

In comprehension, when children either do not have or cannot find the pertinent information in memory for a particular word or expression, they rely on what they know about whatever seems to be being talked about. They take up the properties of particular objects, their usual roles, and the relations that can hold between them in responding to requests or instructions they do not understand. For example, in studies designed to find out when children could understand various locative prepositions in English, Clark (1973, 1983) found that very young children, aged 1;6-2;0, relied on what they knew about containers and supporting surfaces rather than on any understanding of the words *in* and *on*. They put objects in containers and on surfaces regardless of the preposition in the instructions.

Similar reliance on general knowledge—that instigators of actions are typically animate—also guides children's choices of referents for nonsense words presented as the subjects or objects of particular activity verbs (Dewart 1979; see also Bridges 1980). Reliance on the probable relations between adults and babies, for example, allows very young children to give apparently perfect interpretations of passive sentences like *The baby was fed by the girl*. Only the comparison with *The girl was fed by the baby* or *The baby fed the girl* reveals the degree to which 3-year-olds as well as younger children are relying only on their general knowledge rather than knowledge of English word order (Wetstone & Friedlander 1973, Strohner & Nelson 1974, Chapman & Miller 1975). Young children may also rely on their knowledge of the usual routine in particular circumstances to decide how to act, quite independently of what is actually said (cf Bowerman 1978b, Shatz 1978).

As a result of such strategies, children may seem to understand more than they actually do. A particular problem arises when their strategy-based responses are indistinguishable from the responses adults would give—

where the adults' responses are taken to be based on their interpretations of linguistic forms. For example, children aged 2 and under will consistently pick out the uppermost surface of an unmarked object if asked to touch the top (Clark 1980). Initially such responses suggest they already know the meaning of *top*. However, they will select the same surface when asked to touch the bottom, front, or back, as well. And it is only when their responses to *top* and *bottom*, for instance, contrast with each other, with the upper surface being selected for *top* and the lower one for *bottom*, that one can be sure that the children are responding on the basis of some linguistic knowledge rather than general nonlinguistic organizing principles alone (Clark 1980, 1983). To establish that children understand particular lexical items or constructions, then, is often a difficult matter (see also Chapman 1978).

In production, children rely on rather different strategies. Rather than having to infer another's intention, they themselves begin with a particular intention they wish to convey. They then have to find the right words, and with them the relevant articulatory programs (Kiparsky & Menn 1977, Vihman 1981). If they fail to find the right words, they fall back on one of several alternatives. They may go to general purpose forms and, for picking out objects, produce demonstratives like *this* or *that*, or general purpose nouns like *thing*. And for picking out actions, they may produce general purpose verbs like *do* or *go* (Clark 1983). In both instances, children appear to intend a very precise interpretation for each utterance of such general purpose forms, a meaning only computable in the context of the utterance. Another strategy children have recourse to is the production of largely unanalyzed chunks or routines familiar from previous occasions that bear some resemblance to the present one. This results in more advanced-seeming production in some settings than one would otherwise expect (e.g. R. Clark 1974, Fillmore 1979) or inappropriate production of words or longer expressions on some occasions alongside apparently appropriate uses on others (e.g. Bowerman 1976, 1978a).

Just as in comprehension, children's strategies for producing something to convey their intentions may mislead one about how much they really intend of the words and expressions produced. A 2-year-old may produce completely well-formed questions like *Where is the ball?* or *Can I get down?* But an important clue to whether these are simply formulaic is the form of the other questions asked by the same child. The contrasts among all the interrogatives produced by the child are needed in order to assess the status of those productions that seem appropriate (cf Johnson 1981). However, eliciting and recording contrasting forms in production can be even harder than checking up on contrasting forms in comprehension. What appears critical in both cases, to distinguish nonlinguistic strategy from linguistic

knowledge, is that the child be able to contrast a range of forms in comprehension or in production, and that these contrasts correspond to those made by adults.

COORDINATING COMPREHENSION AND PRODUCTION

Everyday uses of language depend on coordinating what we can produce—to express our intentions as speakers—with what we understand as listeners. Without such coordination, we could not make full use of the conventional nature of language—that, for instance, everyone in the speech community agrees that the word *table* picks out instances of the category “table,” that an expression like *would you mind if* introduces a polite request, and so on. For a system to be conventional, such tacit agreements have to be observed by speakers and addressees if they are to use the system to communicate. We have suggested that production and comprehension do not come already coordinated. Children may understand words and expressions before they come to produce them appropriately, and they may produce many expressions that they only partially understand. One task during acquisition is to coordinate their comprehension and production.

Matching Representations

One means for matching production to comprehension would be to align certain parts of what is represented for each process. For instance, what children recognize when they hear someone say the word *apple* should contain certain elements in common with what they produce when they want to say *apple*. But this alignment takes time. Initially, young children may produce only forms like *ap* or *apu* rather than the adult *apple*. And upon hearing *ap* or *apu*, they will fail to recognize it as *apple*. On the other hand, they can recognize *apple* even when it is said by unfamiliar adults (Smith 1973, Dodd 1975). Similarly, children at the telegraphic stage of combining words are more likely to respond to more adult-like commands, favoring *Throw me the ball* over the child-like *Throw ball* (Shipley et al 1969). This suggests that children initially rely on more adult-like representations of words and phrases in comprehension that are not reflected in production, and that these representations provide a standard to which they will eventually match their own productions of those same linguistic units.

Evidence for children's representations for comprehension being closer to the adult's than those for production comes from several sources. First, it has long been noted in studies of phonological development that children can discriminate contrasts between sounds that they fail to

produce.⁶ A classic example is that of a child who correctly distinguishes the words *mouth* and *mouse*, showing comprehension of each, but produces the form [maus] for both (e.g. Smith 1973). Or consider what has been called the *fis* phenomenon. Although young children will often fail to pronounce sounds like the *sh* in *fish* or the *r* in *right* correctly, they become very upset if adults imitate the child pronunciation rather than using the usual form. If the adult says *fis*, following the child's production, the child will reject it, accepting only the adult pronunciation, *fish* (see review in Clark & Clark 1977). Children may also be capable of pronouncing the pertinent sounds, but not yet have coordinated their own production of a word with the adult's. For instance, one child who produced *puggle* for adult *puddle* at the same time produced the form *puddle* for adult *puzzle* (see Smith 1973, Macken 1980). Or consider such metalinguistic comments as *I can't say that* (usually a correct judgment) and the triumphant announcement of mastery once the child achieves the appropriate pronunciation—*I can say X!* (see Clark 1978). These data strongly support the conclusion that what children store in memory about the shapes of words is closer to the adult versions they hear than to their own productions.

A second source of support for the same conclusion is children's corrections or repairs of their own speech. Attempts at correcting one's own production could simply result in random adjustments, some getting closer to the adult forms, some departing still further from them. However, when young children repair their own pronunciation, whether spontaneously or upon request, the majority of their repairs go toward the adult pronunciation. Clark (1982) argued that these data supported the view that children relied on a standard for coordinating their production with comprehension, and that the standard was based on what children have represented in memory so as to recognize words and phrases heard from others. These representations for comprehension provide the measure of whether their own productions of words are adequate.

In setting up a standard of comparison, children presumably go through two main steps. First, they must attend to the adult output and identify recurring sequences of sounds for which they have identified potential referents. They can then set up some representation for these in memory so as to be able to recognize the same sequences on other occasions. Any new words or phrases to which children are exposed can be added to their

⁶This finding is not, of course, limited to studies of phonology, but we cite such studies because investigators in this domain have long been aware of the discrepancies between comprehension and production and have noted that children are aware of them too (cf Clark 1978).

memory store. (However, the representations children set up will not necessarily match adult ones, at least not initially, because the child may not yet know which phonetic contrasts, for example, are systematic and which accidental.) These representations then guide the children's comprehension on subsequent occasions and provide the loci to which children can add more information about meanings, reference, sound patterns for recognition, and so on. This store of representations for recognition—for identifying forms heard in the input, from whatever speaker—is continually modified and added to.

Second, these representations in memory can then be used for checking up on the children's own productions when they aim at particular targets, trying to pronounce words as they have heard them from others. But producing a word is a very different matter from hearing and recognizing it. Children may have difficulty retrieving the right words from memory, and even more difficulty, at times, once they have the right words, in producing the appropriate articulatory "programs" for each one (e.g. Kiparsky & Menn 1977). Like making tennis strokes, producing words takes practice. Children have to discover what sequences of articulations will result in the appropriate sequence of sounds. They also have to learn which adjustments have to be made as longer and longer sequences are combined within a single utterance. It is here that children rely on their representations for comprehension: they use them as the targets toward which to aim. Because these targets are represented in memory, children are not dependent on having just heard an adult rendition of the words or phrases being attempted. But to use a representation for comprehension as a target—a standard—toward which to aim in production requires that children be able to monitor what they produce, check it against the standard, and then repair it.

Monitoring Production

Evidence that children monitor what they produce comes from their repairs to their own utterances. To make a repair, children have to detect the word or construction that is mismatched to what they intended to produce. They must therefore detect the problem item and check it against their standard in order to effect some repair. Even 1- and 2-year-olds make frequent repairs, both in response to adult requests (typically *What?* or *Hm?*) and on their own. And when they make repairs, the repaired versions of their utterances are consistently closer in form to adult productions than their initial utterances were (e.g. Käsermann & Foppa 1981). Moreover, the elements that get repaired are ones in need of repair. Children do not simply change something at random when they are queried by adults.

This directionality of repair is just as evident in deliberately elicited

repairs—where adults simply said *What?* at regular intervals—as in naturally occurring exchanges (Gallagher 1977, Stokes 1977, Käsermann & Foppa 1981). These data also provide evidence against the view that children do not monitor what they say but merely remember their immediately preceding utterances and, in response to adult queries, go back to forms of language they feel more sure of. This view predicts that the direction of repair for younger children should be toward earlier forms developmentally and thus be regressive. The data show such repairs are in fact progressive. So if children can repair their own productions and do so in the direction of more adult-like forms, then they must be able to monitor their own speech.⁷

The directionality of their spontaneous repairs is also toward the adult norm (Clark 1982). These spontaneous repairs suggest that children actively monitor their own speech during acquisition, at least until it matches some standard. The standard, we have suggested, is provided by their representations for comprehension, in memory. Once children can match their productions of particular words or phrases to this standard, their monitoring presumably becomes more automatic, although it will still operate—just as it does for adults—to catch slips of the tongue or wrong word choices. The fact that children initiate repairs to their own utterances offers even stronger evidence that monitoring their own speech is not a sporadic affair. They are systematically trying to match their own productions to whatever standard they have represented in memory for comprehension, and these attempts to coordinate their production and comprehension go on even in the absence of communicative problems. This coordination of the two processes, then, appears to be an integral part of language acquisition.

Coordination in Acquisition

Coordination appears essential to any account of how children change their language during production. Their utterances, for instance, progress from simple one-word forms like *ball* or *juice* to longer more elaborate ones like *I want to play with the ball* or *Can you give me some juice?* within as little as two years. Such changes, which sometimes appear unnecessary from a communicative point of view, have long puzzled researchers in language acquisition. What motivates children to acquire the conventional forms of the language used around them? What we suggest is that the mismatch detectable between what children understand and what they themselves

⁷Although this is generally the case, children sometimes appear to go back from more advanced forms to simpler ones in production as they analyze previously unanalyzed routines (e.g. Fillmore 1979) and as they come to rely on new organizing principles discovered in the semantic relations among words and constructions (e.g. Bowerman 1978a,b).

produce during acquisition provides the impetus for such language change (Clark 1982).

To coordinate production with comprehension takes a long time. Any new information added to the representations stored for comprehension—information about systematic contrasts among sounds, among word meanings, or among word combinations—may temporarily widen the gap between comprehension and production. Children trying to coordinate the two must then narrow that gap again by adding the pertinent information to their representations for production. New routines or formulaic utterances added to the representations for production will also contribute to the gap between production and comprehension. But as children begin to analyze the pertinent forms in comprehension and set up representations of the parts and their meanings, they will both adjust their representations for production and coordinate them with those for comprehension. Each step on the road to coordination advances them toward adult-like uses of language, and not only makes for better coordination of children's comprehension with their own production, but for better coordination with other users of the same language.

To summarize, one essential part of acquiring a language is the coordination of what children produce with what they understand. This coordination is effected by matching certain parts of the memory representations children set up for production to what they already have represented for comprehension. What they understand, then, sets the standard for what they are trying to produce. Explicit evidence for such matching comes from children's recognition of mismatches, along with their skill in identifying adult over child productions, and from the repairs they make to their own utterances.

IMPLICATIONS AND CONCLUSIONS

The prevailing view of language acquisition has focused on the product (the language and its grammar) being acquired. But if we focus instead on the processes of comprehension and production, then we need to reexamine earlier assumptions about, for example, the nature of representations for linguistic knowledge that children store in memory, the effects of linguistic input from mature speakers on children's acquisition of language, and how to tell whether children have acquired particular word meanings or syntactic structures. In this section, we will take up each of these topics—three among many—and consider some of the problems raised or resolved by taking a different perspective.

Memory Representations

What do we represent in memory about the language we use every day? During the last two decades, linguists have usually assumed, either tacitly or explicitly, that speakers maintain a single mental store, a mental lexicon, that can be equated with an idealized grammar of the language. This single set of representations includes information about phonological forms and phonetic realizations of words and idioms, semantic information about the word meanings, and syntactic rules for combining linguistic units. This linguistic knowledge is the speaker's competence, in contrast to his performance—actual uses of language with all its attendant slips and errors, false starts, and mistaken interpretations. But such a view emphasizes the product—the forms of the language—divorced from the processes involved in understanding or producing utterances. This view assumes that whatever the processes invoked, they all draw on the same set of representations.

An alternative to this approach is to start from the perspective of the processes people make use of as they understand and produce language. Speakers need different kinds of information for comprehension and production. In comprehension, they need procedures for identifying dialectal, geographic, stylistic, and historical variants of their first language, access to a much larger recognition store of vocabulary than they use on an everyday basis, the pertinent acoustic information for recognizing linguistic elements, the connections each item (word, idiom, or phrase) has to other linguistic units, and the connections each has to their nonlinguistic knowledge, both generic and specific, about categories of objects, situations, and relations.

In production, speakers need procedures for retrieving words and larger units with meanings appropriate to the speaker's intentions, procedures for combining words and larger units so as to express the desired meanings, and the necessary articulatory programs for pronouncing the resultant utterances (Clark & Clark 1977). These asymmetries in the information needed for comprehension versus production hold for all speakers, but we know very little about how children learn these processing procedures or about how they store linguistic information in memory. Earlier approaches focused on the product—the language as distinct from its users—and ignored most processing considerations, including the differences between comprehension and production.

Focusing on processes in comprehension and production leads to rather different assumptions about how language might be represented in memory. For example, it seems plausible that speakers might draw on at least two sets of memory representations, one for understanding language and one for

producing it. Such an assumption would account quite neatly for the discrepancies between comprehension and production in both children and adults. As we have seen, children commonly understand more than they produce during the early stages of acquisition, and they may understand forms of language in the absence of any production. The same holds for adults. They too can understand a larger range of forms and a more extensive vocabulary than they can produce, though this may not be as obvious for their first language as it is for other languages acquired later.

One important argument in earlier discussions for postulating a single set of representations was parsimony. Why have two sets of representations where some of the information will be duplicated and hence redundant? However, what may be parsimonious for descriptions of the product of some process—here, the grammar of a language—may not be parsimonious for an account of processing. Given the enormous amount of information, linguistic and otherwise, we store in memory, there seems to be no *a priori* reason to assume that we are constrained to make use of only one set of representations for linguistic information. Parsimony, in terms of fewer elements to be represented, does not appear characteristic of human memory (e.g. MacKay 1976, Bolinger 1976, Lukatela et al 1980), so there seems to be little reason to assume it in models of processing.

In principle, of course, one cannot rule out the existence of a more abstract, single set of representations analogous to the kind of linguistic competence postulated by Chomsky (1965, 1976). However, in a processing model with representations in memory for comprehension and for production, an additional, more abstract set of representations combining all such information would appear both redundant and unparsimonious.

In short, greater emphasis on processing may lead us to different theories about how children (and adults) store information about their language, and also about the procedures whereby they make use of that information, both as speakers and as listeners. This approach, we suggest, will also lead to different theories about language acquisition itself. By way of illustration, we will briefly consider one area of research where the contrast between comprehension and production has been ignored, namely in studies of input. Ignoring process in this domain has lead researchers to make certain assumptions that oversimplify what has to be accounted for.

Language Input and Language Acquisition

What relation does language input—the language children hear addressed to them—have to children's acquisition? This question has motivated a large number of studies over the last decade or so (e.g. Snow & Ferguson 1977). In all these studies, researchers have assumed something like the following: adults expose children to particular structures; so to assess the

effects of particular inputs, one waits to see when the child in his turn produces those same structures. This "input-becomes-output" class of models, however, appears too simple once one takes into account what children must represent for comprehension compared to what they represent for production.

The initial discrepancies between comprehension and production make the effects of adult input difficult to assess directly. Children may observe and store forms for comprehension for a long time before attempting to produce them, or they may try to produce them almost immediately after hearing them. Up to now, the effects of input have been assessed only by looking at when children begin to *produce* particular forms. But a better measure of the effects of input might be what children understand. Furthermore, any effects of input will probably also depend on which systems or subsystems children are actively monitoring at that moment (Clark 1982). For instance, pronoun forms will be of little immediate use to a child not working on pronouns. And it is not clear that all children work on the same systems in the same sequence during acquisition. These factors make the precise relation between adult input and child mastery more difficult to analyze.

What is needed is some principled account of how children make use of information from input and what determines their attention to some subsystems over others at the same stage of development. This will require much more careful analysis of what might count as pertinent information from input, given the state of the child's system both in production and in comprehension (e.g. see Cross 1977). Input studies to date, however, have focused almost entirely on what children produce, and not on what children understand. Yet input necessarily has its most immediate effects on comprehension rather than production.

Assessing Acquisition

Word meanings and syntactic structures carry with them a whole network of interrelated forms and uses, connections to other segments of the language. Languages are complex systems "où tout se tient." But many, or even most, of these interconnections take a long time to build up, so that many tests of acquisition are actually only tests of part of the knowledge taken for granted in adult speakers. Researchers tend to look only at comprehension or production of core meanings without regard to the many extensions known to adults.

To assess acquisition, therefore, we need to take into account the degree of coordination between comprehension and production, as well as the gradual nature of the acquisition process itself. First, if comprehension and production are only partially coordinated for a particular domain, one

would expect children's performances to differ in tasks tapping one or the other kind of knowledge about language. Indeed, the issue of what has been acquired becomes less of an issue once we accept that mastery is attained at different points for different kinds of processing. With this perspective, differences are assumed rather than regarded as problems to be explained away. Because production and comprehension are only partially coordinated, and because acquisition is gradual, children may find some kinds of tasks easier than others, so that their performance may match the adult's in some places only. As children get older and have their production and comprehension better coordinated, such differences among tasks will become harder to detect.

While children are still acquiring particular constructions and meanings, they usually start by understanding and using forms in very limited domains. They may show some comprehension in one task but not in another, or produce the appropriate descriptions on one occasion but not on another (Hecht 1983). Children have to build up information about the range of uses possible and the different domains in which particular forms contrast. Different tasks may also lend themselves in differing degrees to children's relying on nonlinguistic rather than linguistic knowledge (e.g. Clark 1980), or on routine productions of utterances rather than on forms intended and designed for that occasion.

Language acquisition takes place gradually. Only by taking account of how children build up their representations in memory for comprehension and production can we gauge the differences between the processes of comprehension and production and study their coordination. All too many studies of acquisition assume that comprehension or production of single instances of a construction or a word meaning show that the child has acquired that form and could therefore understand or produce it in other settings. However, there is more and more evidence that learning a language looks rather like accretion of instances to small paradigms rather than global inferences based on single exemplars (e.g. Bybee & Slobin 1982).

In conclusion, we have suggested that theories of acquisition would profit from a perspective that takes account of the differences between the different demands made by comprehension and production. The study of what is acquired in language acquisition, we have argued, requires consideration of more than just the language used, it requires consideration of the novice language *user*. But to take account of language users, one needs to focus on processes as well as products. A focus on process illuminates such phenomena as discrepancies in performance from one task to another, different points of acquisition as assessed in comprehension versus production, and so on. It also complicates theories about such phenomena as the relation of adult input to child acquisition. Most crucial, though, is that

such a perspective appears essential if we are to get at the many factors that play a role in the actual process of acquiring a language.

ACKNOWLEDGMENTS

Preparation of this chapter was supported in part by the National Science Foundation (BNS80-07349) and in part by the Spencer Foundation. We are grateful to Kathie Carpenter, Herbert H. Clark, Sophia Cohen, and Susan A. Gelman for many discussions and for helpful comments on earlier drafts.

Literature Cited

- Anisfeld, M., Tucker, G. R. 1968. English pluralization rules of six-year-old children. *Child Dev.* 28:1201-17
- Baird, R. 1972. On the role of chance in imitation-comprehension-production test results. *J. Verb. Learn. Verb. Behav.* 11:474-77
- Berko, J. 1958. The child's learning of English morphology. *Word* 14:150-77
- Bloom, L., Hood, L., Lightbown, P. 1974. Imitation in language development: If, when and why. *Cogn. Psychol.* 6:380-420
- Bloom, L., Lahey, M. 1978. *Language Development and Language Disorders*. New York: Wiley
- Bolinger, D. L. 1976. Meaning and memory. *Forum Linguist.* 1:1-14
- Bowerman, M. 1973. Structural relationships in children's utterances: Syntactic or semantic? In *Cognitive Development and the Acquisition of Language*, ed. T. E. Moore, pp. 197-213. New York: Academic
- Bowerman, M. 1976. Semantic factors in the acquisition of rules for word use and sentence construction. In *Normal and Deficient Child Language*, ed. D. M. Morehead, A. E. Morehead, pp. 99-179. Baltimore: Univ. Park Press
- Bowerman, M. 1978a. Systematizing semantic knowledge: Changes over time in the child's organization of word meaning. *Child Dev.* 49:977-87
- Bowerman, M. 1978b. Words and sentences: Uniformity, individual variation, and shifts over time in patterns of acquisition. In *Communicative and Cognitive Abilities—Early Behavioral Assessment*, ed. F. D. Minifie, L. L. Lloyd, pp. 349-96. Baltimore: Univ. Park Press
- Bridges, A. 1980. SVO comprehension strategies reconsidered: The evidence of individual patterns of response. *J. Child Lang.* 7:89-104
- Bybee, J., Slobin, D. I. 1982. Rules and schemas in the development and use of the English past tense. *Language* 58:265-89
- Chapman, R. S. 1978. Comprehension strategies in children: A discussion of Bransford and Nitsch's paper. In *Speech and Language in the Laboratory, School, and Clinic*, ed. J. Kavanaugh, W. Strange, pp. 308-27. Cambridge, Mass: MIT Press
- Chapman, R. S., Miller, J. 1975. Word order in early two and three word utterances: Does production precede comprehension? *J. Speech Hear. Res.* 18:355-71
- Chomsky, N. 1965. *Aspects of the Theory of Syntax*. Cambridge, Mass: MIT Press
- Chomsky, N. 1976. *Reflections on Language*. New York: Random House
- Clark, E. V. 1973. Non-linguistic strategies and the acquisition of word meanings. *Cognition* 2:161-82
- Clark, E. V. 1978. Awareness of language: Evidence from what children say and do. In *The Child's Conception of Language*, ed. A. Sinclair, R. Jarvella, W. J. M. Levelt, pp. 17-43. New York: Springer
- Clark, E. V. 1980. Here's the top: Nonlinguistic strategies in the acquisition of orientational terms. *Child Dev.* 51:329-38
- Clark, E. V. 1982. Language change during language acquisition. In *Advances in Child Development*, ed. M. E. Lamb, A. L. Brown, 2:173-97. Hillsdale, NJ: Erlbaum
- Clark, E. V. 1983. Meanings and concepts. In *Carmichael's Manual of Child Psychology*, Vol. 3: *Cognitive Development*, ed. J. H. Flavell, E. M. Markman; gen. ed., P. H. Mussen. New York: Wiley
- Clark, E. V., Hecht, B. F. 1982. Learning to coin agent and instrument nouns. *Cognition* 12:1-24
- Clark, H. H., Clark, E. V. 1977. *Psychology and Language*. New York: Harcourt Brace Jovanovich

- Clark, R. 1974. Performing without competence. *J. Child Lang.* 1:1-10
- Cross, T. G. 1977. Mothers' speech adjustments: The contribution of selected child-listener variables. In *Talking to Children: Language Input and Acquisition*, ed. C. E. Snow, C. A. Ferguson, pp. 151-88. Cambridge: Cambridge Univ. Press
- Damasio, A. 1981. The nature of aphasia: Signs and syndromes. In *Acquired Aphasia*, ed. M. Taylor Sarno, pp. 51-65. New York: Academic
- de Villiers, J. G., de Villiers, P. A. 1974. Competence and performance in child language: Are children really competent to judge? *J. Child Lang.* 1:11-22
- Dewart, M. H. 1979. Children's hypotheses about the animacy of subject and object nouns. *Br. J. Psychol.* 70:525-30
- Dodd, B. 1975. Children's understanding of their own phonological forms. *Q. J. Exp. Psychol.* 27:165-72
- Fernald, C. D. 1972. Control of grammar in imitation, comprehension, and production: Problems of replication. *J. Verb. Learn. Verb. Behav.* 11:606-13
- Fillmore, L. W. 1979. Individual differences in second language acquisition. In *Individual Differences in Language Behavior and Language Ability*, ed. C. J. Fillmore, D. Kempler, W. S.-Y. Wang, pp. 203-28. New York: Academic
- Fourcin, A. J. 1975. Language development in the absence of expressive speech. In *Foundations of Language Development*, ed. E. H. Lenneberg, E. Lenneberg, pp. 263-68. New York: Academic
- Fraser, C., Bellugi, U., Brown, R. 1963. Control of grammar in imitation, comprehension, and production. *J. Verb. Learn. Verb. Behav.* 7:121-35
- Gallagher, T. 1977. Revision behaviors in the speech of normal children developing language. *J. Speech Hear. Res.* 20: 303-18
- Geschwind, N. 1972. Language and the brain. *Sci. Am.* 226:76-83
- Gleitman, L. R., Gleitman, H., Shipley, E. F. 1972. The emergence of the child as grammarian. *Cognition* 1:137-64
- Goldin-Meadow, S., Seligman, M. E. P., Gelman, R. 1976. Language in the two-year-old. *Cognition* 4:189-202
- Hakuta, K. 1976. A case study of a Japanese child learning English as a second language. *Lang. Learn.* 26:321-51
- Hecht, B. F. 1983. *Discrepancies in children's use of the English plural: A study of partial knowledge*. PhD thesis. Stanford Univ., Stanford, Calif.
- Huttenlocher, J. 1974. The origins of language comprehension. In *Theories in Cognitive Psychology*, ed. R. L. Solso, pp. 331-68. Potomac, Md: Erlbaum
- Ingram, D. 1974. The relationship between comprehension and production. In *Language Perspectives—Acquisition, Retardation, and Intervention*, ed. R. L. Schiefelbusch, L. L. Lloyd, pp. 313-34. Baltimore: Univ. Park Press
- Johnson, C. E. 1981. *Children's questions and the discovery of interrogative syntax*. PhD thesis. Stanford Univ., Stanford, Calif.
- Karmiloff-Smith, A. 1977. More about the same: Children's understanding of post-articles. *J. Child Lang.* 4:377-94
- Käsermann, M. L., Foppa, K. 1981. Some determinants of self-correction. In *The Child's Construction of Language*, ed. W. Deutsch, pp. 77-104. London: Academic
- Keeney, T. J., Wolfe, J. 1972. The acquisition of agreement in English. *J. Verb. Learn. Verb. Behav.* 11:698-705
- Kiparsky, P., Menn, L. 1977. On the acquisition of phonology. In *Language Learning and Thought*, ed. J. Macnamara, pp. 47-78. New York: Academic
- Lenneberg, E. H. 1962. Understanding language without the ability to speak: A case report. *J. Abnorm. Soc. Psychol.* 65:419-25
- Lovell, K., Dixon, E. M. 1967. The growth of the control of grammar in imitation, production, and comprehension. *J. Child Psychol. Psychiatry* 8:31-39
- Lukatela, G., Gligorijević, B., Kostić, A., Turvey, M. T. 1980. Representation of inflected nouns in the internal lexicon. *Mem. Cognit.* 8:415-23
- Maccoby, E. E., Bee, H. 1965. Some speculations concerning the lag between perceiving and performing. *Child Dev.* 36:367-77
- MacKay, D. G. 1976. On the retrieval and lexical structure of verbs. *J. Verb. Learn. Verb. Behav.* 15:169-82
- Macken, M. A. 1980. The child's lexical representation: the 'puzzle-puddle-pickle' evidence. *J. Ling.* 16:1-17
- Moore, K. C. 1896. The mental development of a child. *Psychol. Rev. Monogr. Suppl.* 1(3)
- Rescorla, L. 1980. Overextension in early language development. *J. Child Lang.* 7:321-35
- Rubens, A. B. 1979. Agnosia. In *Clinical Neuropsychology*, ed. K. M. Heilman, E. Valenstein, pp. 233-67. Oxford: Oxford Univ. Press

- Shatz, J. 1978. On the development of communicative understandings: An early strategy for interpreting and responding to messages. *Cogn. Psychol.* 10:271-301
- Shipley, E. F., Smith, C. S., Gleitman, L. R. 1969. A study in the acquisition of language: Free responses to commands. *Language* 45:322-42
- Slobin, D. I., Welsh, C. A. 1973. Elicited imitation as a research tool in developmental psycholinguistics. In *Studies of Child Language Development*, ed. C. A. Ferguson, D. I. Slobin, pp. 485-97. New York: Holt, Rinehart & Winston
- Smith, N. V. 1973. *The Acquisition of Phonology: A Case Study*. Cambridge: Cambridge Univ. Press
- Snow, C. E., Ferguson, C. A., eds. 1977. *Talking to Children: Language Input and Acquisition*. Cambridge: Cambridge Univ. Press
- Stokes, W. T. 1977. *Motivation and language development: The struggle towards communication*. Presented at Bien. Meet. Soc. Res. Child Dev., New Orleans
- Strohner, H., Nelson, K. E. 1974. The young child's development of sentence comprehension: Influence of event probability, nonverbal context, syntactic form, and strategies. *Child Dev.* 45:567-76
- Thomson, J. R., Chapman, R. S. 1977. Who is 'Daddy' revisited: The status of two-year-olds' over-extended words in use and comprehension. *J. Child Lang.* 4:359-75
- Vihman, M. M. 1981. Phonology and the development of the lexicon: Evidence from children's errors. *J. Child Lang.* 8:239-64
- Wetstone, H., Friedlander, B. Z. 1973. The effect of word order on young children's responses to simple questions and commands. *Child Dev.* 44:734-40
- Winitz, H., Sanders, R., Kort, J. 1981. Comprehension and production of the /-æz/ plural allomorph. *J. Psycholing. Res.* 10:259-71
- Yamada, J. 1981. Evidence for the independence of language and cognition: Case study of a "hyperlinguistic" adolescent. *UCLA Work. Pap. Cogn. Ling.* 3: 121-60