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THE PRELINGUISTIC CHILD*

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Introduction

Virtually all children begin to speak somewhere between 18 and 24 months. By the age of 3 they have mastered many of the basic syntactic and phonological components of their language. The incredible rapidity of this process in the face of the enormous complexity of linguistic systems has led many to speculate on the ontogeny of language. Various investigators have suggested that everyone acquires his native tongue in roughly the same way despite seemingly significant individual and cultural differences.

* This selection was written expressly for this volume.

In approaching the theoretical issues raised by the acquisition of language, psychologists and linguists realized that there was relatively little systematic data on language acquisition. To rectify this lack of data, psychologists and linguists over the last two decades have concentrated on experimental investigations of the child's knowledge of grammar. This research on grammatical development, stimulated by the important work of Chomsky (1957; 1965) has added much to our understanding of linguistic development. Concentrating upon grammar, however, necessarily limits one to developmental sequences commencing somewhere between 12 and 18 months. This, in turn, has led many to regard the emergence of grammatical speech at this time as the advent of "true" language (Ervin and Miller, 1963; McNeill, forthcoming, 1970.)

In what follows we will question the assertion that "true" language commences at 12 months. Specifically, are there psycholinguistically significant changes in receptive and productive abilities within the first year? Or more generally, is it appropriate to call any child "prelinguistic?" We will address ourselves to these questions by examining two theoretical approaches to the relationship between early and later language, and by presenting recent data bearing upon several questions raised by the main issue.

Different Approaches

Learning Theory Positions

The most popular view of language development is that the learning of a language can be accounted for by the same principles operating in any other learning situation. The importance of early vocal behavior is stressed. It is assumed that a child, in his initial vocalizations, produces all the sounds used in any language. Commenting on much of the early literature on the development of language, Latif (1934, p. 60) says, ". . . the random sounds first produced by an infant serve as the raw material for its later linguistic progress." According to this view, an infant begins by emitting all possible sounds only some of which are represented in his or any language.

> One cannot fail to hear all the vowels and consonants, dipthongs, aspirates, sub-vocals, nasals, german umlauts, and tongue trills, French throaty trills and grunts, and even the Welsh L. (Bean, 1932, p. 195).

Ultimately, through a process of imitation and differential reinforcement, the infant's repertoire of sounds comes progressively closer to adult speech in a particular language. Thorndike (1943) aptly termed this position the "Babble-Luck Theory" because it was supposed that as the infant

randomly produced sounds he was lucky enough to be reinforced for only those sounds which are represented in his language.

A second position within the learning tradition was proposed by Mowrer (1958) and more recently by Winitz (1968). Mowrer did not argue that the child produces all possible sounds, but instead that the sounds adults make, when coupled with increased comfort, cause these adult sounds to acquire value as secondary reinforcers. The child imitates the sounds he hears because of their reinforcing, or "comforting," value. Mowrer called this the "Autism Theory" of language learning because imitation of appropriate sounds results in a pleasurable experience for the infant.

Both of these positions emphasize the importance of early vocal behavior for later language development. In addition, they concentrate upon environmental support for the language learner via imitation and reinforcement. Consequently, both would predict large variability in linguistic development depending upon variations in environment. In addition, they would predict a smooth transition from early to later verbal behavior.

Linguistic Position

Roman Jakobson, a linguist, was struck by the lack of continuity between early vocalizations and later speech. His pioneering work, *Child Language, Aphasia and Phonological Universals* (1941), serves as the main statement of his influential theory. He agrees with most other investigators that the young infant produces a random collection of the sounds used in many languages. But he notes that this facility with sound disappears toward the close of the first year. For example, in his early vocalizations, the young infant might produce a sound which is acoustically similar to /r/. However, 6 to 8 months later when the rudiments of the adult phonological system begin to appear, this same sound /r/ is absent. This later inability to produce previously articulated sounds is not due to any motor deficiency because "one often secures the 'parrot-like' repetition of single sounds and syllables from children, even though the very same sounds continue to be absent where they talk spontaneously" (Jakobson, 1968, p. 23). Thus, Jakobson makes an important distinction between the production of a sound and the systematic use of that sound in a phonological system.

In mapping out the changes which occur in vocalizations, Jakobson observes that the stage of indiscriminate production "merges unobtrusively" into the systematic use of a small repetoire of sounds. Although several interpreters of Jakobson's theory have argued that there is an abrupt shift from one stage to the next, Jakobson seems to argue only for a gradual transition. The important point for the present discussion is

that there *is* a transition, and that vocalizations in the two stages differ in two significant respects. In addition to the fact that many fewer sounds are initially produced during the second stage, Jakobson argues that the first stage does not show ". . . any general sequence of acquisition," whereas in the second stage ". . . we observe a succession which is universally valid" (Jakobson, 1968, p. 28). Referring to this latter stage he says,

> Whether it is a question of French or Scandinavian children, of English or Slavic, of Indian or German, or of Estonian, Dutch or Japanese children, every description based on careful observation repeatedly confirms the striking fact that the relative chronological order of phonological acquisitions remains everywhere and at all times the same. (Jakobson, 1968, p. 46.)

According to Jakobson, this universal ordering is the result of a direct relationship between linguistic universals and language development. There are two universal principles of language governing the course of language acquisition. The first is a frequency principle. Not all features of language are evenly distributed. Some sounds, such as nasal consonants, are found in all languages; in accordance with the frequency principle, they appear rather early in development. Sounds which are relatively rare in languages, such as nasal vowels, occur rather late. The second principle is that secondary components of languages are never found in the absence of primary components, but primary components are found in the absence of secondary ones. According to Jakobson, primary components are always acquired before secondary components. For example, in all languages the fricatives do not exist unless stop consonants also exist, but the reverse is not true. This is manifested in human development by the fact that consonant stops always appear before fricatives. Unfortunately, he does not postulate any mechanism which could account for the relationship between these two principles and language development. He, instead, points out the important fact that these relationships do exist.

In sum, Jakobson argues that there are two distinct stages of early vocal behavior. The first shows no particular order of development and is unrelated to later language. The second follows a universal order of development and is the matrix out of which "true" language arises. Thus, he predicts that the characteristics of very early vocalizations will be insignificant with respect to later language acquisition. In addition he argues that the transition from early to later verbal behavior is marked by large qualitative and quantative changes.

The theories described above suggest opposite answers to our initial question, "Is there any such thing as a prelinguistic child?" For a con-

sideration of these contrasting answers, we must turn to the relevant data on the following topics: the development of productive and receptive abilities, the role of the environment, and the functional and linguistic significance of early language development.

Productive and Receptive Abilities

Obviously the most important data are those which give us direct information about the development of productive and receptive abilities. Only recently have laboratory procedures been used to examine the early development of these processes. Although there is a limited number of laboratory studies, there exists a wealth of observational data on the longitudinal aspects of child language to which we will also refer.

Production

Chronology of Stages. Most observers (Lewis, 1951; Lenneberg, 1967; Murai, 1960 and 1963; Nakazima, 1962 and 1966; Wolff, 1966b; see also the host of "baby biographies" mentioned later in this selection and referenced in the bibliography) generally agree that the chronology of early vocalizations can be divided into several overlapping stages, although not all agree about the defining characteristics of each stage and transitions between stages.

Stage 1: Crying. The first stage begins with the "birth-cry" and various assorted coughs and gurgles. This period is usually defined by the presence of a basic pattern of crying along with several variations (Lewis, 1951; Lieberman, 1967; Wolff, 1966b). The basic pattern, according to Wolff, is a rhythmical one consisting of a cry, a rest, an inspiration, and a rest, the whole event lasting about a second. It has a rising-falling frequency contour extending over the entire exhalation phase of the breathing cycle (Lieberman, 1967; Wolff, 1966b). The cry is present in this basic form for at least 6 months. Several variants of the basic crying pattern can also be noted. One of these, identified by parents as the "mad" or "angry" cry, has the same basic temporal sequence but is extremely loud, its excess turbulance resulting in frequency distortion. A second variant is associated with physical pain and has a much longer crying portion (Wolff, 1966b).

Stage 2: Pseudocry and Noncry Vocalizations. These begin to appear at 3 weeks and show a greater variety of temporal and frequency patterns and use of the articulatory organs than crying (Wolff, 1966b). By the end of this period (approximately 4 to 5 months) there is a large variety of noncry utterances which become increasingly distinct from crying and from each other.

Stage 3: Babbling and Intonated Vocalizations. The babbling stage is an extension and further differentiation of the previous stage. The vocalizations become increasingly speechlike. Greater numbers of clearly articulated vowellike and consonantlike sounds appear and are combined into reduplicated syllabic constructions. For the first time, seemingly adult intonation patterns are heard. Many observers have remarked on the tendency of infants to begin imitating adult speech at this point. This phase generally lasts until the end of the first year.

Stage 4: Patterned Speech. This last phase, beginning at from 9 to 12 months, is considered by many to mark the close of the "prelinguistic" period and the onset of "true" speech. According to Jakobson (1968) and Shvahckin (1948) the utterances found within this period are quite distinct from all previous utterances. There is a decrease in the large variety of phonetic forms previously heard in the child's speech. Gradually the small repetoire of remaining sounds systematically differentiates into a larger number of sounds directly related to the phonological structure of language. The child's first words begin to appear.

Continuity versus Discontinuity of Stages. One of the major differences between the learning-theory approach (continuity) and the linguistic approach (discontinuity) is their conceptualization of the transition between different stages (particularly between Stages 3 and 4). Let us now look at some data on these transitional periods. There is little disagreement with Jakobson's description of the dynamics of Stage 4. Most investigators have found the uniform and lawful progression in the development of the phonological system, which Jakobson (1968) and Jakobson and Halle (1956) outlined from an initial vocalic-consonantal distinction through a progressively finer differentiation within each class (Leopold, 1947; Nakazima, 1962 and 1966; Shvachkin, 1948; Veltan, 1943). See Ervin and Miller's review (1963) for further details.

Can the notion of successive differentiation also be applied to the transition from Stage 3, the babbling period, to Stage 4, "true" speech? Here the evidence is ambiguous. The data and observations of Jakobson (1968), Shvachkin (1948), and Bever (cited in McNeill, forthcoming) all suggest that there is no continuity between babbling and later speech. On the other hand, data collected by other investigators (Irwin, 1952; Lewis, 1951; Murai, 1960, 1963; Nakazima, 1962, 1966) do not show strong quantitative or qualitative changes between stages.

There are two conceptual problems raised by this question. The first is in deciding what constitutes a significant discontinuity. The second is

the possibility that there are some elements of language which show a continuous development and some which do not.

With respect to the first problem, the discontinuity position claims to be able to demonstrate a difference in the patterning of utterances occurring before and after the onset of Stage 4. Supporters of this position generally agree that the articulated sound segments common to Stages 1 through 3 (the "prelanguage" period) are unpatterned, randomly produced without voluntary control, and do not appear in any universal order. These investigators also point out that there is an observable decrease in the child's ability to produce many previously well-articulated sounds toward the end of the third stage. Depending on the particular sound involved, recovery of a previously well-articulated sound may take anywhere from several weeks to several years. In fact, many have observed the tendency of young children of even 5 years of age to continue to make certain regular sound substitutions. This seems to occur despite the fact that at an earlier age these children had no trouble in articulating these sounds. These observations have led Jakobson and Shvachkin to conclude that the young child has no voluntary control over his articulations and that it is only after the onset of Stage 4 ("true" language) that any voluntary control over the sound system is actually attained.

In contrast, the continuity approach claims that there is order and patterning in the utterances of the "prelanguage" period, particularly in the babbling stage, which forms the basis for later utterances. Despite Jakobson's statement to the contrary, it is our impression that there are a considerable number of developmental regularities prior to Stage 4. For example, virtually all accounts of babbling contain reference to an initial preoccupation with vocalic sounds (V), followed by consonantal sounds (C), and then CV and CVCV patterns produced with language-like intonation and rhythm. However, the fairly consistent observation that certain early sounds disappear only to later reappear in the child's systematic speech is surely troublesome for the continuity position.

With respect to the second problem, it is possible that segmental aspects (phonemes, or actual sound classes of a language) and supra-segmental information (prosodic information, that is, pitch, stress, and duration) show different developmental histories. Even if there is a significant discontinuity with respect to segmental information, there exists some information which suggests the opposite for intonation. For example, Lieberman (1967, p. 42), in a study of the basic respiration patterns involved in crying, suggests that the ". . . infant's hypothetical innate referential breath-group furnishes the basis for the universal acoustic properties of the normal breath-group that is used to segment speech into sentences in so many languages." In addition, Lewis (1951), Nakazima (1966), and even Shvachkin (1948), note the appearance and importance of intonation and its gradual transformation into adult patterns throughout the last three stages.

We would be remiss without a discussion of the distinction between production of a form and the systematic use of that form. Many would argue that in the babbling stage "sounds pronounce themselves" (Shvachkin, 1948) as opposed to being used in a systematic linguistic fashion. This argument is predicated on the assumption that there exists no such system in babbling. To the extent that no other systematic analysis of babbling besides Irwin's (1957) has been performed, we cannot eliminate the possibility that there is a highly structured system underlying babbling.

Although neither of the major theoretical positions we have discussed makes specific claims about the transitions between even earlier stages, it will be useful to examine the nature of these changes if we want to know when language begins. For example, in considering a restatement of our question ("When does language begin?") it is helpful to know whether language develops continuously from the initial crying stage. Two psychologists, Lenneberg (1967) and Wolff (1966b), have recently addressed themselves to this important question. Lenneberg distinguishes between two kinds of vocalizations: crying and cooing. The former is present at birth and appears to correspond with Wolff's description of the "angry" cry. With the exception of some minor maturational changes within this pattern, it remains virtually the same throughout an individual's life. Cooing emerges independently at 6 to 8 weeks, although it too is similar in origin to crying. It is cooing and not crying, according to Lenneberg, which develops into babbling and eventually speech. Lenneberg's main evidence for the independent genesis of these two kinds of vocalizations is his failure to observe any acoustic or articulatory similarities between them. On the other hand, Wolff's data suggest the origin of cooing or noncry vocalizations is found in crying. At 3 weeks he notes the emergence of what he calls the "fake" cry. It differs from the basic cry pattern in that it is longer in duration, different in fundamental frequency toward the middle of the utterance, and does not fall in frequency toward the end. Wolff observes that in its early stages the "fake" cry always precedes full crying, but becomes independent at approximately 6 to 8 weeks. (It is important to note that this is the age at which Lenneberg marks the onset of cooing.) It is the early temporal dependency between "fake" crying and "basic" crying that leads Wolff to believe that the former evolves from the latter. It is difficult for us to resolve the discrepancy between Wolff's and Lenneberg's findings at this point, since both researchers have made careful study of vocalizations over the same time period. Perhaps further study of the transition from the first to the second stage will clarify the issue.

An interesting source of data which gives indirect support to Wolff's

assertion that cry and noncry vocalizations are closely related is provided by Cullen, *et al.* (1968); Cullen, Fargo, and Baker (1968); and Fargo, Mobley, and Goodman (1968). These authors find that the crying of 2-year-old infants and the noncrying sounds of 6- to 19-month-old infants are similarly affected by delayed auditory feedback (DAF). That is, modification of the normal time delay between speaking and hearing what one has just said affects cry and noncry vocalizations similarly. Although they did not actually examine infants of between 3 to 8 weeks of age, the data they did collect suggest that it would be informative to do so. If, in that age range, cry and noncry utterances are similarly affected by DAF it would suggest at least a partial relationship between the two.

The Basic Sound Repertoire. As we pointed out above, a commonly held position is that the young infant's sound repertoire contains at the very least all the sounds occurring in all languages of the world. Although this claim is not important for Jakobson's approach, it clearly is of the utmost importance for the learning-theory approaches of Latif (1934), Skinner (1957), and Thorndike (1943). If it is true, the infant might either (1) begin producing all sounds simultaneously, or (2) acquire them gradually so that he has all of them before 11 or 12 months of age. All available data suggest that there is a gradual increase in the frequency and variety of sounds produced during the first year—in short, that all the sounds do not appear simultaneously (Irwin, 1957; Lewis, 1951; Nakazima, 1962; and others). There is also some evidence that the young infant has not acquired all possible sounds by the end of the first year. For example Preston (cited in Moffitt, 1968) has found that infants 10 months of age, from a variety of language communities including English, do not produce the aspirated unvoiced stop /p/ as in *pie*. This observation leads one to ask whether there aren't other sounds absent from the child's repertoire throughout this period.

Again we meet the problem of the disappearance and ultimate reappearance of many speech sounds at the end of the first year of life. Any attempt to explain language acquisition which emphasizes the early appearance of sounds and their incorporation into the child's phonological system—such as the learning-theory approach—will have to account for this phenomenon. The problem is complicated by the fact that sounds which occur relatively early in one stage, such as /r/ [as uttered in the comfort sound *ra* (Lewis, 1951)] may emerge relatively late in the next stage. It is interesting to note that the absence of previously controlled sounds is restricted to the simple wordlike utterances which begin to appear toward the end of the first year. The child may still produce these sounds in spontaneous babbling (which continues for some time after the end of the first year) and according to Jakobson's (1968) and Shvachkin's (1948) observations, he also retains his ability to imitate these sounds. Superficially, there seem to be two different sound systems in operation at this point. This fact suggests that the information-processing abilities of infants are limited. It could be that a great deal of processing is required to control an immature articulatory system well enough to produce early wordlike forms. Or, as some researchers suggest (Shvachkin, 1948), it may reflect the child's increased involvement with semantic processing, leaving less processing available for the control of production. We will return to the involvement of semantic processing in early language in a later section.

Reception

In the previous section we traced some aspects of the development of speech in the first year of life. It is important not to confuse what the child says, his speech, with what he knows about his language. Lenneberg (1962) has documented the case of a boy who, because of a congenital inability to control articulation even minimally, was unable to learn to speak. Nevertheless the child exhibited normal comprehension of language. Thus, the vocal aspects of language should be taken as symptoms of an underlying language system, rather than as the system itself.

Theoretical approaches to language acquisition have not often made explicit their views on the development of receptive abilities. Early learning-theory approaches assumed that production preceded reception, but Lenneberg's data, just referred to, cast strong doubt upon that assumption. Later learning-theory and linguistic approaches generally assumed that the child must be able to appreciate differences before he could systematically produce them. Strikingly little data were collected, however, on the ontogeny of reception or its relation to production and the underlying language system. Many investigators believed that the relationship between speech and language was rather direct and therefore saw no reason to focus on language perception. In addition, experimental techniques which could be used to examine early receptive development were not available.

Chronology. The development of the child's discriminative system is not so easily divided into stages, but it is possible to sketch a rough picture on the basis of the kinds of auditory inputs that can be discriminated at various ages.

Stage 1: The infant at birth seems to respond to some auditory stimulation. For example, Wertheimer (1961) demonstrated that an infant only a few minutes old could successfully localize sound sources. There is, in addition, a growing body of evidence on the neonate's and young infant's abilities to distinguish among sounds differing in fre-

quency, intensity, duration, temporal patterning, and location in space. (See Lipsitt, 1963; and Spears and Hohle, 1967 for a more complete description of this literature.) However, until 2 weeks of age there is little evidence that infants discriminate between voice and nonvoice inputs.

Stage 2. At approximately 2 weeks, according to Wolff (1966b), the infant begins to distinguish between voices and other sounds. His evidence is that the voice, as opposed to inanimate nonhuman sounds (for example, bells, whistles, rattles) is especially effective in arresting crying. Other investigators have noted the prepotency of the voice in eliciting smiling and vocalizations within the next month and a half (Champneys, 1881; Hetzer and Tudor-Hart, cited in Lewis, 1951; Lewis, 1951; Nakazima, 1966; Preyer, 1890; and Rheingold, 1961).

Stage 3. During a third stage beginning at the end of the second month and continuing into the third and fourth months, the infant seems to discriminate between affective qualities of utterances. Bühler and Hetzer (cited in Lewis, 1951) found that angry voices produced withdrawal responses at this age, while friendly voices elicited smiling and cooing. Similar observations are reported by Wolff (1963) and Lewis (1951). During the early part of this period we see the development of the ability to distinguish between familiar and unfamiliar voices (Wolff, 1963). The end of this stage is marked by discrimination between male and female voices (Kaplan, 1969).

Stage 4. In the fourth stage, which begins at approximately 5 to 6 months, the infant begins for the first time to show the ability to attend to and discriminate between several kinds of linguistic information. Many observers have commented on the increasing sensitivity of the infant at this stage to the intonation and rhythm of adult utterances. Kaczmarek (cited in Weir, 1966) reports that a 5-month-old Polish child made the same response to a series of utterances which all had the same overall intonation pattern whether composed of Polish or non-Polish words. In a similar experiment, Tappolet (cited in Lewis, 1951) trained his 8-month-old son to turn toward the window when he said, "Wo ist das Fenster?" Following this training he said, "Où est la fenêtre?" with the identical intonation, and the child looked at the window. Tappolet concluded that his child had been attending to the overall intonation pattern. There are many other reports emphasizing the importance of intonation to the young child.

Until quite recently it remained to be shown experimentally that young children could discriminate between alternate intonation patterns. E. L. Kaplan (1969) conducted an experiment utilizing newly developed experimental techniques for assessing perceptual development in infants.

Specifically, 4- and 8-month-old infants listened to repetitions of the sentence, "See the cat." One group of children of both ages heard half the repetitions pronounced with a rising intonation contour typical of some classes of questions—"See the cat?" On the remaining repetitions the sentence was pronounced with a falling intonation, a contour characteristic of statements and some classes of questions—"See the cat." Another group got the reverse order. In both cases the sentences contained the normal American-English stress patterns. A second group of children heard the same two intonation patterns, but without the normal terminal stress changes. Discrimination of the intonation patterns with degree of stress held constant was tested. Subjects heard a sequence of repetitions with intonation held constant, then the intonation was changed. The data were analyzed for significant changes in heart rate and behavioral orientation at the point of stimulus change. The results indicated that 8-month-old infants could discriminate the two intonation patterns when they contained normal stress assignments but not when normal stress was lacking. The 4-month-old infants could not discriminate in either case. The data seem to support the assertion that in Stage 4 infants develop the ability to discriminate normal intonation patterns.

With the exception of a study by Moffitt (1965) most of the literature suggests that at Stage 4 the child is primarily processing suprasegmental aspects of speech such as patterns of intonation, stress, and duration. Moffit's study used procedures essentially identical to those used by Kaplan (1969), but he was interested in a segmental feature of speech. He examined 5-month-olds' discrimination of the contrast between two phonemes, /b/ and /g/, embedded in a common vocalic environment (*bah* versus *gah*). The crucial acoustic basis for this discrimination for adults is an extremely short 60 msec. period in which the two sounds exhibit different spectral characteristics. (Properly speaking the difference between the two sounds is given by the differently shaped second formant transitions.) Moffit found clear evidence of the ability to make the discrimination. We will return to a discussion of this experiment in a later section.

Stage 5. Toward the end of the first year, the segmental aspects of language become more important. The child becomes able to distinguish among the various phonemes of his language. There is an astonishing lack of data on perception in Stage 5. The only systematic study of which we are aware is by Shvachkin (1948). In a rather ingeneous experiment, this researcher tested the ability of Russian children from 10 to 15 months of age to comprehend commands to retrieve certain objects. Because the names of various pairs of objects differed only in the initial phoneme, he was able to infer the kinds of phonological contrasts present in the child's system. He found that the development of the child's

phonological system proceeded very much in the order suggested by Jakobson (1968) and Jakobson and Halle (1956). These researchers appear to have independently derived this same order.

The Relevance of Early Discrimination to Later Language. There is little disagreement with the chronology sketched above. However, there is considerable disagreement about the significance of early receptive abilities in later language acquisition. The disagreement is usually focused on the transition from Stage 4 to Stage 5. Let us consider the role of intonation as an example. Some writers (Bever, Fodor, and Weksel, 1965, and McNeill, 1966b) have held that appreciation of the role of intonation can come only after the mastery of syntax. McNeill (1966b) notes that

> A widely accepted generalization about languages is that there is a close connection between phonology and syntax, especially in the imposition of intonation contours. The existence of this connection has caused some psycholinguists to suggest that intonation—which is observable in speech—might be the vehicle on which children arrive at rudiments of syntax. At first glance this is a plausible view. . . . [However] it is difficult . . . to see how intonation could guide a child to syntax; for no matter how strong the tendency is for children to imitate speech they receive from their parents, they will not imitate the appropriate feature unless important parts of the syntax have already been acquired. (1966b, pp. 52–53)

An alternative view has been presented elsewhere by Kaplan (1969). He argues that McNeill's position, and those similar to it, are based on a misinterpretation of an earlier study by Lieberman (1965). Lieberman found that when linguists were asked to identify the intonation and stress patterns in utterances using a rather complex notational system, their accuracy and reliability varied as a function of their knowledge of the structure and content of the utterances. A second finding often neglected by interpreters of this study is that increased accuracy and reliability resulted when a simpler notational system was used to transcribe the same set of utterances. This finding casts strong doubts on the arguments of Bever, Fodor, and Weksel; and McNeill.

The alternative position is that intonation could be used to provide some minimal kinds of semantic and syntactic information. For example, Lieberman (1967) has documented how intonational signals are used to define major semantic-syntactic boundaries. Speakers seem to adjust their speech rates and respiratory cycles in such a way that the onsets and offsets of intonation contours (or, in Lieberman's term, Breath-Groups) occur primarily at sentence boundaries or major phrase boundaries within sentences. In addition, speakers seem to exploit the use of intonational signals at points of potential ambiguity in sentences. Lieberman's data suggests to us that listeners could rely on such information in decoding language. Conceivably an infant tuned to detecting intonation patterns could begin to isolate semantically and syntactically important aspects of messages on the basis of intonation. [See Kaplan (1969) for more complete documentation of this argument.] Braine (1963a) and others take a stronger position, apparently suggesting that intonation is a vehicle by which a child might learn some rather subtle syntactic distinctions in his language. All we mean to suggest is that the early appreciation of intonation might provide infants with a primitive way of segmenting an otherwise continuous stream of sound. We are inclined to believe that the attention to intonation in Stage 4 marks a significant stage in language acquisition.

Continuities and Discontinuities in Receptive Development. Information on continuity between early stages of receptive development does not distinguish between the two major approaches to language acquisition as easily as did information on the stages of production. This is primarily because, as we noted earlier, the advocates of neither approach concern themselves with reception. We can speculate, however, that if elaborated to include reception the theories would emphasize either continuity (learning theory) or discontinuity (linguistic approach) between stages.

With respect to this issue it is interesting to consider the transition between the first three stages and Stage 4. We noted earlier that the second stage was characterized by attention to the voice, the third by discrimination of affective tone, and the fourth by discrimination of suprasegmental patterning. Let us look into the possibility that there is some uniform characteristic linking these three stages.

For reasons which we do not fully understand the young infant at around 2 weeks of age (Stage 2) shows more interest in the human voice than in other sounds. It could be, as Lewis (1951) and others before him have suggested, that this interest in the voice is innate: the infant may come equipped at birth with the ability to discriminate species-specific sound patterns (Marler and Hamilton, 1966). Or it may be, as Mowrer (1958) suggested, that by 2 weeks the infant has learned to associate the presence of a nurtural caretaker with the human voice. Be that as it may, discrimination of human from nonhuman sounds alerts the child to the specific affective properties of the voice. It is likely that there is at least some overlap between the acoustic properties which differentiate between, for example, angry and pleasant expressions and those which underlie the suprasegmental system. If this is the case, then detection of these properties in the context of different affective states will point the child toward, and perhaps even sensitize him to, the systematic use of suprasegmental features and all the subsequent information which he is directed to through intonation. Thus, we are arguing

that with respect to at least some receptive aspects of the child's language system it is possible to find antecedent events as early as 2 weeks. This argument, in many respects, agrees with Lewis' (1951) approach to the ontogeny of language.

Lieberman (1967) also argues that the roots of the intonation system are present at birth with the "first" cry. However, according to him, attention to intonation does not differentiate out of attention to affective qualities of speech; instead, intonation is salient to the child because it is present in his own earliest vocalizations, being determined by properties of the efferent nervous system.

> . . . during the first minutes of life children employ "meaningful" intonational signals. The cries are at first meaningful only in that they have a physiological reference. We believe that these signals, which appear to be innately determined, provide the basis for the linguistic function of intonation in adult speech. (1967, p. 41)

It is clear that Lieberman believes that the development at least of intonation is a continuous process. Although he does not take a strict "motor theory" approach, it is not clear what he feels the consequences for reception would be of not being able to produce normal intonation patterns, or any speech for that matter. It would be interesting to know how Mongoloid children perceive intonation patterns. According to Lieberman they do not exhibit the cries characteristic of normal neonates which ultimately lead to normal adult intonation.

There do not seem to be any data or observations suggesting discontinuities between Stages 3 and 4. The difficulty is that most investigators of receptive development have started their discussion with Stage 4. Generally speaking, observers note that receptive control over the suprasegmental system (Stage 4) emerges before the child gains equivalent control over the segmental system (Stage 5), (Fry, 1966; Kaplan, 1969; Lenneberg, 1967; Lewis, 1951; Shvachkin, 1948; Zhurova, 1963). For example, Lewis distinguishes the following 3 stages:

> 1. At an early stage the child shows discrimination in a broad way, between different patterns of expression in intonation.
> 2. When the total pattern—the phonetic form together with intonational form—is made effective by training, at first the intonational rather than the phonetic form dominates the child's response.
> 3. Then the phonetic pattern becomes the dominant feature in evoking the specific response; but while the function of the intonational pattern may be considerably subordinated, it certainly does not vanish. (1951, pp. 115–116).

However, Moffitt's (1968) data, referred to earlier, are an apparent exception to this trend. In light of all the observations to the contrary, it is surprising that Moffitt's 5-month-old subjects were able to discriminate the acoustically subtle distinction between *bah* and *gah*. It is possible to argue that Moffitt's subjects were making a phonetic rather than a phonemic discrimination—that is, discriminating on the basis of continuous differences along the sound spectrum rather than classifying the two sounds as categorically different. Stating this rather simply, it is possible that the discrimination was not a language-specific one. In order to demonstrate that the discrimination was phonemic it would be necessary to show that allophonic variations (specifically, acceptable variations of a phoneme) are not perceived as being different from that phoneme. For example, it would be necessary to demonstrate a discrimination between the two phonemes /b/ as in *bah* and /g/ as in *gah* but not between the /b/ in *bah* and its allophone /b/ in *tab*. A similar observation can be made about Kaplan's (1969) study of intonation. However, since the results are consistent with most other observations the question does not seem as critical.

What preliminary conclusions can we draw concerning the two main approaches to early language development outlined earlier? There is evidence for some continuity of development in the discrimination and production of suprasegmental aspects of language, and this evidence would seem to favor the learning-theory approach. However, it seems hard to reconcile the evidence that there are ordered sequences of development with such an approach. This latter evidence is of course consistent with the linguistic approach associated with Jakobson, although there are suggestions of even more regularity in development than he would have predicted. The disappearance and subsequent reappearance of certain sounds toward the end of the first year cast doubt upon all the learning-theory approaches discussed. Other observations concerning the presence of language in certain clinically interesting patients and the apparent fact that infants do not produce all sounds further question the validity of most learning-theory approaches. It seems unlikely that either approach can adequately account for the data on production and especially reception. However, there remain two other important issues which require discussion before we can confidently complete our evaluation of these two theoretical approaches.

Role of the Environment

A complete understanding of the course and nature of language acquisition must include a description of the role of the environment. It plays a role, of course, for at some point the child acquires the ability to

communicate in his "mother tongue." Theorists disagree widely, however, on how the child manages to "lock in" on his language community. The traditional learning theorist assumes that all the requisite linguistic information is made available to him by the speakers in his environment. The child begins with no knowledge of his language and by means of a combination of imitation, selective reinforcement, and generalization gradually grasps the substance of his language. Others have been less convinced of the efficacy of the environment in shaping the acquisition process. Recently, many linguists and psycholinguists, have pointed out that there are both empirical and theoretical problems surrounding such a position (Chomsky, 1959; Lenneberg, 1967; McNeill, 1968). They have suggested that children are born with a biologically based, innate capacity for language acquisition which includes considerable knowledge about universal aspects of language. The role of the environment, then, is to provide information about particular languages.

In evaluating these positions we will discuss evidence relating to the influence of the linguistic context and the behavioral environment in which early language acquisition takes place.

The Role of the Linguistic Context

In discussing the influence of the linguistic environment on the early acquisition process, it is important to focus on aspects of language which characterize particular languages. The absence of such data on this suggests that observers have noted no significant early developmental control over these aspects. There are only two recent studies which suggest the appearance of characteristics specific to individual languages in the first year of life. Weir (1966) examined the babbling of 6-month-old infants from monolingual American-English, Chinese (Cantonese), and Russian families for evidence of differences. Her impression was that the vocalizations of Russian and American infants differed from those of the Chinese infants, especially in intonation and stress patterns. Although there seem to be some technical problems in the design of this experiment and the subsequent scoring, a similar experiment by Tervoort (cited in Weir) lends support to this major finding. Tervoort found that the babblings of American and Dutch infants were discriminably different to naive observers. Unfortunately, it is unclear on what basis his judges were able to make this discrimination.

The suggestion that productive control of intonation is one of the earliest appearing characteristics of a particular language is confirmed by Nakazima (1966). He compared spectrograms of the vocalizations of American-English and Japanese infants from early infancy to around 5 months of age. The earliest difference he could detect was in intonation at about 1 year.

Failure to find evidence for the acquisition of features which characterize particular languages does not indicate that the linguistic context has had no effect. It is entirely possible that the early role of the linguistic context is to transmit information about universal aspects of language, or, if the child already possesses this knowledge, to serve as a release of such information. Some of the data on production and perception which we reviewed earlier (Kaplan, 1969; Lieberman, 1967; Moffitt, 1968; Shvachkin, 1948) suggest, in accordance with Jakobson (1968), that it is indeed those universal aspects of language which emerge earliest.

The Role of the Behavioral Environment

While it is clear that the people as well as the voices that surround a child must be important, it is not at all clear of what relevance they are to language acquisition. Learning-theory approaches to language acquisition have placed much emphasis on the way others respond to sounds the child makes. According to one group (Latif, 1934; Skinner, 1957; among others) the infant emits vocal responses which are selectively reinforced according to their similarity to adult speech. A second approach (Mowrer, 1958; Winitz, 1968) claims that the infant imitates the speech sounds he hears and his caretakers positively reinforce any infant vocalizations similar to adult speech. Both of these theories rely heavily upon the principles of imitation and reinforcement. Let us now consider some aspects of these notions, as applied to early language acquisition. A study by Rheingold, Gewirtz, and Ross (1959) found that it was possible to increase the frequency with which vocalizations occurred in 3-month-old infants by the use of social reinforcement. Other studies (Routh, 1969; Wahler, 1969; Weisberg, 1963) have attempted to extend this analysis. Generally these studies demonstrate only that it is possible to increase or decrease the frequency with which a given type of already present vocalization occurs. They cannot account for the occurrence of new forms. In addition, as Wahler points out in discussing his results, there is evidence that in a natural situation mothers reinforce vocalizations indiscriminately, not differentially. Indeed, parents may sometimes reinforce vocalizations which will be inappropriate at a later date. This certainly seems to be the case with "baby talk." Thus, there are at least empirical reasons for rejecting the selective-reinforcement approach.

There are even more serious theoretical reasons. For one thing, how can this approach explain the universal ordering of development in productive and receptive systems? It seems unlikely that any parent is familiar enough with the distribution of linguistic features across languages to construct the appropriate reinforcement schedule. What about the fact that, despite widespread variation in socialization practices, the

initial stages of language acquisition seem to proceed relatively uniformly (Irvin, 1957; Lenneberg, 1967)? Finally, the rapidity and complexity of even the initial stages of a language-acquisition process seem to us to argue that reinforcement alone is not a sufficient condition for language development.

There are also empirical and theoretical objections to the idea that imitation is essential for language acquisition. Lenneberg and his colleagues (1967; 1965; 1964; 1962) recorded the vocalizations of children of deaf and hearing parents from birth to the end of the third month. If imitation were important during this period the vocalizations of the children with deaf parents should be considerably different from the vocalizations of children born to hearing parents, but the crying and cooing sounds of the two groups were identical. The result was the same in the case of a deaf child born to deaf parents. Lenneberg's report of the congenitally inarticulate boy who showed normal comprehension is another indication that example of imitation is unnecessary for language acquisition.

Furthermore, it seems hard to account for the side-by-side existence of two phonological systems toward the end of the first year within the framework of a theory of imitation. Presumably the language environment from which the child selects material to imitate remains constant while his productive system is undergoing significant reorganization. There are also changes in the receptive system and, short of any elaborate mediational approach, it is hard to see how imitation and reinforcement could account for these changes. Finally, it is often pointed out that the principles of imitation and reinforcement are not very useful when trying to deal with the generative aspects of language, be it phonology, syntax, or semantics.

Summarizing the above discussion, it appears that the traditional learning-theory approach to the role of the environment in language acquisition is inadequate. In our opinion a revision of the concept of reinforcement and imitation will not help; a whole new set of explanatory concepts is needed. Unfortunately, there do not seem to be any psycholinguistic or learning theoretic approaches rich enough to deal with the phenomena at hand.

The Functional and Linguistic Significance of Early Language Development

Traditionally the infant's first year has been seen as a laborious, hard-fought battle to adapt to the environment. Perceptually his world was assumed to be, as William James put it, "a blooming buzzing confusion." We have reason to believe that this is not at all an adequate representation of the infant's perceptual and cognitive abilities (Bower, 1966b). In our opinion there is evidence that it is not an accurate representation of his language abilities either. In the preceding sections we presented data indicating that the process of language acquisition, at least with respect to some features, begins perhaps as early as the first few weeks of life. However, our discussion was almost entirely restricted to the phonological system and, to a very limited extent, the semantic-syntactic systems.

In this section we want to speculate further on the development of the semantic system. Many investigators (for example, Ervin and Miller, 1963; McNeill, forthcoming; Mowrer, 1958) mark the occurrence of the first word as the beginning of this system. This would have a certain methodological value in that we could then look at distributional data on the use of these early words and infer from this data what the child's semantic system amounts to. However, in our view this would result in a severe underestimation of the child's semantic structure. For example, if the young infant's semantic system were more highly developed than his phonological system, then estimates of his semantic system which were based on his phonological system would certainly be inaccurate. Putting it somewhat differently, although we can infer facts about the child's semantic system from the way he uses words, the absence of conventional words does not necessarily indicate the absence of an underlying semantic system.

How are we to gather information about the child's early semantic system? One possible way is to consider the development of communicative functions in the child and try to infer possible semantic organization. We do not mean to suggest that the semantic and communicative systems are identical; rather they share some properties. We will sketch an extremely tentative chronology of the development of communicative functions, based primarily on the observations of a number of "baby biographers" (Darwin, 1877; Kirkpatrick, 1910; Leopold, 1947; Lewis, 1951; Major, 1906; Moore, 1896; Preyer, 1890; Stern, 1924).

By *communicative functions* we mean the systems by which information is transmitted between the child and his environment, including everything from crying to pointing to speaking. The crucial aspect of such systems is that they have a set of differentiated "messages." From birth we find such differentiation of messages in crying. Wolff's study (1966b) demonstrated that the child has a repertoire of different cries which communicate distinct messages about the infant's state. What is more, he confirmed the common observation that mothers can discriminate between the various cries. From about 2 weeks old, observers note the infant is able to discriminate speech from nonspeech sounds. Somewhat later what appears to be voluntary control over the frequency and type of vocalization emerges. The frequency of vocalization increases in

the presence of other people, and the child appears to vocally interact with others in his environment. At the same time the child seems to distinguish between familiar and nonfamiliar faces and voices, and responds angrily to removal of a favorite toy. During this period babbling-type sounds which appear to be contextually defined emerge. The context consists of the momentary environmental situation as well as gestures and intonation. During the final period, we see a progression of wordlike forms which begin to phonologically approximate adult words. Semantically, these initial words may be very different from adult usage and appear to be rudimentary sentences or "sentence-words."

This rough sketch suggests that there is a progressive differentiation and elaboration of the communicative system. It might be argued that it cannot represent the beginnings of a true, symbolic semantic system. Since many of the early "messages" are tied to the affective state of the child, one might conclude that they do not possess the requisite symbolic aspects which characterize semantic systems. But we are inclined to believe that only a very parochial view of semantics would allow that conclusion. Most current linguistic theories recognize that an adequate semantic-syntactic theory must include distinctions which reflect universal properties of the environment and events in that environment, including affect (Chomsky, 1965b; Fillmore, 1968; Katz and Fodor, 1963). We assume that if we can show that important distinctions about the environment and the events within it are present early in the development of the child's communicative system, there is every reason to believe that those distinctions are also part of the child's emerging linguistic competence.

Although we are severely limited by lack of data, we want to present a few examples of features likely to be present in the early semantic system. Our identification of these features, their developmental ordering and the relationships between them should be taken as highly provisional. A similar approach has been suggested by Ingram (1969) who has attempted to adapt Fillmore's (1968) "case system" to descriptions of child language. He is interested in an analysis of early syntactic development, whereas we are at present primarily concerned with an analysis of early semantic development.

One of the early distinctions seems to be between human and nonhuman. We might represent it as "± human." Evidence for this discrimination is the differential response of the infant to voices versus other sounds. An initial differentiation of self versus other, which could be marked "± ego," is suggested by the very early effect of DAF on crying, indicating that the infant can distinguish between his own voice and other sounds. The ability of infants to manipulate the meaning of what superficially appears to be the same phonetic form by the application of different intonations and gestures suggests that the infant realizes his communicative control; this generative use of intonation and gesture could be taken as evidence for further differentiation of the "± ego" distinction. The child's realization that he can affect his environment by his speech must surely mark an important step in his cognitive and linguistic development. A highly related development probably occurs slightly later when the infant becomes able to differentiate vocally between requesting and rejecting objects not directly relevant to his "state." We can represent this as "± request."

At the same time it is possible that there are similar developments with respect to the child's knowledge of object properties. Recently Wolff (1966b) has reported that 2-month-old infants seem to respond specially to the presence of favored toys. We could take this, together with other effects of familiarity, as evidence for the marking of "± presence" of an object. It is interesting to note that at approximately the same age Bower (1967) reports that infants discriminate between ecologically possible disappearances of objects versus nonecologically possible disappearances. Thus we might have evidence for a distinction "± presence" which is joined with "± existence."

There is other evidence which suggests the existence of marked distinctions such as "± caretaker," "± female," and "± past." There is reason to suspect the existence of many more such contrasts. For example, it would be interesting to know when the distinction "± agent" appears. Ingram (1969) suggests that this distinction appears around 15 months. This is an important distinction in the realm of both semantics and syntactics, because it requires the synthesis of object and event distinctions. In general we expect to find continuous changes in the ordering, priority, and interrelationships of various semantic features. Observation of such changes can tell us much about the principles underlying the evolution of semantic systems.

Of course this is all highly speculative. Considerably more experimental work is needed before we can conclusively say when the child possesses control over these distinctions. Such work would need to pay careful attention to the possible use of intonation, gesture, context, and so forth in early semantic systems. Earlier we discussed the use of intonation and gesture as devices for marking semantic differences. A recent unpublished study by Charrow, Ingram, and Dil (1969) suggests that context is also very important for understanding what children mean. They selected twenty-five 2- and 3-word utterances from Leopold's biography of his daughter's language between 19 and 23 months. Leopold had noted the context in which each utterance was spoken so that it was possible to assign a "correct" interpretation. Charrow, *et al.*, gave the twenty-five utterances, out of context, to three groups of judges—linguists, mothers, and graduate students—who were asked to interpret them. For only 36 percent of the utterances did the judges assign the correct inter-

pretation. Presumably the effect of context is even greater with "1-word" utterances.

In the absence of further work, it seems reasonable at the present time to hypothesize that the child's semantic system develops continuously from early distinctions present in his communication system. Thus we again find some evidence for very early beginnings of child language. Neither of the two major approaches to early language acquisition considered that the child's semantic system began this early. Although the evidence does not allow us to choose between the two positions, it seems likely that analyses of early semantic development will put significant constraints on any new approach to language acquisition.

Concluding Remarks

We began by asking, "Is there such a thing as a prelinguistic child?" In answering this question we considered two major approaches to early developments in the child's language system. What can we conclude about the relative merits of these two approaches? The assumptions, characteristics, and mechanisms of the learning-theory approaches do not seem able to accommodate the bulk of the available data. On the other hand, though the linguistic approach illuminates many important and empirically documented trends in the early development of language, it does not provide us with any hypotheses about the underlying mechanisms which could account for language acquisition. In addition, it posits a strong discontinuity in development for which there is only marginal empirical support.

In answering our question we have also examined the evidence that language functions develop continuously. In our opinion there is evidence for significantly more continuity than has previously been supposed. In any event, it has become increasingly clear that the first year is a significant period for language acquisition. Of course, much more work is needed. We need more analyses of the changes in receptive abilities which take place during the first year. It would be helpful to have better analyses of early vocalizations, including babbling, with particular emphasis on the role of suprasegmental and contextual features. Additional data on language development in children from different language communities as well as children suffering from congenital abnormalities is needed to give us information on the interplay between universal and environmentally determined aspects of language.

Finally, a crucial but often neglected domain is the early development of the communication and semantic systems. Aside from the relevance of semantic developments to the "continuity" question, this issue may be important in answering the interesting question of what motivates

changes in the developing linguistic system. For example, Shvachkin (1948) has suggested that semantic development motivates phonological change. It is even possible to speculate that the semantic system is the most highly developed language system during the first year of life. Attention to concurrent changes in early semantic systems and other cognitive systems is likely to be crucial to any real understanding of language acquisition. Although all these questions must ultimately be answered, it seems reasonable to conclude at this point that there is probably no such thing as a prelinguistic child.