Journal of Psycholinguistic Research, Vol. 4, No. 1, 1975

Is Language Acquired Through Imitation?

Grover J. Whitehurst[1] and Ross Vasta[1]

Received October 10, 1973

The role of imitation in language acquisition is examined, including data from the psycholinguistic, operant, and social learning areas. From the psycholinguistic data, four empirical statements have been extracted: (1) there is no evidence that spontaneous imitations of adult speech influence grammatical development, (2) imitation of speech does not appear to occur with frequency beyond age 3 years, (3) speech and hence imitation are not necessary for the comprehension of linguistic structures, and (4) most utterances of a child are novel and therefore could not have been exactly modeled. The first and second propositions are seen to be based on a too restrictive definition of imitation–immediate and exact copying. Selective imitation–a functional relationship involving similarity of a particular form or function of the model's responses–is proposed as an alternative, thus leaving the validity of statements (1) and (2) in question. Concerning assertion (4), certain data from the operant literature are presented as evidence of the compatibility of novel responding and modeling, imitation, and reinforcement. Finally, it is proposed that statement (3) suggests a mechanism by which selective imitation can be understood. A three-stage process is proposed in which comprehension of a grammatical form sets the stage for selective imitation of that structure, which leads in turn to spontaneous production. Thus imitation is a process by which new syntactic structures can be first introduced into the productive mode.

INTRODUCTION

Imitation has always been thought to play an important role in problems of child development. The process of language acquisition has been no exception

Preparation of this paper was supported in part by Biomedical Sciences Support Grant No. 31-8241-F to the first author. Reprints may be obtained from the first author at Department of Psychology, State University of New York at Stony Brook, Stony Brook, New York 11790.

[1]Department of Psychology, State University of New York at Stony Brook, Stony Brook, New York.

in this regard (Allport, 1924; Holt, 1931). However, early approaches often confused product with process. While the increasing similarities between a growing child's speech and the speech of his caretakers were noted, such products were necessarily ascribed to an "imitative" process. It has since been recognized that the behavior of two people may come to be similar without that similarity being properly described as imitation. For example, two people approaching a street corner may come to a halt in close succession. It is likely, however, that the commonality of behavior is due to environmental constraints–e.g., in this case passing traffic–rather than to an imitative mechanism. The relevance of this example to language acquisition is important. A broad matching relationship between the syntax or phonology of an adult's speech and that of a child is not evidence that the child is imitating or has imitated the adult. In ignoring this distinction, early theories suggested a role for imitation in language acquisition which was not, in fact, supported by data.

Recent research has attempted to focus on the imitation *process* rather than on general similarities in product. In so doing, a variety of new questions and issues have arisen with regard to the role of imitation in language acquisition. At present, opinion on the matter ranges from suggestions that imitation plays, at most, a very limited role to suggestions that it may, indeed, be critical for language learning.

Unfortunately, it is too often the case in psychology that researchers from one "school" of approach appear unaware of or uninterested in the data generated by other approaches. This appears to be especially true in the present case. The literature review to follow will examine studies that have been generated by several theoretical positions. From the analysis of the totality of these data, no definitive answers will emerge. However, the confluence of the several approaches does suggest that new questions are in order.

The question of the interrelationship of the acquisition of syntax and the process of imitation will be the focus of this review. While the importance of phonology and semantics is acknowledged, the critical issues are highlighted in the area of syntax, most work having been done there. Additionally, this article is aimed at an understanding of the processes responsible for language acquisition as it occurs in the normal environment.

THE PSYCHOLINGUISTIC STUDIES

While "psycholinguistics" can be a generic term which subsumes all of the studies reported in this review, its use here is restricted to the work of

psychologists that has been influenced by Chomsky's (1957) transformational grammar position. As previously noted, modern investigators have attempted to restrict their use of the term "imitation" to the process in which there is actually a functional link between the behavior of one individual (the model) and the subsequent similar behavior of a second individual (the observer). This aim has been pursued in different ways. The psycholinguists, who have, by and large, conducted observational, nonexperimental studies, have adopted an operational definition of imitation that seeks to lower the probability that matching verbalizations observed in two individuals are only "accidentally" related. This has been accomplished by restricting attributions of imitation to those situations in which the vocalizations of an observer occur in close temporal proximity to those of the model. In addition, a more or less precise match between the model's vocalizations and those of the observer (as judged by the experimenter) has been required. Thus, in choosing not to use the typical experimental-manipulative methods for assessing the occurrence of imitative behavior, these investigators have opted for a restrictive operational definition by which "false-positive" counts of imitation are assumed to be held to a minimum. The consequences of this type of definition will be discussed in a later section. For now, the reader should note that imitation in the following studies means immediate and exact copying.

An early study by Fraser *et al.* (1963) suggested that imitation could well play an important role in language acquisition. They compared 3-year-old children's responses to ten grammatical contrasts in three tasks. For each contrast, such as direct-indirect object, a pair of sentences and a pair of corresponding pictures were constructed which differed only in respect to that contrast: e.g., "The girl shows the dog the cat" and "The girl shows the cat the dog." In the imitation task, the experimenter recited the sentence pairs and after each asked the child to repeat it. In the comprehension task, the experimenter recited both sentences and presented both pictures, although not necessarily appropriately paired. The experimenter then repeated the sentences and, in turn, asked the child to point to the correct picture. The production task also stated with unpaired presentations of pictures and sentences, after which the experimenter pointed to each picture and asked the child to describe it. For all ten grammatical features, the imitation scores were substantially higher than the comprehension scores, which were in turn higher than the production scores.

Lovell and Dixon (1967) replicated the procedures of the Fraser *et al.* study with normal 2- to 6-year-olds and retarded 6- and 7-year-olds. The same relationships were found: imitation exceeded comprehension, which exceeded production. The implication, therefore, is that imitative language appears earlier than corresponding comprehension and production abilities.

Ervin (1964), however, objected to the extension of these data to language acquisition in the normal environment. She noted that in the Fraser *et al.* procedure the children had been *asked* to imitate, while the issue for language acquisition is the relationship between *spontaneous* imitation and comprehension-production. Ervin collected samples of the spontaneous speech of five children occurring in the presence of adult experimenters. These procedures were not reported by Ervin in detail, although it seems likely that the experimenters attempted to interact as naturally as possible with their subjects. The utterances of the children were divided into an imitative category, consisting of immediate and exact repetitions of adult utterances, and a spontaneous category, consisting of all other utterances. A grammar was then written for the spontaneous category of vocalizations for each child and applied to the imitative category. Ervin reasoned that if imitative responses were more advanced than spontaneous utterances the grammar written for the latter category would not be consistent with the imitative utterances. In fact, the spontaneous-category grammar adequately accounted for both categories of utterances. Ervin thus concluded that "there is not a shred of evidence supporting a view that progress towards adult norms of grammar arises merely from practice in overt sentences" (1964, p. 172).

There are a number of problems with this study—the author herself noting that the procedure was exploratory and the results only suggestive. First, the "spontaneous" nature of the utterances may be questioned since the children were interacting with strange adults. One can also question the grammar that was used to score sentences, since all grammars are arbitrary, at least in terms of specificity. In addition, a grammar written on the imitative utterances and applied to the spontaneous category might possibly have produced different results. However, of paramount importance is the limitation that the definition of imitation used in this study systematically distorted the data. This point will be enlarged on in a subsequent section.

These questions suggest that Ervin's data, at best, do not permit unequivocal conclusions about the role of imitation in the acquisition of grammar. However, her observations are not the only evidence related to the implications of the original Fraser *et al.* study. A number of investigators have observed that if a child is requested to imitate a sentence that is considerably longer than sentences he is currently producing spontaneously his attempt at imitation will be distorted. The distortion will take the form of conversion of the adult sentence into one or more sentences consistent with the grammar used in the child's spontaneous speech. For example, Slobin and Welsh (1967) reported the following exchange: [Adult] "John who cried came to my party." [Child] "John cried and he came to my party." Similar findings

appear elsewhere (Henrie, 1969; Labov *et al.*, 1968; Menyuk, 1963). Because the distortions take the form presented above, McNeill concluded that "imitation thus plays no role in the acquisition of new transformations" (1970, p. 1114).

Clearly, the appropriateness of the previous conclusion can be questioned. The demonstration that children cannot accurately reproduce long utterances or utterances that far exceed their comprehension competence does not preclude their imitating utterances which exceed, but are still relevant to, their current grammatical skills. Indeed, the Fraser *et al.* (1963) study illustrated just this point.

Data on the frequency of imitation by children at particular ages are also relevant to the role of imitation in language acquisition. Unfortunately, there are no large-scale systematic studies of this relationship. However, based on observations of three children (Brown and Bellugi, 1964; Brown *et al.*, 1968), a rough estimate may be attempted. Between the ages of 28 and 35 months, children imitate approximately 10% of the adult utterances they hear. This figure drops to 2-3% by age 3 years. Although no data bear on imitation at later ages, it is reasonable to assume that the percentage drops still further. But it must be once again stressed that the imitation referred to here is the immediate mimicry previously discussed.

Within the category of imitative behavior frequently observed between the ages of 2 and 3 years, interest has focused on a particular type of imitative exchange termed an "expansion." In expansion, a child initially produces an utterance which is grammatically incorrect by adult standards: e.g., "The doggy goed home." The parent follows with a model of the correct form: e.g., "No, son, the doggy went home." The exchange may end at this point or the child may immediately copy the corrected utterance. The first study of expansions was reported by Brown and Bellugi (1964), and further reports derived from the same data base have been made by Brown *et al.* (1968). Many of these data have also been summarized by Slobin (1968). Between the ages of 28 and 35 months, almost 30% of the individual utterances of the three children studied resulted in expansions by the parents. Fifteen percent of the imitative behavior of the children was in response to parental expansions. Fifty percent of these expansion-imitations added important grammatical characteristics to the child's original utterance. These observations suggest that grammatically relevant imitative behavior is occurring in 2- to 3-year-olds. However, whether the expansion sequence advances linguistic development is not clear.

In an attempt to answer this question, Brown *et al.* (1968) compared the linguistic development of their three subjects with the frequency of

expansions provided by the subjects' parents. The measure of linguistic development was the grammatical complexity at a given utterance length. According to this measure, Sarah, the subject receiving the fewest expansions, showed the most grammatical development. This finding, of course, would not be expected if expansions were playing a critical role in syntactic development. However, as McNeill (1970) suggests, the measure of grammatical development may have been inappropriate. If grammatical complexity is measured against chronological age, instead of mean utterance length, then Sarah would have, instead, been the least grammatically advanced. Moreover, this study focused on adult reactions to the child's initial incorrect utterances and not on the child's attempts to imitate these parental expansions. The Brown *et al.* observations are, therefore, only indirectly relevant to role of imitation in language acquisition.

Other studies of expansions have also been concerned with the adult's reaction to the child rather than the child's imitation of the adult's reaction. Cazden (1965), for example, contrasted expansions with conversational replies. One group of 2½-year-old children talked to an adult about picture books during daily sessions over a period of weeks. Every comment made by a child was expanded by the adult experimenter. For a second group, the adult responded to every comment of a child with a relevant conversational reply that did not expand or correct the grammar. A control group received no treatment. Pre- and post-tests of grammatical skills were given to all children. Both treatment groups were found to improve more than the controls, with the more dramatic gains occurring in the group receiving conversational replies. Again, however, no attempt was made in this study to directly examine the nature and frequency of imitative responding by children in different groups. So, although the results have been interpreted to be relevant to imitation, they are not directly so.

Any theory of language acquisition which relies on interactive exchanges between the vocalizations of the child and the parent must confront Lenneberg's (1962) case report of language understanding in the absence of speech. The subject of Lenneberg's article was a male child who was physically incapable of speech but able to demonstrate mature comprehension of the grammatical complexities of speech. Similarly, Whitehurst *et al.* (1972) presented data on a physiologically normal child with severely delayed speech development who scored within the normal range on a test of language development based solely on comprehension. If these observations are not to be taken as isolated instances, they suggest that abstraction of the grammatical features of language can occur in the absence of imitation.

Another point to be drawn from studies by psycholinguists is that the

vast majority of the sentences that children produce have not, in their totality, been previously heard. Yet these novel utterances display consistent grammatical regularities (Brown and Bellugi, 1964). Examples range from sentences that diverge from the grammatical properties of adult speech—e.g., "Allgone daddy"—to sentences that are grammatically correct but unlikely, on a probabilistic basis, to have previously been heard. This observation may be taken to demonstrate the perhaps obvious point that something other than imitation is involved in mature linguistic production.

In sum, the psycholinguistic studies thus contribute four empirical statements which have direct bearing on the role of imitation in language acquisition:

1. Imitative responses, when explicitly requested, can be grammatically more advanced than a child's spontaneous speech, but there is no evidence that they are so when the imitative responses occur "spontaneously" in a normal environment.
2. Imitation in the form of immediate, exact copying of adult utterances may not occur with frequency after age 3 years.
3. Children can come to respond appropriately to syntactic characteristics of speech without having spoken and hence without having imitated those characteristics.
4. Most child utterances, when observed as a total unit, could not have been previously modeled by an adult, although most child speech, even when novel, is describable in terms of grammatical rules.

Clearly, none of these statements suggests a language acquisition process in which imitation plays a significant role. Thus these four points shall be regarded as *boundary conditions* which any laboratory research on imitative language processes must address if it is to be relevant to the normal environment. In the remainder of this article, the adequacy of proposed language processes involving imitation will be assessed with respect to these conditions.

THE OPERANT STUDIES

By "operant studies," we refer to those programs of research that have been inspired by the general approach to language acquisition taken by Skinner (1957). The first examples of this work were almost entirely technological in intent (e.g., Sloane and MacAulay, 1968). These training programs relied heavily on imitation and reinforcement. A typical program for

a child with severely retarded speech development would involve, as a first step, the establishment of vocal imitation. This would be accomplished by reinforcement of initial rough attempts by the child to imitate an adult. Reinforcement would then be delivered contingent on closer and closer imitative approximations of the speech of a model. Once imitation was firmly established, critical linguistic responses would be modeled for the child in the presence of the appropriate environmental stimuli. The modeled speech would then be treated as a prompt, to be gradually faded out, leaving the child to produce the appropriate verbal response nonimitatively. The success of these methods in establishing functional speech in previously speech-deficient children has been convincingly demonstrated (e.g., Risley, 1966; Sloane and MacAulay, 1968). However, the relevance of this research to an understanding of language acquisition in a normal environment is not clear.

Although the power of a teaching process involving imitation and reinforcement was clearly demonstrated in these studies, no attention was paid to the boundary conditions presented in the previous section. For example, no explicit notice was taken of processes that would link imitative responding to "novel" grammatical speech. Thus there is no evidence to indicate that the applied training program should be taken as a more precise and articulated version of the normal acquisition process. Additionally, the necessary emphasis in this early operant research on packages of procedures made it impossible to specify exactly *what* modeling and reinforcement processes were responsible for *what* linguistic outcomes.

Recent operant research, due to psycholinguistic arguments, has begun to address the questions raised in the previous section and has moved toward a more exact specification of processes responsible for linguistic changes (Sherman, 1971). The fourth of the boundary conditions–referred to in abbreviated form as "novelty" argument–has been the target of several studies.

In an attempt to understand the phenomenon that children often produce grammatical utterances which have never been modeled for them, Guess *et al.* (1968) tried to establish generative (novel but grammatically appropriate) usage of the plural morpheme in the speech of a retarded girl. During training, she was presented with an object to label. If she responded with the appropriate label, she was reinforced by the experimenter with food and praise. If she did not produce the label correctly, the experimenter modeled the correct form and then once again presented the object to be labeled. After she had correctly labeled a single object, the experimenter presented a pair of the same objects. Now she had to produce the correct label with the additional plural morpheme. Again she was reinforced for

correct responding and incorrect labeling was followed by a model of the correct form. After she had used the appropriate plural and singular forms to describe an object, training continued with a new object. Following training on several items for which both the singular and plural forms had to be modeled, she began to demonstrate generative usage of the plural morpheme. That is, she now correctly supplied the plural morpheme without modeling, after having learned the appropriate singular label. In order to demonstrate the role of the training procedures in the establishment of generative plural usage, the training contingencies were temporarily reversed. Now she was reinforced for using the plural morpheme to describe singular objects, with modeling of desired forms continuing to follow undesired labeling. Her behavior, as expected, reversed in the same direction as the training conditions–i.e., she used the plural morpheme generatively, but in a manner reversed from normal English usage. Reinstatement of the original contingencies resulted in her once again using the plural morpheme generatively to describe pairs of objects.

The generality of the Guess *et al.* (1968) finding has been demonstrated in an impressively large number of related studies. Procedures involving reinforcement and modeling have been effective in training generative usage of both of the inflectional forms of the plural morpheme ([-z], [-s]) (Sailor, 1971) prepositions (Sailor and Taman, 1972) verb inflections (Schumaker and Sherman, 1970), and present progressive sentence forms (Bennett and Ling, 1972), and have been effective in increasing the frequency of the verb "is" in the spontaneous sentences of aphasic children (Fygetakis and Gray, 1970). Wheeler and Sulzer (1970) used modeling and reinforcement procedures in the case of a child whose utterances typically omitted articles and verbs. Following training, the child began to use complete sentences–including articles and verbs–without imitative prompts to describe pictures on which he had previously received training as well as pictures not previously seen.

Whitehurst (1971) has conducted a study with effects similar to the ones listed previously. While those studies typically used normal English constructions and speech-deficient children, Whitehurst created a nonsense-syllable language which he used with young (24-month-old) normal subjects. During a given series of training trials involving modeling of a particular grammatical form, probe stimuli which involved no modeling were responded to by the children with the same grammatical form. This occurred even after more than one grammatical form had been acquired and was available for use in describing identical stimuli. Thus the children were able to respond transformationally as a function of modeling and reinforcement.

The thrust of the recent operant research, ignoring its applied importance, has been to demonstrate that modeling, reinforcement, and imitation

can be effectively combined to form a procedure which eventuates in novel and grammatical responding. In the studies discussed up to this point, no attempt was made to separate reinforcement from modeling effects. Neither was there analysis of how, in a more specific sense, the procedures resulted in generative responding. Each of the experimenters may have assumed that a precise specification of his training procedures, given appropriate control conditions, constituted an adequate explanation of obtained behavior. However, Premack, for one, has objected to such conclusions, stating that "a strict training procedure is not an explanation of how, as a result of carrying out the prescribed steps, the organism accomplished the function in question" (1970, p. 107).

Whitehurst (1972) conducted a study with normal 2-year-olds to demonstrate that the process involved in the production of novel generative responding through modeling and reinforcement procedures is one of the establishment of *stimulus control.* Briefly stated, the hypothesis begins by assuming that children learn to make specific verbal responses under the control of specific stimuli and classes of stimuli–e.g., the color red is to be labeled "red," the object car is to be labeled "car." Novel verbal responses are then seen to be a result of the novel juxtaposition of stimuli to which the child has previously learned to make appropriate responses. For example, after specific labels had been acquired, the child, on first seeing a red car, would be expected to say "red car" or "car red" without an adult's modeling those utterances. However, through modeling and reinforcement, the child could also learn basic syntactical requirements–e.g., "red" should come first when it is linked with an object name. Given this syntactic form, the child, on first seeing a red truck, should say "red truck" and not "truck red." Such an analysis depends on the response itself ("red") or the related stimulus acquiring stimulus control of the ordering of other responses. It thus suggests that a naive young child, at the initiation of this learning process, should be able to produce grammatically appropriate ordering only with respect to specific verbal responses which had acquired control of ordering. For example, the child with the relevant training history could say "red car," "red truck," "red house," etc. But when first presented with a brown horse he would be as likely to say "horse brown" as "brown horse" because "brown," the label, or brown, the color, did not possess control of ordering. The experiment based on this analysis (Whitehurst, 1972) demonstrated with nonsense syllables that it was, in fact, correct for the subjects involved. Thus this analysis suggested that performances describable through rules of grammar could be analyzed as a function of stimulus control exercised by classes of words and classes of semantic stimuli. Additionally, it was demonstrated that such control could be

an outcome of an imitative process (*cf.* Skinner, 1957, p. 336; Staats, 1971, p. 122).

In summary, each of the studies outlined above demonstrated that modeling, imitation, and reinforcement are not incompatible with novel responding as it is discussed in boundary condition (4). Further, the analysis of stimulus control suggested by these procedures indicates how, in a more specific sense, generative responding can be a direct result. As yet, the individual roles of modeling, reinforcement, and imitation have not been evaluated. Thus it is not clear whether it is necessary that the child be reinforced for responding. Neither has modeling been shown to be essential, although on a logical basis it would seem extremely difficult to bring about complicated linguistic responses solely through the use of differential reinforcement. The contribution of imitation as a specific copying response has also not been evaluated. In several studies the children were required to copy imitative prompts, in others they were not. The function of the copying response was not examined and there was no attempt to measure or analyze "uninstructed" imitative responses.

Finally, nothing in the operant research speaks directly to the three remaining boundary conditions. What of the fact that children apparently do not imitate progressively if not asked to do so (Ervin, 1964)? What of the fact that basic, discriminative responses to the syntax of language can be acquired without speaking (Lenneberg, 1962)? And what of the fact that the frequency of imitative responding apparently drops to a low level at an age when children are still acquiring important grammatical characteristics? Thus it seems inappropriate to suggest, without further research and theoretical analysis, that language acquisition in the normal environment occurs via parental procedures directly analogous to the experimental procedures used in the operant studies. Either the appropriateness of the boundary conditions must be challenged, or mechanisms relating modeling, reinforcement, and imitation to language acquisition must be found that are consistent with those conditions.

THE SOCIAL LEARNING STUDIES

The approach to observational learning phenomena taken by Bandura (1971) has spawned several studies involving language acquisition. Moreover, this research suggests how two of the remaining gaps between imitation as studied in the laboratory and language acquisition in the natural setting may be filled. These two conditions are (1) the empirical observation that

spontaneous copying responses are not linguistically progressive and (2) the more informal observation that the rate of imitation drops to a low level long before acquisition of grammatical skills ceases.

The first of the observational learning studies (Bandura and Harris, 1966) involved modeling of passive constructions and prepositional phrases for normal second-grade children. An initial baseline phase was given in which single words were presented about which the subjects were asked to construct sentences. The base rate for use of the passive construction was very low, while that for prepositional phases was substantially higher. There followed a brief experimental period in which children were divided into groups which differed with respect to whether there was (a) modeling of passive or prepositional constructions prior to the subject's opportunity to respond, (b) reinforcement following a child's production of a sentence containing the target construction, and (c) instructions to the subject to attend to and repeat those sentences which resulted in reinforcement. As a consequence of the experimental operations, passive constructions increased only slightly above base rate and only for those children who received a combination of all three of the independent variables. Prepositional phrases, however, showed large increases following modeling plus reinforcement plus instructions and following reinforcement plus instructions. In discussing their results, Bandura and Harris suggested that the acquisition of syntactic skills by children in the normal environment might be due to interactions similar to those produced by their procedures. There are several reasons to question this conclusion.

On an intuitive basis, it is difficult to see an analogy between the explicit instructions that were such an important part of the experimental procedures and the normal environment of language acquisition. Also, while certain parallels can be suggested for the reinforcement operations employed in this study, preliminary observations by Brown *et al.* (1968) suggest that, however feasible it may be, parents seldom reinforce or punish the *grammar* of their children's utterances. Finally, caution should be used in attributing *acquisition* effects to these operations. This may be argued on the conceptual grounds that the language constructions used may not have been at a zero base rate for the children studied, as well as on the empirical grounds that passive construction usage was only weakly affected.

The outcome of greatest value in the Bandura and Harris study received only a passing comment from the authors. They noted that many of the utterances produced by children following modeling, while similar in structure to those of the model, were different in content. The authors described this effect by saying that their procedures often resulted in novel responding. Subsequently, several studies have replicated this effect in designs that allow

analysis of what is controlling the child's responding. In addition, this phenomenon has been obtained without the use of the instructional and reinforcement variables used by Bandura and Harris.

Harris and Hassemer (1972) had second- and fourth-grade children listen to a model who, in response to pictures, produced either simple or complex sentences. The children were given an opportunity to produce descriptions of pictures other than those described by the model. The length and complexity of the children's utterances were measured before hearing the model, after hearing the model produce complex sentences, and after hearing the model produce simple sentences. Results indicated that the complexity and length of the children's utterances were similar to and controlled by the length and complexity of the model's utterances. This was true even though the children and the model were describing different pictures with different words.

In a related study involving different response categories, Rosenthal *et al.* (1970) studied the question-asking style of a large group of culturally disadvantaged sixth-grade children. In the baseline phase, subjects were asked to make up questions about a series of pictures. They were then assigned to different groups for a modeling phase, which differed in terms of the types of questions modeled for them by an adult. For one group, the adult modeled "physical" questions: e.g., "What shape is that?" Another group heard "functional" questions: e.g., "What do you use this for?" A third group heard "causal-relation" questions: e.g., "How does the guitar make music?" The fourth group heard the model use "value" questions: e.g., "Which one is the prettiest?" After hearing the model, all subjects were asked again to make up questions about the original set of pictures. All children were then exposed to a generalization test involving the same instructions with a new set of pictures. Control subjects had the same three opportunities to construct questions but never were exposed to a model. Compared to baseline, each group of subjects showed significant increases in question-asking of the class that they had heard modeled. Questioning of the modeled class also generalized to the new stimulus materials. Most importantly, only 12% of the questions asked by the children were exact imitations of those presented by the model. Fully 70% of the experimental subjects never produced a single exact mimicry.

Similar effects have been produced through simple modeling of verb tense (Carroll *et al.*, 1969; Rosenthal and Whitebook, 1970). In each of these studies, some aspect of syntax was modeled by an adult using sentences varying in content. Following modeling, a child asked to describe a different set of stimulus materials did so with content different from that of the model but with the same sentence structure.

While it is appropriate to note that novel utterances are a result of this

process, it is more important to see that the child was *imitating* the structure of the model's utterances. The importance of this phenomenon cannot be overemphasized. It indicates that a child's language may be imitative without being an exact copy of any complete utterance of a model or parent. If imitation is appropriately defined as a functional relationship between a model's behavior and an observer's subsequent response–involving similarity of the form or function of the two responses–then the phenomenon demonstrated by Harris and Hassemer is clearly an example of imitation. This effect will be referred to subsequently as "selective imitation" to differentiate it from the occasion when the child copies or tries to copy the entire utterance of a model. Although the dynamics of these two types of imitation may be identical, the outcomes are sufficiently different to warrant the distinction. Since selective imitation has been demonstrated to occur in the absence of reinforcement or instructions, a model of language acquisition free of many of the constraints imposed by observations in the normal environment is suggested. The boundary condition of novelty is accounted for since utterances can be simultaneously novel and imitative. The boundary condition on the limits and progressiveness of imitation is seen to be based on measurements of immediate and exact copying which in all likelihood excluded numerous examples of selective imitation.

In this regard, it is important to note that the methodology used by psycholinguists to identify examples of imitation in their studies is inadequate, in principle, to the task of recording instances of selective imitation. Only an experimental methodology in which the behavior of the model can be independently varied will be sufficient to the task of identifying responses which are imitative of perhaps unexpected aspects of the model's behavior. Just as an operant response cannot be identified in the absence of the demonstration of a controlling relationship with the environment, neither can an imitative response be specified without evidence of a controlling relationship with a modeling stimulus (Whitehurst, 1974b). Observational methodology is inadequate to this task.

FURTHER DATA AND A HYPOTHESIS

It is obvious from the previous section that children may be engaging, pervasively, in verbal imitation that would not be measured as such by investigators focusing on topographical similarity between the total response of a model and the total response of a child. However, selective imitation, defined quite differently, raises several new questions.

While it is easy to understand how children might match a model on the frequency of usage of various syntactic structures that they had previously used, it is not obvious how modeling without other processes would allow the child to acquire the structures initially. That is, given a diversity of utterances and a naivete with regard to, for example, the passive construction, it is not evident why, in the absence of reinforcement contingencies or other feedback mechanisms, the child should attend to and imitate the passive construction instead of other aspects of the sentences he hears. If the child must already "know" about a structure in order to imitate it selectively, then the inability to produce acquisition effects through modeling, as reported by certain investigators (e.g., Bandura and Harris, 1966), should be easy to understand. However, the necessity of adding instructional information and reinforcement for production to modeling, in order to produce acquisition, would severely limit the applicability of the selective imitation effect in the normal environment. In contrast, a selective imitation process requiring no more of parents than modeling of relevant structures would be consistent with the facts of language acquisition as we assume it typically occurs.

Whitehurst and Novak (1973) conducted a study to assess more directly the effectiveness of a modeling manipulation in producing selective imitation of both structures previously occurring in a subject's repertoire and structures not observed to occur. The analysis was conducted by comparing modeling with a procedure involving modeling plus reinforcement for exact imitation of the modeled utterances. While it has been suggested that the latter procedure, termed "imitation training," may not be analogous to usual parental practices, it has nevertheless been shown in the operant studies to be effective in producing acquisition. A multiple-baseline individual analysis was conducted with four children approximately 4 years of age. The subjects were first asked for descriptions of pictures, from which baseline measures were obtained on their use of participial, prepositional, appositive, and infinitive phrases. Following baseline, modeling procedures were employed for each of the phrase types in turn. Training pictures were described by a model using the critical phrase type, while probe pictures were interspersed for the child to describe without the benefit of modeling. If modeling did not result in selective imitation of the phrase type by a child on the probe trials, then imitation training–i.e., the addition of reinforcement for exact repetition of the modeled utterances–was employed. Both modeling and imitation training resulted in selective imitation–i.e., the children used the types of phrases used by the model on training trials to describe, with different content, the pictures presented on probe trials. However, the modeling procedure produced strong selective imitation for only some subjects and some phrase types, the

phrase types typically being those that the subjects had used in the baseline period. In contrast, the imitation training procedure produced strong effects for all subjects and phrase types–including phrase types which had never occurred in the subjects' baselines. Thus these results suggest that modeling in the absence of other procedures is a weak procedure for the acquisition of language constructions.

Given the data presented up to this point, it would seem that the role of imitation in the development of syntax would be limited to adjustments in the frequency with which children use grammatical constructions that are already present in their verbal repertoire. However, such a limitation may be premature. There seems little doubt that modeling, when coupled with contingencies for correct production, can result in selective imitation and, eventually, spontaneous usage of novel structural forms. While the elimination of production contingencies as a critical component of acquisition is desirable given our knowledge of natural setting conditions, there may be other processes which would allow a child to selectively imitate a *new* grammatical construction modeled by an adult even in the absence of feedback contingencies.

The boundary condition from the linguistic observations to which a response has yet to be made suggests one possible mechanism by which modeling could result in selective imitation of novel forms. This boundary condition derives from the demonstration that a child can come to make the appropriate discriminative responses to the syntactic characteristics of language without ever speaking himself (Lenneberg, 1962). Extrapolating this datum to normal children suggests that discrimination of new linguistic structures in the receptive mode is feasible. The laboratory studies of selective imitation have focused entirely on production aspects. It might be the case that if the child were first taught to understand a syntactic construction by having to make the appropriate nonverbal responses, then modeling without feedback mechanisms would subsequently be sufficient to establish selective imitation of that form in the productive mode.

Since selective imitation of a grammatical construction involves, by definition, the use of that construction in a novel but appropriate context, nonimitative generative usage could occur quite readily given a situation that required use of the construction but provided no model. Additionally, few problems are suggested in positing a process by which abstraction of a grammatical form might originally occur in the receptive mode. While there are apparent problems in finding instances in which parents explicitly or implicitly reinforce the grammatical parameters of a child's productions (Brown *et al.*, 1968), the environment of every child should be replete with natural reinforcement contingencies for understanding of parental speech. Not

only does parental speech convey information which, if understood, leads the child to behave more efficiently in numerous situations, but also there are many instances of instructions to a child which, if not understood, lead to direct social reproof from parents or the withdrawal of possessions or approval. Thus reinforcement contingencies could act to produce a motivational context for comprehension of new forms by the child. Of course, the child's environment does not consist solely of parental speech and contingencies for responding to it. The speech of adults does not occur at random; it exists in a semantically meaningful context. A child's natural-setting task in the receptive mode would be to discriminate the correlations between how a parent says something, on the one hand, and the nonlinguistic events which lead the parent to speak, on the other. While little is known regarding comprehension of language, the general notion that a child learns syntax through the observation of correlations between the speech of his parents and nonlinguistic events is consistent with recent linguistic theory (e.g., Olson, 1970). In addition, there are numerous examples in the observational learning literature of the sensitivity of children to the relationships between the behavior of a model and the stimulus events which precede it (Whitehurst, 1974b).

Thus we suggest a three-stage process. In the first stage, a child comes under the discriminative control of the relationship between a syntactic structure as produced in the speech of adults and the stimuli in the environment which are correlated with the usage of that structure. Such a process, which can be called *comprehension,* will depend on the variables which are important to observational learning, including explicit reinforcement. In the second stage, the child begins to use the structure in his own utterances. These initial productions will fit the model of *selective imitation* in that they will match and be controlled by the grammatical structure of a previously occurring utterance of a model but they will not include identical content words since the semantic events being described by the child will typically differ from those described by the model. Explicit contingencies of reinforcement would not be necessary for these productions. In the relationships between comprehension and selective imitation, we imply neither unidirectional effect nor a model in which comprehension reaches asymptote prior to the initiation of production.

Rather, we suggest that the structure as used by adults need only to have acquired some discriminative control over the responses of the child as a listener prior to the selective imitation of it. Comprehension can continue to develop and be aided by the selective imitation process. Finally, *spontaneous production* of the structure occurs in the absence of an imitative component.

EVIDENCE FOR THE COMPREHENSION, IMITATION, PRODUCTION (CIP) HYPOTHESIS

Previously cited studies have shown that children typically understand language before they can use it productively (Fraser *et al.*, 1963; Lovell and Dixon, 1967). In addition, Mann and Baer (1971) conducted a study involving articulation which is suggestive for the development of syntax. They gave 4-year-old normal children an articulation test on words which either had never been heard before by the children or had been previously presented in a comprehension training task. The latter task required the subjects to make a nonverbal pointing response, indicating a learned relationship between the words and objects. Accurate articulation was subsequently learned faster for those words which had the reception training history.

A series of studies by Liebert and his associates (Odom *et al.*, 1968; Liebert *et al.*, 1969; Vasta and Liebert, 1973) is interpretable through the CIP hypothesis. The initial study (Odom *et al.*, 1968) was similar to that of Bandura and Harris (1966) in that it employed modeling plus reinforcement plus instructions in a procedure designed to teach a language form to young children. The construction used, however, was a novel prepositional construction of the form article-noun-preposition: e.g., "The boy went *the store to.*" While no evidence of acquisition obtained for this construction, the second study (Liebert *et al.*, 1969) demonstrated that first-grade children exposed to these procedures subsequently increased their frequency of normal English prepositional phrases. However, third graders, who also failed to acquire the novel construction, did not show the anomalous increase in the familiar form. In the final study (Vasta and Liebert, 1973), it was revealed that first graders were unable to discriminate the two forms on a reception measure, while third graders could differentially identify them reliably.

These data might be interpreted to suggest that, since the novel and familiar forms were indistinguishable to first graders, they were functionally equivalent for this group. This modeling of the novel form resulted in selective imitation, as witnessed by the increased production of the familiar form. Such an increase did not occur, however, with the third graders, since their ability to distinguish the forms receptively made them functionally distinct.

An implication of the analysis of the relationship between comprehension and selective imitation is that the presentation to a child of a reliable correlation between a model's usage of a particular syntactic structure and given semantic events would be sufficient to allow the correlation to acquire some control over the discriminative responses of the child as a listener. Thus the stage would be set for the selective imitation of that structure in the productive mode.

Support for this hypothesis is derived from a comparison of the procedures and results of studies by Bandura and Harris (1966) and Whitehurst *et al.* (1974). In a previous section, it was noted that modeling of the passive construction without reinforcement or instructions was not effective in producing use of that construction for 7-year-old children in the Bandura and Harris experiment. However, Whitehurst *et al.* demonstrated use of the passive as a function of modeling without reinforcement or instructions for every subject (approximately 4 years of age) in an experimental group. While the procedures used in the two studies were not identical in several ways, the critical difference appears to have been in the way that modeling was conducted. In the Bandura and Harris procedure, the passive constructions were modeled without a semantic context and the children were required to produce sentences following modeling with no other stimulus than a noun around which to construct their utterances. In contrast, the model in the Whitehurst *et al.* procedure used passives to describe pictures involving one animal performing an action with respect to another animal. In responding, the children had similar subject-action-object pictures around which to construct their verbalizations. Thus a procedure which involved modeling of a structured form without an appropriate semantic framework did not result in selective imitation, while correlation of both syntax and semantic stimuli along with modeling did. In a post-test of the ability to comprehend the passive form, subjects who had received the modeling manipulation in the Whitehurst *et al.* study performed significantly better than control subjects who had not. Thus appropriately arranged modeling conditions can result in selective imitation as well as comprehension of a syntactic form.

Because the relationships among comprehension, selective imitation, and spontaneous production demonstrated in the previous studies are correlative rather than causal, it is impossible to decide whether comprehension training is necessary for selective imitation of a new grammatical form or merely precedes it in the typical developmental progression. The strongest evidence for the CIP hypothesis would derive from a study in which the ability to respond discriminatively to a grammatical form was treated as an independent variable with selective imitation of that structure as a dependent measure.

The results of two such experiments were complex. Working with severely retarded children, Guess and Baer (1973) found that comprehension training aimed toward establishment of a successful discrimination of the proper usage of plurals had strongly facilitative effects on correct production of plurals in only one of four subjects studied. The productions of two children were weakly affected, while one subject showed no transfer between comprehension and production.

In a study using normal 4-year-olds as subjects, Whitehurst (1974a) found a similar mixture of results. Comprehension and production of direct-indirect object sentences–e.g., "The bear shows the horse the dog" vs. "The bear shows the dog the horse"–were studied. In an individual subject analysis, the children were given alternating periods of comprehension training on the normal direct-indirect form and a reversed direct-indirect object structure (in the reversed structure, they were reinforced for responding as listeners as though the direct object were the indirect object and vice versa). Probe trials were interspersed in which the children were asked to talk about a series of pictures which were similar but not identical to those used in comprehension training. Three of five subjects showed immediate and direct transfer from comprehension to production such that if they were being reinforced for correct responding to the normal direct-indirect object structure in the comprehension mode they also produced normal direct-indirect object sentences. If the contingencies were switched so that reversed comprehension responses were reinforced, production also switched over. One subject showed similar effects following a period in which comprehension and productions were out of phase–i.e., comprehension responses showed reversed usage while production showed normal usage. A final subject showed no transfer between comprehension and production despite virtually perfect levels of responding during comprehension training.

We can conclude from these two studies that comprehension training can lead directly to selectively imitative productions but that there are conditions, as yet unidentified, which can either promote such transfer or render performance in the two modes independent.

FINAL SUMMARY

The data from laboratory studies by operant and social learning researchers on imitation and language have been weighed against observations of acquisition and imitation made in naturalistic settings. It has been suggested that imitation occurs in language acquisition through a process by which the child imitates the structure of his caretakers' utterances, but not necessarily the content of their utterances. Research shows unequivocally that such selective imitation can occur, simply as a result of modeling, when the structures involved have already been produced by the child or when comprehension of the grammatical forms has been developed. We propose a three-stage model in which the development of receptive abilities (comprehension) precedes and sets the stage for the occurrence of productive responses

which are imitative of the structure but not the content of a model's utterances (selective imitation). Finally, spontaneous production occurs which is neither in whole nor in part imitative.

As is the case with almost any topic of inquiry, much more needs to be known. Three questions that are of immediate relevance are (1) what are the conditions of modeling which facilitate comprehension of a syntactic structure? (2) what are the variables which mediate transfer between comprehension and production? (3) what facilitates the move from selective imitation to spontaneous production?

Regardless of these and other unanswered questions the CIP hypothesis derives suggestive and direct support from several sources. Moreover, it orders the data from the psycholinguistic, operant, and social learning traditions much more effectively than either the proposal that imitation is unimportant for language acquisition (Ervin, 1964; McNeill, 1970) or the suggestion that the causal sequence is in the order ICP (imitation-comprehension-production) (Fraser *et al.*, 1963; Lovell and Dixon, 1967).

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