AN ANALYSIS OF GENERALIZED IMITATION¹ROBERT L. BURGESS,² JUDY M. BURGESS, AND KAREN C. ESVELDT

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An experimenter presented English words to three intermediate-level children and reinforced accurate imitation of these words. The experimenter also presented novel Spanish words, but the imitation of these words was never experimentally reinforced. One subject quickly ceased performing non-reinforced imitative responses. The other two subjects were exposed to a series of conditions designed to facilitate discrimination. Upon observing the first subject for one session they immediately ceased imitating Spanish demonstrations. For all three subjects, when reinforcement was delivered for responses other than imitation, all imitative responses eventually ceased. When reinforcement was reintroduced for English imitations there was an immediate resumption of such responses to their previous 100% level. The occurrence of non-reinforced imitations in this and previous studies was discussed as being a function of one or combination of four variables: (1) similarity acquiring conditioned reinforcing properties, or (2) instructional, (3) coincidental, or (4) conditional stimulus generalization.

The concept of imitation is critical for an understanding of the socialization process. Imitation has frequently been used to describe and explain a child's rapid acquisition of those complex behaviors exhibited by his parents, siblings, and peers. The term *generalized imitation* has been used to emphasize the fact that many different responses of a model are often copied in diverse situations, sometimes in the absence of extrinsic reinforcement (Gewirtz, 1969). To the extent that an individual possesses a generalized imitative repertory, he often can avoid long-term and arduous shaping periods. It is thus that imitation may function as a teaching technique that reduces the time needed to acquire new behaviors.

Given this apparent importance of imitation for socialization, it is not surprising that this behavioral process has received much attention, both experimental and theoretical. The available research strongly suggests that imitation is acquired and maintained like other operants. It has been found, for example,

that an imitative repertory can be established in subjects who have failed to display such behavior by providing positive reinforcement contingent upon imitative responses (Baer, Peterson, and Sherman, 1967). Careful shaping and fading techniques may, of course, be necessary at the outset. Even more detailed documentation has been presented that imitation functions according to the same principles that apply to operant behavior in general. For instance, the greater the percentage of the imitative responses that are reinforced, the more likely those responses are to occur (Kanareff and Lanzetta, 1958, 1960). Further, an imitative response's resistance to extinction is inversely related to the frequency of its prior reinforcement (Lewis and Duncan, 1958).

One particular experimental finding has resulted in considerable theoretical attention and controversy. The case in point is the occurrence of presumably non-reinforced imitative responses. Baer and Sherman (1964) found for 64% of their subjects that if some imitative responses directly produce reinforcement, then another imitative response will occur even though it is never directly reinforced. This finding has been replicated in several subsequent studies (Metz, 1965; Lovaas, Frietas, Nelson, and Wahlen, 1967; Baer *et al.*, 1967; Brigham and Sherman, 1968; Peterson, 1968).

Two alternative explanations have been proposed for this finding. (1) *Conditioned re-*

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inforcement. The argument is that behavioral similarity, by being discriminative for subsequent reinforcement, acquires its own reinforcing properties. The stimuli produced in copying the behavior of another then come to maintain those imitative responses not followed by extrinsic reinforcement. (2) *Stimulus discrimination.* The reasoning here is that since imitative responses comprise a class of topographically different behaviors, it is highly likely that the recurrence of non-reinforced imitative responses is a function of inadequate discrimination of the reinforcement contingencies. Due to the failure to discriminate, all the imitative responses are then maintained by an intermittent schedule of reinforcement.

There exists at least partially supporting data for each of these two explanations. Support for the conditioned reinforcement hypothesis can be found in the difficulty some researchers have had extinguishing both reinforced and non-reinforced imitations (Baer, *et al.*, 1967; Brigham and Sherman, 1968). Indeed, Brigham and Sherman never did succeed in extinguishing imitations, though they did report a decrement in imitative accuracy during differential reinforcement of other behavior.

In support of the discrimination hypothesis, Peterson (1968) found that while non-reinforced imitations occurred when interspersed among reinforced imitations, they ceased under "massed" extinction trials. Also, data from Exp. V in the Peterson study cast some doubt on the functional importance of behavioral similarity as a stimulus in maintaining non-reinforced imitations.

The purpose of the present study was to explore further the occurrence of non-reinforced imitative responses. Particular attention was given to the discrimination hypothesis by introducing subjects to a series of experimental conditions designed to facilitate such discrimination.

METHOD

Subjects

Each of the three subjects were male and attended the Experimental Education Unit of the Child Development and Mental Retardation Center at the University of Washington for the past three years. Subject 1 was 14 yr

old, now working at a seventh-grade level; Subject 2 was 11 yr old, now at a fifth-grade level, and Subject 3 was 13 yr old, now working at a fifth-grade level.

Procedure

In each of several experimental conditions, English and Spanish words were presented. At no time was imitation of Spanish words reinforced. The experimental manipulations consisted of reinforcement of accurate English imitations with Spanish words interspersed with English words in a random sequence (A_1); reinforcement of English words in an English-Spanish-English sequence (A_2); reinforcement of English words in a Spanish-English-Spanish order (A_3); presentation of Spanish words only (A_4); presentation of one Spanish word (A_5); reinforcement of behavior other than imitation DRO 5- to 20-sec (B_1); reinforcement of behavior other than imitation DRO 60- to 90-sec (B_2); reinforcement of behavior other than imitation DRO 0-sec (B_3).

Sessions were conducted from one to four times per day, five days a week. Each session, with the exception of Conditions B_2 and A_5 , lasted from 5 to 10 min. The reinforcers were tokens, which were exchangeable for points in the classroom economy. The ratio was four tokens per one point. Points were used in the classroom for lunch and play periods, access to special equipment, such as the gym, *etc.*

The first session for each subject was designed to test whether he would imitate the experimenter's verbal cues. The subject was seated at a table across from the experimenter. He was informed that the experimenter would read a list of words one at a time and that the child could earn points if he correctly repeated the word after the experimenter. The stimulus words for the first session were 15 English words of similar complexity such as "window" and "suit." Each word was presented twice in an unsystematic order. Each time the child correctly duplicated the stimulus word, he was immediately given a token, and was also praised by the experimenter (*e.g.*, by a smile and the word "good"). If the child failed to repeat the stimulus word correctly, the experimenter said nothing and then presented the next stimulus word after a 10-sec interval. The criterion for reinforcement of the subject's imitation was the ability of the experimenter to understand the subject.

Reinforcement for imitation of English words with English and Spanish words in mixed order (A_1). The procedures for Sessions 2 through 14 for Subject 1, Sessions 2 through 33 for Subject 2, and Sessions 2 through 13 for Subject 3 were essentially the same as the first session with two changes. The instructions were deleted and the subjects were given no further instructions throughout the study. Additionally, Spanish words were added. The Spanish words were presented in the same manner as the English words with two exceptions. One, when a Spanish word was presented, the experimenter dropped her head and, if the subject responded, presented a new stimulus word no sooner than 10 sec after the subject's response. Likewise, if the subject did not respond, the next stimulus word was presented no sooner than 10 sec after the experimenter's demonstration. The head drop was designed to facilitate discrimination of the reinforcement contingencies. The second difference between English and Spanish demonstrations was that imitation of Spanish words was never followed by reinforcement.

Fifteen stimulus words were presented each session (10 English and five Spanish) with each word being presented twice in an unsystematic order. Table 1 contains a list of the English words and the Spanish words with their phonetic spelling.

Reinforcement of English words in an English-Spanish-English order (A_2). If, at the minimum of 13 sessions, a subject was still

imitating Spanish words, Condition A_2 was begun. This condition was designed as a further attempt to facilitate discrimination. The only difference between this and the previous condition was that the English and Spanish words were separated. A block of 10 English words was presented, then a block of 10 Spanish words (the original five being presented twice) then the 10 English words again.

Reinforcement of English words in a Spanish-English-Spanish order (A_3). Should a subject still be imitating Spanish demonstrations after five sessions, Condition A_3 was begun. It was thought that a subject might continue to imitate Spanish words due to the relatively low response cost involved. Hence, discrimination might be facilitated by reducing the amount of reinforcement that could be received in a given session. Whereas in Condition A_2 a child could earn a maximum of 20 tokens or five points, now he could earn a maximum of only 10 tokens or two points. The pattern was 10 Spanish-10 English-10 Spanish.

Presentation of Spanish words only (A_4). If a subject were still imitating Spanish words after five sessions, he would be introduced to a series of extinction trials. The five Spanish words were presented six times each in a changing sequence with no reinforcement being given.

Presentation of one Spanish word (A_5). If, after five sessions of Condition A_4 , there was still no change in the frequency of Spanish imitations, the subject was to be introduced to an experimental condition wherein only one Spanish word would be presented 30 times per session. Due to a misunderstanding in the delivery of instructions, the experimenter continued presenting the one Spanish word to Subject 2 continuously for a 3.5-hr session. As soon as this was discovered, it was decided to continue this procedure with any other subject who reached Condition A_5 . However, due to classroom plans, Subject 3 was continuously presented one Spanish word for only a 1.5-hr session.

Presentation of a model. If after the above manipulation a subject was still imitating Spanish words, he was brought in to observe one session involving Condition A_1 with a child who had ceased imitating Spanish words. The instructions were simply, "Please sit down and await your turn." At the com-

Table 1
Stimulus Words Used in the Experiment

English	Spanish	Approximate Phonetic Spelling
1. window		
2. night		
3. soap		
4. apple		
5. road		
6. cake		
7. grass		
8. suit		
9. bird		
10. money		
	1. viá	ve-ya
	2. ave	a-vay
	3. traje	tra-hay
	4. noche	no-chay
	5. jabón	ha-bóne

pletion of this session, the observing child was reintroduced to Condition A₃, *i.e.*, the reinforcement of English imitations in a Spanish-English-Spanish order. After five sessions of stable behavior, Condition A₁ was reintroduced.

Reinforcement of behavior other than imitation DRO 5-sec to 20-sec (B₁). After 14 sessions of Condition A₁ for Subject 1, a schedule of differential reinforcement of behavior other than imitation of English words (DRO) was used. During this condition, no imitative responses were reinforced. Reinforcement, instead, was delivered no sooner than 5 sec after the last imitation of each English word. Again, no reinforcement was presented after Spanish words. If the subject did not respond, reinforcement was delivered no sooner than 5 sec after the stimulus word was presented. The time between response and reinforcement varied from 5 to 20 sec with a mean of approximately 10 sec. The experimenter continued to deliver praise whenever a token was given. This was done to keep the amount of reinforcement equal to that in Condition A.

Reinforcement of behavior other than imitation DRO 60-sec to 90-sec (B₂). After five sessions of no change in the frequency of English imitations, the subject was exposed to a DRO condition wherein reinforcement was delivered no sooner than 60 sec after the last English imitation or, if the subject had not responded, 60 sec after the stimulus word had been presented. This condition was designed in an attempt to avoid the possibility of the inadvertent development of a chain of responses.

Reinforcement of behavior other than imitation DRO 0-sec (B₃). Again, after five sessions of no change in the frequency of English imitations, the subject was exposed to a DRO condition wherein reinforcement was delivered immediately after the demonstration of an English word. No reinforcement was delivered after a Spanish demonstration. This condition more closely approximates a non-contingent reinforcement schedule and is particularly useful for breaking up an established chain of responses. Due to time limitations, Subjects 2 and 3 were not exposed to DRO 5-sec to 20-sec and 60-sec to 90-sec but only to DRO 0-sec.

Reinforcement for imitation of English words with English and Spanish words in

mixed order (A₁) II. Contingent reinforcement of correct imitation of English stimulus words was reinstated. Again, imitation of Spanish words was never followed by experimental reinforcement. Subjects 2 and 3, however, were reintroduced to Condition A₃ before A₁.

Scoring of verbal responses. The data from all sessions were recorded on tape. The Spanish words were analyzed in detail for pronunciation. Following Brigham and Sherman (1968), we intended to score the Spanish words for relative accuracy. In contrast to their study, however, we found over the entire experiment no variation in accuracy. Hence, in the Results section the scores for both English and Spanish imitations are based simply on the number of words correctly pronounced divided by the total number presented.

Initially we began with two analysts independently scoring the imitative responses. But since over 20 sessions for each subject we had perfect reliability, the balance of the scoring was performed by one independent coder.

RESULTS

The major results of the study are graphically presented in Figs. 1, 2, and 3. Looking at the data from Subject 1 first, it can be seen that by the third session, with the exceptions of Sessions 4 and 11, he had ceased imitating all Spanish demonstrations. Twice he began to imitate a Spanish word only to stop before completing the statement. These are scored as "Partial Spanish" and occurred once each time in Sessions 2 and 8.

When the DRO condition was introduced no change in behavior was observed. This was true for Conditions B₁ and B₂. By the first session under Condition B₃ (Session 28) the frequency with which he imitated English demonstrations began to decline. By Session 32 he had ceased all imitative responses. The reinstatement of reinforcement for English imitations resulted in an immediate recovery of English imitations to 100%.

Subjects 2 and 3 presented a different response pattern than Subject 1. After 33 sessions under Condition A₁, Subject 2 was still imitating 100% of the Spanish demonstrations. Given no indication that the behavior was going to change, we introduced Condition A₂. Five sessions later there was still no indication that he was going to cease imitating Spanish

Fig. 1. The maintenance and extinction of reinforced and nonreinforced imitative responses in Subject 1. In Condition A₁, English and Spanish words were presented in a mixed order with only English imitations being experimentally reinforced. B₁ refers to DRO 5-sec to 20-sec; B₂ is DRO 60-sec to 90-sec; B₃ represents DRO 0-sec.

demonstrations. Each of the succeeding A conditions (A_{3,4,5}) failed to produce a decrease in Spanish imitations. The same pattern was observed in Subject 3.

Just after Session 34 for Subject 3 (Condition A₅), the following conversation was overheard by the experimenter who was standing behind a one-way mirror.

Subject 2: "What were you doing in there?"

Subject 3: "Oh, she wanted me to repeat the same word over and over again."

Subject 2: "That's right. She did the same thing to me yesterday. All she wants is for you to say what she says."

In any event, just before Session 55 for Subject 2 and Session 35 for Subject 3, we had each of them, in turn, observe Subject 1 during one session. Both subjects, after observing Subject 1 uttered such statements as:

... "oh! I finally get it!"

In each case, the observation of the model produced an immediate cessation of Spanish imi-

tations. This can be observed in Figs. 2 and 3 for Conditions A₃ and A₁.

After five sessions of consistent response patterns, both subjects were introduced to Condition B₃, the differential reinforcement of behavior other than imitation (DRO 0-sec). Both subjects quickly ceased imitating. Upon resumption of Condition A₁, there was an immediate increase in English imitations to its previous 100% level.

DISCUSSION

The data from this study replicate in part the finding from previous studies that it is possible to maintain imitative responses which, themselves, are never directly reinforced, by seeing to it that at least some imitative responses are reinforced (Baer and Sherman, 1964; Metz, 1965; Lovaas *et al.*, 1967; Baer *et al.*, 1967; Brigham and Sherman, 1968; Peterson, 1968). The explanation of this particular phenomenon is, however, by no means clear.

Fig. 2. The maintenance and extinction of reinforced and nonreinforced imitative responses in Subject 2. Condition A_2 represents an English-Spanish-English order of presentation, again with only English imitations being experimentally reinforced. A_3 is a Spanish-English-Spanish order of presentation. A_4 is a condition where only Spanish words were being presented. In A_5 the same Spanish word was presented for a 3.5-hr session. The word MODEL, just subsequent to Session 54, indicates that the subject had observed Subject 1 for one session.

Consider, for example, the data from Subject 1. He ceased imitating Spanish demonstrations very early. This suggests that he had, in fact, discriminated the reinforcement contingencies. But, when the DRO conditions were introduced, we had a difficult time extinguishing English imitations. Perhaps he had not been responding to the contingencies *per se* but simply to the head-down cue given by the experimenter. It is even possible that similarity between English demonstrations by the model and his matching of those demonstrations, as a stimulus, had acquired conditioned reinforcing properties. His behavior after being exposed to the DRO 0-sec condition, however, suggests still another possible explanation, which is discussed below.

But first, consider the data from Subjects 2 and 3. They continued to imitate all Spanish demonstrations throughout Conditions A_2 and A_3 (English-Spanish-English and Spanish-English-Spanish, respectively). These data are in opposition to those reported by Peterson (1968). Likewise, they continued to imitate

Spanish demonstrations during Conditions A_4 and A_5 (Spanish only). These data contradict those reported by Baer and Sherman (1964) and Peterson (1968). Two possible explanations for these data present themselves. One is that Subjects 2 and 3 were under instructional control. The same may be true for the subject in Peterson's study at least from Exp. II on. For, in Exp. III, his subject actually had to be prompted to emit non-reinforced responses both imitative and non-imitative. Two, response similarity may have acquired conditioned reinforcing properties.

The major conclusion to be drawn from this study is that our original statement of the problem was oversimplified. The introduction mentioned two explanations for the occurrence of non-reinforced imitations—*conditioned reinforcement* and *stimulus discrimination*. The question is: What is to be discriminated?

There are actually three possible sources of stimulus control independent of similarity possessing conditioned reinforcing properties:

Fig. 3. The maintenance and extinction of reinforced and nonreinforced imitative responses in Subject 3. Condition A₅ consisted of one session lasting 1.5 hr with only one Spanish word being presented. Just before Session 35 the subject observed Subject 1 for one session. This is indicated by the word MODEL.

(1) *Instructional stimuli*. In each of the studies reporting "generalized" imitation, including this one, some form of instructions have been used (Baer and Sherman, 1964; Metz, 1965; Lovaas *et al.*, 1967; Baer *et al.*, 1967; Brigham and Sherman, 1968; Peterson, 1968). In each of these studies the possibility exists that the occurrence of non-reinforced imitations was a function of the instructions employed ("Show me . . .," "Do this," "Say . . .," "If you repeat what the teacher says . . .").

(2) *Coincidental stimuli*. Subtle cues from the experimenter such as eye contact (attention), head movements, speech intonation, and other gestures may come to control the subjects' behavior in very important ways. Coincidental stimuli may be defined as stimuli correlated with the demonstrations of the model, including the model himself, which are not an inherent part of the behavior to be imitated. Subject 1 seems to have been under the control of a coincidental stimulus (head drop) during Conditions A₁, B₁, and B₂. Again, the possibility exists that non-rein-

forced imitations reported in previous studies also were a function of inadvertent coincidental stimuli.

(3) *Conditional³ stimuli*. The non-occurrence of generalized imitation (Baer and Sherman, 1964; Peterson, 1968; and the present study) may be due to the subjects actually distinguishing demonstrations followed by reinforcement from those which are not.

In summary, the occurrence of generalized (non-reinforced) imitation in this and previous studies may actually be a function of (1) conditioned reinforcement, or (2) instructional, (3) coincidental, or (4) conditional stimulus generalization separately or in various combinations. Though these four sources of stimulus control have now been conceptually distinguished they remain to be experimentally isolated from one another. Studies currently underway suggest that these variables can be separated experimentally and promise

³This term is taken from "matched to sample" research where the stimulus to be matched is termed the conditional stimulus.

to lead to further explication of the conditions under which generalized imitation will and will not occur.

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