THE DEVELOPMENT AND FUNCTIONAL CONTROL OF READING-COMPREHENSION BEHAVIOR¹

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Reading comprehension, indicated by motor behavior and multiple-choice picture selection called for in written instructions, was taught to an autistic child using verbal prompts, modelling, and physical guidance. The child was rewarded for correct behaviors to training items; nonrewarded probes were used to assess generalization. Probable maintaining events were assessed through their sequential removal in a reversal design. Results showed: (a) following acquisition, performance was maintained at a near-100% level when candy, praise, attention, and training were removed, (b) absence of other persons was correlated with a marked decrease in performance, whereas their presence was associated with performance at near 100%, and (c) performance generalized to probes and across experimenters. Rewards, which may have been reinforcing during acquisition, did not appear necessary to maintain later performance. Instead, presence of others (a setting event) was demonstrated to have control over maintained performance.

DESCRIPTORS: acquisitional learning, imitation, instruction following, prompt, reinforcement removal, stimulus control, setting events, autistic children

Behavior therapy has typically proceeded by building on behaviors initially in the patient's repertoire. Where there have been severe deficits in basic performances, imitation training has effectively expanded the behavioral repertoire (Baer, Peterson, and Sherman, 1967; Lovaas, Berberich, Perloff, and Schaeffer, 1966; Lovaas, Freitas, Nelson, and Whalen, 1967; Martin,

1971; Metz, 1965; Peterson, 1968; Risley and Wolf, 1967; Wolf, Risley, and Mees, 1964). One objective of this training has usually been the generation of generalized imitation; that is, imitation of performances not previously taught. Food and social reinforcers have frequently been used to maintain the patient's attention to and participation in the training and to strengthen the performances taught in the program. Recent investigations (Peterson, Merwin, Moyer, and Whitehurst, 1971; Peterson and Whitehurst, 1971; Steinman, 1970a, 1970b; Steinman and Boyce, 1971) have questioned the primacy of extrinsic reward for the occurrence of the specified behavior by showing the major role of setting events, defined as antecedent environmental changes that alter the probability of subsequent behaviors (Peterson and Whitehurst, 1971).

The present study sought to add comprehension, defined as carrying out the behaviors specified by written instructions, to the repertoire of an "autistic" child who could read sentences but whose comprehension was nil. For this purpose, the Baer *et al.* (1967) imitation

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procedure provided a model for the systematic instruction needed to broaden the child's repertoire to include comprehension. As in imitation research, generalization of the training was assessed by the use of probe items; that is, written instructions for which no training or rewards were offered. Generalization was promoted by the use of the single-presentation procedure, in contrast to a choice-presentation procedure that has led to discrimination between training and probe items (Steinman, 1970*a*, 1970*b*; Steinman and Boyce, 1971). Once complete mastery of comprehension behavior was achieved (*i.e.*, 100% correct performance), the maintaining events were determined by the sequential withdrawal of probable supporting factors, candy and social praise, experimenter monitoring, and experimenter presence. When performance decreased, the factor withdrawn (presence of another person) was manipulated in an ABA (reversal) design to demonstrate its functional role.

METHOD

Subject

A 12-yr-old Caucasian girl, diagnosed at various times as brain-damaged, emotionally disturbed, and/or mentally retarded, scored consistently in the severely retarded range (AAMD) on tests of intelligence and social functioning. Her most recent psychiatric evaluation included the diagnosis of "psychosis of the childhood type . . . marked by her somewhat obliviousness as to her environment". She rarely initiated social interactions except with adults, displayed perseveration, was echolalic on several occasions, generally used simple words rather than sentences, and often would not emit a response when one was called for. She could follow verbal commands and imitate motor and verbal responses, although she displayed "bizarre distorted speech expressions, hand gestures, infantile mannerisms and irritability".

Her parents had sought special assessment and programs for her as a preschooler; yet, her

mother, a former teacher, had been able to teach the girl to read, print, and do arithmetic at about age six. A regularly scheduled evaluation during this study yielded grade-level scores of 2.8 in reading (word recognition), 2.0 in spelling, and PK. 2 (performance equal to the average prekindergartner in the second month of a school year) in arithmetic on the Wide Range Achievement Test (Jastak and Jastak, 1965). A 1972 administration of the same test had yielded scores of 2.6 in reading and 3.2 in spelling. Her reading was completely phonetic; evaluation and classroom reports agreed on the absence of comprehension.

Following a teacher's judgement in the semester preceding this study that the subject's initial progress in a program emphasizing basic instructional control, social behavior, and instruction had ceased, an intensive multi-faceted program was introduced to promote her development. This program utilized individual training sessions in tooth brushing, instruction following, bicycling, table setting and manners, solitary play, cooperative play, and language development. The *Speech and Language Training Program for Developmentally Disabled Children* (Stewart, 1973), used to teach language development, provided further formal confirmation of the child's ability to name words while not necessarily comprehending them. The areas for intensive training were selected in part through an intensive program of consultation and training for the child's mother. An area of major concern for the mother was the development of her child's academic skills and particularly her language skills.

Setting

All sessions for this study, except for the first two, were conducted in an office approximately 5.5 by 6 m, which was down the hall from the subject's classroom. This room was equipped with observation windows on two sides and a blackboard on a third wall. It was carpeted and furnished with a desk, file cabinet, table, and three chairs. The physical arrangement of the

furniture was altered during several experimental sessions as indicated below. The first two sessions were conducted in an unused and sparsely furnished classroom on the same floor as the child's classroom.

General Procedure

The subject was seen once daily for the initial 17 sessions and twice daily for the latter 17 sessions. Each session lasted 15 to 20 min. The two daily sessions were separated by 10 min, during which the subject was removed from the experimental room. The experimenter escorted the subject from her classroom to the experimental room. Once inside, the subject sat at one corner of the desk with the experimenter about 0.61 m away and facing her.

Each cue card, stacked on the desk, contained a single printed instruction taken from Stewart's (1973) program. In addition, pictures of common objects taken from the same program (*e.g.*, a book) and those depicting action verbs (*e.g.*, a man pushing a car) were used. The cards with

instructions were divided into two groups, one group of 18 items calling for motor action and the other group of 36 items requiring pointing to pictures. Of these latter items, 18 referred to common objects and 18 to action verbs. Of the total 54 items, there were 37 training items and 17 probes (see Table 1). The probe items, not included in every session, were used to assess the subject's generalization of the reading-comprehension behavior. When included, probes were randomly interspersed among training items and were never followed by rewards or training procedures. All training items were randomly presented in each session to minimize the possibility that the subject might learn a routine. Candy rewards (M&Ms) were located in a desk drawer, easily accessible to the experimenter but concealed from the subject.

Scoring and Observer Agreement

The subject's responses to the training items were recorded, by item, on a scale of one through five in Sessions 4 through 13. A five was re-

Table One
TRAINING AND PROBE ITEMS

Items Not Requiring Pictures	Items Requiring Pictures	
	Common Objects	Action Verbs
Stand up	Point to the ball	Point to the man combing
Sit down	* Point to the doll	Point to the girl cutting
Point to your mouth	Point to the milk	* Point to the man dressing
Point to your stomach	* Point to the cake	Point to the man pushing
* Point to your ear	Point to the bird	Point to the man washing
Point to your eyes	Point to the horse	Point to the man writing
Point to your head	Point to the cat	Point to the man driving
* Point to your leg	* Point to the dog	* Point to the man sleeping
Point to your finger	Point to the girl	Point to the man eating
Point to your nose	* Point to the boy	Point to the girl sitting
* Point to your arm	Point to the dress	* Point to the girl sweeping
Point to your cheek	Point to the shirt	* Point to the man jumping
Point to your hand	Point to the tree	Point to the girl running
* Point to your teeth	* Point to the car	Point to the man standing
Point to your back	Point to the chair	* Point to the man smiling
Point to your hair	Point to the book	Point to the man throwing
* Point to your chin	* Point to the shoe	Point to the man brushing
Point to your foot	Point to the bed	* Point to the man carrying

* denotes probe items

corded when the subject performed the behavior called for, e.g., "point to the ball", within 10 sec of presentation of the cue card; a four, if the desired behavior followed a verbal prompt; a three, if it followed modelling of the behavior; a two, if it followed physical guidance; and a one, if a correct response did not occur after execution of all of the training steps. In the three baseline sessions, and in Sessions 14 through 34, correct responses received a five and incorrect ones received a one, since these were maintenance sessions and training was not available. Performance to probe items was always rated as either a five or a one.

The experimenter served as the primary observer; during 15 sessions a second observer, either an assistant teacher or the second author, also recorded the subject's responses. These occasions included every condition of the study, except one that involved a single session (Session 34). During Sessions 3, 6, 8, 11, 14, and 18, the independent observer was in the training room. The experimenter recorded data on a record sheet placed on the desk; his markings were not visible to the independent observer. All other observations by the independent observer were made from the adjacent observation room. The independence of these observations was maintained when both were in the observation room at the same time.

Observer agreement was computed by dividing the number of trials on which the experimenter and independent observer agreed on their ratings by the total number of agreements and disagreements, and multiplying the quotient by 100. Observer agreement averaged 99% and ranged from 95 to 100%.

Procedure

The six different conditions occurred in the following procedural sequence: Baseline (A), Training (B), Baseline (A), Withdrawal of monitoring (C), Presentation of cue cards—Experimenter obscured (D), Experimenter absent (E), Experimenter present (F), Experimenter absent (E), Experimenter present (F), Experi-

menter absent (E₂), and Experimenter present (F₂).

Baseline (A). Each cue card was presented for a full 10 sec regardless of whether the subject responded correctly or incorrectly. In addition, pauses of 10 sec were maintained between presentation of successive items. Each response was recorded and neither feedback nor rewards were given for correct responses.

Training (B). A cue card was presented for a full 10 sec, followed by praise and a candy reward if a correct response occurred within the 10 sec. An incorrect response resulted in removal of the card for a 10-sec pause. The card was then presented again for a full 10 sec with the verbal prompt, "Do what the card says". A correct response produced the praise and candy, whereas an incorrect response was followed by removal of the card for the 10-sec pause. In the latter case, the experimenter presented the cue card again, read the instruction himself, and modelled the behavior for the subject. After a 10-sec pause, the card was presented for a full 10 sec with the verbal prompt. Praise and candy followed a correct response. An incorrect response resulted in removal of the card for 10 sec, followed by the experimenter presenting it again, reading the instruction, and physically guiding the subject through the behavior. After a 10-sec pause, the experimenter presented the card for a full 10 sec with the verbal prompt. A correct response produced praise and candy. If the specified response did not occur, the physical-guidance procedure was repeated up to a total of three times. If, after this training, subject still responded incorrectly, the experimenter proceeded to the next item on the list.

For those items requiring pointing to pictures, not more than six nor fewer than four pictures were placed on the desk at any one time. During sessions including training items only, six sets of four pictures were used. During sessions including both training and probe items, six sets of four pictures and two sets of six pictures were used. This method, arbitrarily selected by the experimenter, avoided presenting the subject

with a simple two-picture discrimination. Pauses of 10 sec were maintained between presentation of successive items to which the subject responded correctly. This was the only condition in which candy rewards and social praise were delivered for correct responses.

Baseline (A). After the subject's performance had stabilized under the previous condition, both candy and praise were withdrawn. The training procedure described above was also withdrawn. Instead, each item was presented in turn to the subject for a full 10 sec, and her correct and incorrect responses were recorded. Ten-second pauses were maintained between presentation of successive items.

Withdrawal of monitoring (C). The experimenter avoided all eye contact with the subject by turning his profile to her and presenting each card by holding it over the side of his face. The experimenter was able to view the subject's responses to the first 18 items in Table 1. For the other items, the experimenter was able to view where the subject pointed on the desk.

Presentation of cue cards—Experimenter obscured (D). The file cabinet was moved to the experimenter's position, and another person hid behind it before the subject entered. This person was instructed to present the cards by placing her hand over the top of the cabinet and holding the card in front of it. Both the length of presentation and pauses between items remained at 10 sec. The experimenter brought the subject into the room and promptly entered the adjacent observation room. The only time that he entered the experimental room was to arrange the pictures on the desk, after which he immediately left. The pictures, cards, and subject were in full view from the observation room.

Experimenter absent (E). To eliminate the need for any person to be present in the experimental room, slides of each written instruction were prepared. A projector was placed on a chair directly opposite the door to the room and automatically projected each slide on the back of the door at 15-sec intervals. The subject's chair was positioned directly opposite the door,

but still close enough to the desk to permit her to point to the pictures without leaving her seat. In addition, the file cabinet was placed between the subject and the projector, to prevent her from playing with the projector.

Before this condition, the subject had been primed to respond to the slides. During priming, the experimenter operated the projector and verbally prompted the subject to respond to the projected instructions. The subject reliably responded after 5 min of prompting. When the E condition was actually initiated, the experimenter brought the subject into the room, turned on the projector, and immediately entered the observation room. The only time that the experimenter entered the experimental room was to arrange the pictures on the desk. All social interaction with the subject was avoided. The subject, pictures, and the instructions presented by the projector were in full view from the observation room.

Experimenter present (F). The experimenter remained in the experimental room and sat next to the projector, which he operated manually at 15-sec intervals. All social interaction with the subject was avoided, and the experimenter left his seat only to arrange pictures on the desk. Since the experimenter was not easily able to view the figures on each picture, they were arranged in a predetermined order. This enabled the experimenter to differentiate between the subject's correct and incorrect responses of pointing to the different locations on the desk. The arrangement of pictures was changed for each session. For those items not requiring pictures, the experimenter was able to view the subject's responses without having eye contact with her.

Experimenter absent (E). This condition was the same as the previous E condition.

Experimenter present (F). This condition was the same as the previous F condition.

Experimenter absent (E₂). A new experimenter brought the subject into the room, turned on the projector, and entered the observation room. This experimenter also entered the experimental room to arrange pictures on the

TYPE OF PROMPT	SESSION								
	4	5	6	7	8	9	10	11	12
All prompts (incorrect response)	32	22	24	3	0	0	0	0	0
Physical Guidance	41	24	3	0	0	0	0	0	0
Modelling	22	38	5	11	5	5	5	3	0
Verbal	5	16	3	30	3	0	0	0	0
Mastery Performance (initial stimulus presentation)	0	0	65	56	92	95	95	97	100

Table 2. Percentage of responses following each type of prompt during acquisition (Training—condition B).

desk, as in the previous E conditions. The original experimenter remained in the observation room for the entire session.

Experimenter present (F₂). To assess generalization across experimenters, the second experimenter remained in the experimental room and operated the projector. Otherwise, this condition was the same as the previous F conditions.

RESULTS

Acquisition

The training program provided for the sequential use of more extensive training prompts as necessary to obtain performance indicating comprehension behavior on each item. Failure of the training on a particular item was indicated by recording it as incorrect after all three prompts and physical guidance three times in a row had been used in turn. The ordering of the training prompts was substantially confirmed by the acquisition data (see Table 2). In the first training session (Session 4), comprehension behavior was demonstrated after physical guidance on 41% of the trials, after modelling on 22%, and after verbal prompts on 5%. Looking at the order in which the training prompts became effective, physical guidance was followed by correct performance almost immediately and in about half of the first 22 items. Modelling was first successful on the twenty-third item, and verbal prompts on the thirty-third item. In the second training session (Session 5), modelling was first effective on the seventh item

and verbal prompts on the twenty-fifth item. The figures on the percentages of desired performances following each type of training prompt confirm this earlier occurrence of initial effectiveness for verbal prompts and modelling: 16% for verbal prompting, 38% for modelling, and only 24% for physical guidance.

In training session three (Session 6), mastery level performances (correct performance without the assistance of any training prompts) first occurred on the fifth item with the percentage correct of such behavior totalling 65% for the session, and with desired performances following verbal prompts dropping to 3%, modelling to 5%, and physical guidance to 3%. The percentage of incorrect responses, despite training, was 24% compared to 22% and 32% in the two preceding sessions. In training session four (Session 7), probe items were interspersed among training items. While the performance of nonprompted correct responses indicating comprehension behavior dropped to 56% in this session, the percentage of correct responses following probe items was at the higher level of 76%. Desired performances following training prompts were up to 30% for verbal prompts and to 11% for modelling, zero for physical guidance, and 3% for those performances not obtained in spite of the training assistance.

In training session five (Session 8), mastery was displayed on 92% of the items, with desired performances following verbal prompts (3%) or modelling (5%) in the remaining

cases. Complete mastery (100% correct performance) occurred in training session nine (Session 12).

Generalization

Generalization was displayed throughout the study, with the level of performance on probe items equalling or exceeding that of training items on 12 of the 13 occasions in which probe items were included. In addition, performance on the probe items followed the same pattern as for training items throughout the study.

Maintenance

Figure 1 presents the percentage of non-prompted correct responses at mastery level to both training and probe items. During the baseline sessions and first two sessions under condition B (training), no correct responses were displayed at mastery level; that is, following

initial presentation of cue cards only. A marked increase from zero to 65% occurred in the third training session (Session 6), followed by a slight decrease to 56% in training session four (Session 7). During the following five sessions (8 to 12), correct responses increased to 100% and remained at this level during Session 13. During the return to condition A (Sessions 14 and 15) in which rewards were not given, a 100% mastery level was maintained. In Sessions 16 to 19, condition C, experimenter attention was removed and correct responses averaged 96% and ranged from 92 to 100%. During condition D (Sessions 20 to 22), a slight decrease occurred, but correct responses rapidly returned to the 100% level.

With the beginning of condition E, with the withdrawal of all persons except the subject (Session 23), correct responses decreased markedly from 100 to 35%. During the three sessions

Fig. 1. Percentage of mastery level reading-comprehension responses to training items (●) and probe items (○). Sessions during which observer agreement was determined are indicated by the following mark (Λ) below the session number.

under this condition, correct responses averaged 24% and ranged from 11 to 35%. In addition, the subject displayed inappropriate behaviors, such as leaving her seat and attempting to exit from the room, placing her chair against the wall adjacent to the door so she no longer faced the area on which the slides were projected, searching through the file cabinet and desk drawers, and jumping around the room. In anticipation of the first of these behaviors, a staff member of the school was instructed to sit outside the door of the room and tell the subject to return to her seat whenever she opened the door. On those occasions, the subject closed the door and often returned to her seat.

When the experimenter returned to the room in Session 26 (condition F), correct responses increased from 27 to 89%. Correct responses during the four sessions under this condition averaged 92% and ranged from 86 to 97%. In addition, the aforementioned inappropriate behaviors were not displayed. A return to condition E began in Session 30 and resulted in another decrease from 97 to 38%. Correct responses averaged 38% for both sessions under this condition. In addition, the inappropriate behaviors that occurred in the previous E condition reappeared.

During Session 32, a repetition of the F condition, correct responses increased from 38 to 95%. When the new experimenter conducted Session 33 (condition E₂) without remaining in the room, correct responses decreased from 95 to 54%. In the following session, (condition F₂) also conducted by the second experimenter but from within the room, an increase from 54 to 97% resulted.

DISCUSSION

The training in condition B rapidly developed reading-comprehension behavior to training items according to the hierarchy of training steps. This program can be conceptualized as providing a shift in stimulus control (Baer *et al.*, 1967; Lovaas *et al.*, 1967; Risley and Wolf,

1967; Striefel, Bryan, and Aikens, 1974; Wolf *et al.*, 1964), since initially the subject's behavior was under the control of physical prompts, followed by a shift to modelling, then to verbal prompts, and finally to cue-card presentation alone. Whereas behaviors had to be initially taught using physical guidance in Session 4, a shift to higher levels, modelling and verbal prompts, occurred in the latter part of that session. As responses reliably came under the control of higher levels, lower levels declined in importance, until initial cue-card presentation alone yielded mastery at 100% in Session 12 (see Figure 1).

In the Baer *et al.* (1967) study, the authors mentioned that initially each response had to be taught separately. Acquisition of these early responses did not play a functional role in any acquisition of later responses. In the present study, however, responses taught initially in Session 4 may have functioned to produce the shift in the latter part of that session, and this pattern continued for the subsequent seven sessions. Due to the rapidity with which the reading-comprehension behavior was acquired, analysis of controlling factors was not attempted. Instead, because of the time limit imposed on this study and the major area of interest to the authors, it was necessary to investigate maintenance variables. With this decision, the question of whether reading comprehension behavior was developed or the subject was simply trained to comply to instructions appropriate to desired behaviors previously learned remained unanswered.

During Sessions 14 to 34, an attempt was made to identify the variable(s) responsible for maintaining reading-comprehension behavior (or compliance with instructions). The procedure involved a systematic withdrawal of probable reinforcing stimuli. It is clear from Figure 1 that withdrawal of candy, verbal praise, and experimenter monitoring produced only slight effects, if any. Although candy and praise did not appear to play a role in maintaining reading-comprehension behavior, they may have been important in establishing this behavior during

the acquisition phase (Baer *et al.*, 1967; Baer and Sherman, 1964; Martin, 1971), since no correct responses were displayed during the initial baseline sessions in which these rewards were not offered.

During condition D, the subject's behavior remained at a high level because she may have been able to detect the hidden person's presence. This was possible because this person's hand and arm were visible to the subject when the cue cards were presented. In addition, a reflection of this person's body in the one-way mirror was also visible. The procedure employed during condition E, when the instructions were presented by slide projector and the experimenter was out of the room, dramatically decreased responding. A subsequent return to the previous high level of responding resulted under condition F, when the experimenter returned to the room. After replicating this relation, it appeared that the presence of the first experimenter in the room was the maintaining variable for a high level of responding. Since this relation was replicated again with another experimenter under conditions E₂ and F₂, it appeared as though the simple presence of another person maintained the behavior.

The present results are similar to those of Peterson *et al.* (1971) and Peterson and Whitehurst (1971), who suggested that the experimenter's presence was the stimulus controlling imitative behavior. In addition to considering the presence of the experimenter as a setting event, they mentioned that it could fall within a set of variables called *demand characteristics*. Orne (1962) defined demand characteristics as including such cues as the experimenter himself, the experimental setting, communication during the experimental procedure, and the subject's reinforcement and punishment histories with respect to following instructions given by adults. Other studies (Steinman, 1970*a*, 1970*b*; Steinman and Boyce, 1971; Waxler and Yarrow, 1970) have also indicated the importance of antecedent and setting events. Martin (1971) proposed that imitative behavior (and reading-comprehension

behavior in the present study) could be considered as "members of a larger class of responses called 'instruction-following' (p. 391)". Since the subject was rewarded on some trials for following the instructions given by an adult (*i.e.*, when correct responses followed a verbal prompt), instruction-following behavior was strengthened in this setting.

As far as setting events were concerned in the present study, it appeared that neither the physical arrangement of the room, the mode of presentation of the instructions, nor the individual who presented them played significant roles in affecting the subject's level of responding. Although these variables were altered (*i.e.*, the furniture moved around, instructions presented on cards and slides, experimenters varied), the level of responding was affected only by the absence from the room of another person, which appeared to have been the major setting event in operation.

Consistent with the findings of Steinman (1970*a*, 1970*b*) and Steinman and Boyce (1971), the single-presentation mode utilized in the present study was associated with generalization of the performance on probe items. It was striking that the level of performance on probe items equalled or exceeded that on training items on 12 of 13 occasions when probe items were interspersed. This effect was manifested beginning with the fourth training session (Session 7), when the percentage of correct performances on probe items was 76% as compared to 56% on training items. In addition, the pattern of responding to probe items paralleled that of training items. It was concluded, therefore, that the same variables functionally controlled performance to training and probe items. These results indicate that the generalization obtained with the single-presentation mode of presentation in imitation studies appears to include reading-comprehension behavior as well. The number of items with which generalization can be obtained, in absolute numbers and relative to the number of training items, needs to be determined in future research.

The high level of correct performance on probe items in the seventh session, when they were first introduced in this phase, was in sharp contrast to the trial-by-trial gradual movement through the training hierarchy toward mastery performance with training items. The role of the training program was, however, well supported when reading performance did not return to baseline levels when baseline conditions were restored. Since component analyses were not conducted, the role of praise, candy, and the training program in the development of this durable behavior change cannot be determined. Other studies with subjects drawn from special populations have shown the functional role of rewards such as those used in the present study (Baer *et al.*, 1967; Lovaas *et al.*, 1966; Lovaas *et al.*, 1967; Martin, 1971; Metz, 1965; Peterson, 1968; Risley and Wolf, 1967; Wolf *et al.*, 1964) for the performance of the desired behaviors. These two considerations suggest that a transfer of control may have taken place and that the presence of a person, whether hidden behind a file cabinet as in condition D, or sitting unattentive and unresponsive but in full view of the subject as in conditions F and F₂, had acquired functional control over the maintenance of the behavior.

The functional control of the reading-comprehension behaviors by the presence of another person was shown within and across experimenters in conditions E, F, E₂, and F₂. Even though the numbers of sessions per condition were limited (one to four), the size of the variation between conditions was large in each case (more than 40%), and similar levels of performance were obtained in each category of the variation (the presence or absence of another person). Nevertheless, a larger number of sessions in each condition would have been preferable. The demonstration of the role of setting events in this study is consistent with the other research in this area (Peterson *et al.*, 1971; Peterson and Whitehurst, 1971; Steinman, 1970a, 1970b; Steinman and Boyce, 1971; Waxler and Yarrow, 1970) in pointing to the

need for work that goes beyond consequences and even antecedents to what may be termed matters of environmental design. It can be suggested that the field of environmental design might usefully approach the effects of its work on the occurrence of various behaviors by studying the processes by which setting events acquire functional control over behaviors, and then systematically varying such elements as visibility of other people in school settings, offices, and factories, as well as by carrying out similar variations in physical design elements once setting-event control is established for these factors.

REFERENCES

- Baer, D. M., Peterson, R. F., and Sherman, J. A. The development of imitation by reinforcing behavioral similarity to a model. *Journal of the Experimental Analysis of Behavior*, 1967, 10, 405-416.
- Baer, D. M. and Sherman, J. A. Reinforcement control of generalized imitation in young children. *Journal of Experimental Child Psychology*, 1964, 1, 37-49.
- Jastak, J. F. and Jastak, S. R. *Wide range achievement test*. Wilmington, Delaware: Guidance Associates, 1965.
- Lovaas, O. I., Berberich, J. P., Perloff, B. F., and Schaeffer, B. Acquisition of imitative speech by schizophrenic children. *Science*, 1966, 151, 705-707.
- Lovaas, O. I., Freitas, L., Nelson, K., and Whalen, C. The establishment of imitation and its use for the development of complex behavior in schizophrenic children. *Behaviour Research and Therapy*, 1967, 5, 171-181.
- Martin, J. A. The control of imitative and non-imitative behavior in severely retarded children through "generalized instruction-following". *Journal of Experimental Child Psychology*, 1971, 11, 390-400.
- Metz, J. R. Conditioning generalized imitation in autistic children. *Journal of Experimental Child Psychology*, 1965, 2, 389-399.
- Orne, M. T. On the social psychology of the psychological experiment: With particular reference to demand characteristics and their implications. *American Psychologist*, 1962, 17, 776-783.
- Peterson, R. F. Some experiments on the organization of a class of imitative behaviors. *Journal of Applied Behavior Analysis*, 1968, 1, 225-235.
- Peterson, R. F., Merwin, M. R., Moyer, T. J., and Whitehurst, G. J. Generalized imitation: The effects of experimenter absence, differential rein-

- forcement, and stimulus complexity. *Journal of Experimental Child Psychology*, 1971, **12**, 114-128.
- Peterson, R. F. and Whitehurst, G. J. A variable influencing the performance of generalized imitative behavior. *Journal of Applied Behavior Analysis*, 1971, **4**, 1-9.
- Risley, T. and Wolf, M. Establishing functional speech in echolalic children. *Behaviour Research and Therapy*, 1967, **5**, 73-88.
- Steinman, W. M. The social control of generalized imitation. *Journal of Applied Behavior Analysis*, 1970, **3**, 159-167. (a)
- Steinman, W. M. Generalized imitation and the discrimination hypothesis. *Journal of Experimental Child Psychology*, 1970, **10**, 79-99. (b)
- Steinman, W. M. and Boyce, K. D. Generalized imitation as a function of discrimination difficulty and choice. *Journal of Experimental Child Psychology*, 1971, **11**, 251-265.
- Stewart, F. J. *Speech and language training program for developmentally disabled children*. Portland, Oregon: Multnomah County Intermediate Education District, 1973.
- Striefel, S., Byran, K. S., and Aikens, D. A. Transfer of stimulus control from motor to verbal stimuli. *Journal of Applied Behavior Analysis*, 1974, **7**, 123-135.
- Waxler, C. Z. and Yarrow, M. R. Factors influencing imitative learning in preschool children. *Journal of Experimental Child Psychology*, 1970, **9**, 115-130.
- Wolf, M., Risley, T., and Mees, H. Application of operant conditioning procedures to the behavior problems of an autistic child. *Behaviour Research and Therapy*, 1964, **1**, 305-312.

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