THE FACILITATING EFFECT OF MODELING PROCEDURES 
UPON BEHAVIOR MODIFICATION OF 
MENTALLY RETARDED 

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The study was undertaken to investigate the facilitating effects of imitation procedures upon a traditional behavior modification program. A "token economy" was instituted within a workshop setting.

The mentally retarded subjects were four boys and six girls, with a median age of eighteen years six months and mean Intelligence Quotient of 66.4. The subjects performed the following three production tasks an average of six and one half months prior to the study. One consisted of drilling a hole in a rivet. The second entailed grinding off the burr left by the drilling operation. The third was composed of assembling two washers and a screw into a fastener combination.

Each subject was matched with another in terms of production on the three tasks. One subject of the matched pair was randomly assigned to one of two groups, designated the model and observation groups. The other subject was automatically placed in the other group. Sex was equalized across groups.

At the beginning of the study, all the subjects in the model group were given a production goal to achieve based on
previous output. If this quantity was achieved within a half-hour period of time, verbal praise was given, as well as a token to be exchanged for privileges and games not ordinarily enjoyed. Although not involved directly with the token economy, the observation group worked in the presence of the model group and observed the distribution of tokens as well as the exchange for privileges and games.

The model group was provided six opportunities per day for reinforcement during three hours in the afternoon, five days a week, for three weeks. Production goals were increased as a function of increased production. At the beginning of the fourth week, the observation group was included in the reinforcement program. For three days both groups were allowed six opportunities per day to receive a token to be exchanged for games and privileges. The number of opportunities for reinforcement was subsequently reduced from six to two times per day. The reinforcement period was reduced from three hours to one hour. During the fifth week, this reinforcement period was gradually increased to the original three hours, but the number of opportunities for reinforcement remained constant.

The first hypothesis predicting that all subjects would exhibit superior performance received support from the results. All subjects accomplished at least fifteen per cent increase on all tasks, which was significant with $P = .05$. 
The hypothesis that the observation group would exhibit superior performance when compared to that of the model group, received considerable support from the results as well. The observation group committed significantly fewer errors and outperformed the model group significantly on two of the three tasks.

The hypothesis that reduction of reinforcement from one hundred per cent down to thirty-three per cent would not adversely affect production of either group was also substantially confirmed. With a single exception, all subjects either maintained or increased production quantity. This result was significant with \( P = .05 \).

This study demonstrates that imitation procedures facilitate performance on production tasks of mental retardates involved in a traditional behavior modification program. The experiment does not prove that a combination of imitation and behavior modification is superior to behavior modification alone, but the results add support to this contention. The necessary control condition using behavior modification exclusively was not provided for practical consideration. Nevertheless, a sharp reduction in the number of reinforcements without a concomitant reduction in quality of work did conserve the technician's time. On a larger scale, the combination of procedures could relieve overburdened institutional staff personnel while maintaining production rate of patients.
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MENTALLY RETARDED

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CHAPTER I

INTRODUCTION

Traditional Concepts of Mental Retardation

The capabilities of mental retardates are widely believed to be inferior to normal individuals and are seen as a general deficiency Kahn and Burdett (5). DiStefano, Ellis, and Sloan (3) lend support to this view and observe that the literature indicates that mental deficiency reflects not only a reduction in intellectual functioning, but also inferior sensori-motor abilities. Sloan (11) and Malpass (7) corroborate this conclusion by noting poor performance of mental retardates on motor skill tasks when compared to normals.

Revised Concepts of Mental Retardation

Kahn and Burdett (5) hypothesized that the previously cited studies seemed to support a deficiency hypothesis, because they assume that one test administration reveals a constant difference between normals and retardates. The ultimate implication is that this obtained difference will remain constant regardless of the number of test administrations. Accordingly, these two investigators administered a number of trials using standardized motor tasks to mental retardates. On the basis of the norms generated from scores of normal subjects, performance of the retardates went from the fifth
parcentile to the fiftieth percentile. These investigators believe their results indicate that the retardates experience difficulties in adapting to novel stimuli and are capable of higher performance if they are allowed to practice. This study does suffer from one serious defect: There is no normal subject control group which would be necessary to demonstrate a convergence of performance between retardates and normals as the number of trials increases.

Clarke (2) did observe this convergence by noting that retardates' performance improved and over a number of trials approached the level of normals who also had benefit of practice. This result corroborates those of Reynolds and Adams (9) who found that subjects of low initial ability over a number of trials approached the performance of subjects with high initial ability. These investigations account for the convergence effect by hypothesizing that normal subjects initially perform close to the physical maximum by "activating a pool of previously acquired relevant responses, carried over, perhaps, from psychomotor tasks encountered in every day situations" Reynolds and Adams (9, p. 276), and therefore reach asymptote early while the retardates improve slowly and steadily, approximating the performance of normals over a number of trials.
Techniques Used to Improve Performance of the Mentally Retarded

The process involved in this steady progress of improved performance can be included within the "behavior modification" framework. Generally, this technique entails manipulation of external conditions and/or subject to bring about a desired change in behavior. One effective, specific technique of behavior modification used with retardates is operant conditioning, a procedure developed from Skinner's experiments with pigeons Skinner (10). The basic paradigm involves a reinforcement administered to the subject directly after performance of a desired task. The underlying assumption is that an individual is more likely to repeat a behavior if it is followed by a reinforcement. Lent (6) and Girardeau and Spradlin (4) incorporated this technique within a "token economy" with institutionalized mental retardates and noted good results. Each subject received a token or poker chip for desired behavior and was allowed subsequently to cash these in for desired privileges and articles. One time-consuming consequence occurs because the therapist must wait until the desired response occurs before he can introduce reinforcement. One adjunct procedure devised to raise the probability of response is shaping. The therapist reinforces behaviors closely related to the desired one. This strategy continues until the desired behavior is produced. Another facilitating procedure, thought to be even more effective,
is that of imitation. The therapist, Metz (8) or a more advanced subject Berkowitz (1) demonstrates the behavior to the retardate, with reinforcement administered as a consequence.

The following three hypotheses were devised to examine the effects of imitation used in conjunction with a "token economy."

**Hypothesis 1.**—Both imitation and traditional behavior modification techniques will facilitate performance.

**Hypothesis 2.**—Subjects provided with a model will exhibit superior initial performance in comparison to those subjects who were not provided with a model.

**Hypothesis 3.**—Reduction in per cent reinforcement will not adversely affect performance of either subjects provided with a model, or those who were not provided with a model.

Before the proposed experiment is introduced, studies dealing with imitation behavior will be discussed. Theoretical interpretations will be reviewed, as well as factors facilitating imitation.


CHAPTER II

REVIEW OF THE LITERATURE

Theoretical Orientation of Imitation

Perhaps one of the earlier major treatments of imitation was that of Miller and Dollard (23). To them, imitation was regarded in Hullian terms and like all learning phenomena consisted of drive, cue, responses, and reward (23, p. 2). Bandura (2) views modeling as the vehicle, "... whereby new modes of behavior are acquired and existing response patterns are extensively modified through observation of other people's behavior and its consequences for them" (2, p. 202). His theory is described as multiprocess and is closely analogous to the computer model. Stimulus events are transformed and then stored in "imaginable and verbal memory codes." Presentation of appropriate environmental cues and recall of the stored information guide the reproduction of the model response (2, p. 202). Whaley and Malott (38) view imitative behavior in terms of similarity to the behavior of the model. They feel that the model provides discriminative stimuli which control the imitative responses (38, p. 12-28). Effective control will be maintained only if the imitative responses made in the presence of these discriminative stimuli are reinforced (38, p. 13-2).
Generalization and Imitation

Generalized modeling procedures have been shown to be effective means of modifying the behavior of suspected low intelligence children. Wolf, Risley, and Mees (39) developed a procedure in which children diagnosed as retarded, brain-damaged, or autistic were taught appropriate imitative speech. Typically, these children exhibited inappropriate parroting of overheard conversation (termed "echolia"). With a food deprivation schedule in effect, the subject was presented with various pictures. The experimenter would say, "This is a cat," or "Now say cat." On some trials the subject would mimic the experimenter's statement, and the experimenter would immediately administer social and food reward. In order to develop more appropriate imitative answers instead of simple mimic responses, an anticipative method was instigated. The experimenter would present a picture and then pause. If the subject responded correctly, he received a food reward earlier than usual. Since deprivation was in effect for about six hours, the subject began to make appropriate responses with only the presentation of the card. Picture books and common household objects were also mastered. The subject progressed rapidly and was discharged within seven months. His parents continued this procedure. Later, he attended a Laboratory Preschool for two years. Appropriate verbal behavior was developed sufficiently for the subject to enroll in special education.
Using basically the same procedure, Risley and Wolf (28) developed some refinements. Instead of using bits of the subject's food, they utilized small spoonfuls of ice cream. In addition, extinction procedures were also utilized along with positive reinforcement to eliminate disruptive behaviors. Metz (22) interpolated non-reinforced imitation trials within blocks of reinforced imitation trials with two severely autistic children. Imitative behavior was viewed to be composed of two conditions: (1) the behavior must be similar to, and occur upon the occasion of the specific example demonstrated by the model; and more important: (2) the subject must respond to the experimenter's responses in a discriminative manner. In other words, the subject must be guided by the nature of the response made by the model. The subject must not use the model's response simply as a signal to respond. The author designed some procedures to demonstrate this generalized limitation technique. The subjects were reinforced to touch their toes after the experimenter had demonstrated. Then the experimenter touched his head and requested the subject to do the same. During the early part of the experiment, the subject would again touch his toes instead of his head. This inappropriate response helps to demonstrate the need for responding discriminatively and not simply making a stereotyped response. Another procedure consisted of the experimenter's picking up one of two identical objects among several
objects on a table and requesting the subject to do the same. The subject obviously must discriminate accurately. The results of the study indicate that the subjects did achieve what the author called generalized imitation. The subject would also imitate behaviors which were interpolated between rewarded behaviors but were never themselves rewarded.

Peterson (26) also observed the generalization qualities of imitation, but additionally was interested in discrimination attributes. Given bites of food as the reinforcement, retarded children were taught to perform a series of related responses. As training progressed, the children began spontaneously to imitate behaviors as soon as they were demonstrated. Generalization was thus established. The investigator then discovered that one of the behaviors could be extinguished without influencing the others by massed non-reinforced evocation of that behavior. Discrimination was therefore demonstrated. This investigator noted that these extinguished responses would reappear if interspersed among other reinforced behaviors.

Using adult subjects, Schein (32) demonstrated that imitation responses established in the presence of reward would generalize to a new situation in which reward was no longer present. Hartup (16) noted that normal children achieved partial generalization. Subjects provided models of the same sex would tend to generalize behaviors across situations, but subjects with opposite sex models would not generalize imitative behavior across situations. Berkowitz (10) demonstrated that retarded children
would generalize. After considerable shaping, the subjects would sustain a high rate of imitative behavior on the strength of receiving reinforcement at the end of the session. It was necessary, however, for food to be present and visible during the session for this effect to occur.

Baer and Sherman (1), using normal children, established specific imitation behavior by generalization. They reasoned, as did Metz (22), that learning by imitation does not solely consist of a mimic-like response, but that discrimination of relevant cues facilitates imitation. This provides an explanation for the generalization effect of imitation in similar but never previously reinforced situations. Accordingly an experiment was designed to demonstrate this hypothesis. Subjects of nursery school age were introduced to a puppet. A bar press was located next to the subject's seat. The experimenter demonstrated how it worked but no mention was made for the subject to do so. The puppet also was provided with a bar press. The puppet started the conversation by asking the subject to repeat head nodding, mouthing, and strange verbalizations. Each time the subject complied, the puppet would remark "that's good" or produce other socially rewarding phrases. At various times the puppet would bar press but would not ask the subject to do so. When the subject bar pressed no reinforcement was given. Of the eleven subjects seven exhibited the bar press responses in varying degrees. The subject had effectively imitated a non-reinforced behavior
through generalization. However, the effect was dependent upon contingent reinforcement of the other responses. When social reinforcement was administered independent of imitation of the head nodding, mouthing, or verbalizations, bar press responding declined.

Influence of Model Characteristics Upon Imitation

Model characteristics have been shown to influence imitative behavior. Bandura, Ross, and Ross (5) exposed children to aggressive or non-aggressive adult models in a play situation with "Bobo" the clown. Later the children were allowed to play alone in the same situation. The aggressive model both verbally and physically abused the clown while the non-aggressive model engaged in quiet play. The children with an average age of four years four months, were subjected to mild aggression arousal prior to testing by being deprived of valued toys. After observation of the models, the children were placed in a room with "Bobo" and other toys for a free play period. Their recorded behavior indicated that those subjects exposed to an aggressive model exhibited significantly more verbal and physical abuse toward "Bobo" the clown than those subjects observing the non-aggressive model. In addition, the non-aggressive model subjects displayed less aggression in this free play period than did controls which were not exposed to any model.
In a similar experiment Madsen (20) varied familiarity of model and sex of the child within the aggressive - non-aggressive framework. Two male graduate assistant nursery school teachers spending half-time in each classroom for an entire summer session were the familiar models. A stranger served as the unfamiliar model. Generally, males confronted with a familiar aggressive model performed more aggression than girls exposed to the same model. The male models were effective instigators of aggression in the girls but the imitation behavior was not as precise and exact as with the boys.

Mussen and Rutherford (24) demonstrated the efficacy of aggressive models in freeing subjects to express aggressive impulses. Three groups of children were experimentally frustrated by being required to perform a tedious task prior to viewing a film. Each group saw either an aggressive cartoon film, a non-aggressive cartoon film or a non-aggressive, non-cartoon film. Three other groups did not experience the tedious task, but did view the films. The effects of the tedious task were negligible when compared to the effects of the film content. Those subjects who were exposed to the aggressive cartoon film were better able to express aggressive impulses by verbal desire to break a balloon than the other groups.

Although many of the studies investigate the disinhibition effects of aggressive models as exampled by the previous studies, other model attributes have been investigated.
Rosenbaum, Chalmers, and Horne (31); Chalmers, Horne, and Rosenbaum (12) observed that competent models were usually imitated more than non-competent ones. Others who are more likely to be imitated are those with sought-after attributes such as: social power Bandura, Ross, and Ross (6), ethnic status Epstein (13) and expertise Mausner (21).

The effects of the model's characteristics upon imitation behavior can be altered. Gumpert, Hornstein, Lasky, and Lewicki (15) demonstrated the transient effect of a model's value judgment upon imitation when a dissident judgment is also interjected. Children observed an adult model administer self-reward or self-punishment depending upon his recorded performance on a particular game. The child was then left alone to play the game and self-administer rewards and punishments. "Correctness" as depicted by a series of lights, controlled by the experimenter, was independent of the actual quality of the subject's responses. As the child continued to play the game, a second adult entered and enforced stricter or more lenient criteria for the child even though "lip service" was given for the original criterion. The child was again left alone to play the game and self-administer rewards or punishment. "Correctness" was still controlled by the experimenter. The results indicated rule adherence during the first independent play period. During the second independent play period, those subjects who were either underpunished or overrewarded by the second experimenter, tended to be more lenient and reward
themselves more often. Subjects overpunished or underrewarded exhibited a slight increase in rule adherence.

Influence of Perceived Similarity Between the Model and Imitator
Upon Imitation

Perceived similarity between model and observer has also been demonstrated to influence imitation. Rosekrans (29) exposed young boys to a filmed male model playing a war strategy game. The model was dressed and portrayed as being either similar to or different from the subject. The boys were then allowed to play the same strategy game. Results indicate that the boys exposed to the similar model made significantly more instrumental imitating responses than did those exposed to a dissimilar one. Adding supporting data, Stotland and Patchen (33) first determined attitudes of prejudice and authoritarianism of subjects using a questionnaire, and then exposed them to a perceived similar or dissimilar model. This model proposed views different to the subjects. The results indicate a shift in attitudes for those subjects who viewed a similar model, when the questionnaire was again administered. Burnstein, Stotland, and Zander (11) found that boys would adopt more the sea-diving preferences of a deep sea diver similar to them in background than one portrayed as dissimilar. Stotland, Zander, and Natsoulas (34) exposed subjects to models who were either similar or dissimilar to the subjects' preferences for musical compositions. The models then chose some
nonsense syllables, and the subjects were allowed to see their choices. The subjects were then asked to select nonsense syllables. Subjects whose model was perceived as similar to themselves in respect to musical preferences, tended to choose more of the same syllables chosen by the similar model than did subjects with dissimilar models.

Influence of Reward Upon Imitation

Rewarding an imitative response in one way or another is a requisite condition for continuation of that behavior, Miller and Dollard (23, p. 17); Whaley and Malott (38, p. 13-2). Punishing or rewarding the model in the presence of the imitator has also been shown to have an effect upon imitation behavior. Walters and Parke (36) exposed three groups of young boys to three different films depicting other boys playing with toys. The films differed only in the consequences displayed as a result of play behavior. One group was depicted as being rewarded, another punished, and the last received no consequences for playing with the toys. A fourth group did not view a film. Each of the four groups was then given access to the same toys which were employed in the films and were initially told not to play with them. After fifteen minutes, all groups were told they could play with the toys. The results indicate that during the prohibited fifteen minutes, the rewarded and no consequence groups played with toys significantly more times than the punished and no film groups. The group differences disappeared when the prohibition was terminated.
In a similarly designed study, Rosekrans and Hartup (30) found that children would imitate models to a greater extent if these models were depicted as being rewarded for aggressive behavior. Imitation behavior diminished for a group of subjects who saw a model receive fifty per cent reward and fifty per cent punishment for aggressive behavior. Imitation behavior diminished even further for subjects observing a consistently punished model.

Most of the studies investigating the effects of model consequences upon imitative behavior entail either inhibiting a behavior, Bandura and Kupers (4), Benton (9), Walters, Parke, and Crane (37) or reinstating a previously inhibited behavior, Porro (27), Walters, Leat, and Mezei (35). Except for the investigation by Walter and Parke (36) cited previously, only the Bandura, Grusec, and Menlove (3) study provides evidence for the facilitation of imitation by rewarding the socially sanctioned behaviors of models. In the most pertinent segment of this investigation, children ages seven to eleven were confronted with an adult model who demanded high performance of himself on a bowling game and would not administer self-reward in the form of tokens until he reached a high prearranged criterion. In addition, this model would verbally praise or admonish himself depending upon his "performance." "Actual performance" had little or no relation to "perceived performance" represented by a series of lights over the game. This "perceived performance" was controlled by the experimenter in
another room. At the end of the modeling trials, the experimenter praised the model for his high standards in the presence of the child. The child was allowed to play the game himself, with the "perceived performance" controlled by the experimenter. The results indicate that these children adapted the strenuous standards significantly more than children who observed simultaneously the adult model and a low-standard-setting peer model. The experimenter's praise of the adult model had a facilitating effect as well.

Influence of Peer and Adult Models Upon Imitation

The effectiveness of peer models' behavior upon imitation has received very little attention by investigators until recently. The casual observer cannot help but note the influence of peers on the behavior and attitudes of a child. In a study cited previously, Berkowitz (10) utilized high level mentally retarded children with I.Q. 46-66 as models for non-imitative profoundly retarded children with I.Q. range from 18 to 22. The high level model would sit across a table from the subject and demonstrate the behavior to be learned. When the behavior was produced either spontaneously or manually prompted, the model gave the subject some food. Twenty motor tasks were learned in this manner. When ten other never reinforced tasks were interspersed among the twenty original, generalization occurred. Even though never reinforced, these ten tasks were imitated as long as the other twenty tasks were reinforced.
Per cent reinforcement was reduced to twenty-five per cent; the subjects continued to imitate both sets of tasks at the same level of performance. Response frequency was maintained when reinforcement was given only at the end of seventy responses. A necessary condition was that food was visible at all times during the seventy response sessions.

In an experiment similar procedurally to the Bandura, Grusec, and Menlove (3) study, Bandura and Kupers (4) investigated the effects upon imitation behavior of peer and adult models who adopted a high criterion for self-reinforcement. They found that children would emulate the high standards of peers but that adult models had even more influence. Hicks (18) compared the effect of aggressive peer model to that of an adult on imitation behavior of children. Thirty boys and thirty girls were rated on aggression to obtain baseline measures. The children were then divided into groups. One group viewed a film depicting male adult aggression with toys, another of female adult aggression, another male peer aggression, and the fourth of female peer aggression. The children were then mildly frustrated by being shown some toys but were not permitted to play with them. The children were then led into a room and allowed to play with the toys, some of which were depicted in the film. Six months later additional measures were taken to assess the long-range effects of the filmed aggression. All groups displayed aggression to a significant level in the play situation immediately subsequent to viewing.
the film. Boys tended to emulate male peer models more than any other condition or group. The results of the six months follow-up indicate a significant diminution of aggressive behavior. Boys, however, tended to retain more of the aggressive elements than any other group if the model was an adult male.

Hartup and Coates (17) found that peer models influence philanthropic behaviors of children. Nursery school children observed an altruistic peer perform a task, receive a reward, and then put part of the reward aside for another child. The results indicate that the subjects who viewed the altruistic peer model would imitate altruistic behavior significantly more than those subjects who had not viewed a model.

Influence of the Imitator's Past History Upon Imitation

The imitator's past history and self-concept have been shown to affect imitation behavior in various ways. Hartup and Coates (17) were interested in the effects of past history of social reinforcement. Independent judging at discrete intervals of nursery play, plus the investigators' observations determined which subjects more frequently gave or received social rewards relative to the whole group. After imitation trials, the results indicate that subjects who usually receive more spontaneous rewards from peers significantly imitated a rewarding model more than a non-rewarding model. The reverse
outcome was true in relation to children who were infrequently rewarded by peers. Adding support to these results, Schein (32) and Miller and Dollard (23, p. 167) observed that those who have experienced frequent reward for matching behavior in the past tend to be more attentive to modeling cues.

Rosenbaum, Chalmers, and Horne (31) also investigated the effects of previous experience on imitation. Subjects who had more experience with failure tended to imitate more than subjects who were relatively successful. Rosenbaum, Chalmers, and Horne (31) and Gelfand (14) supported these results by observing that subjects with low self-esteem, as determined by a self-concept test, tended to match models more on tasks of an instrumental nature than did subjects who possessed high self-esteem. Bandura and Walters (8) studied self-esteem as well and obtained comparable results.

Lending support to Hartup and Coates (17) contention that prior experience influences imitation, Madsen (20) investigated parental child-rearing practices and found that a warm, child-centered father seemed to foster imitation in boys. Also, boys whose fathers encourage approach tendencies during times of emotional upset or misbehavior tend to imitate more. Mothers who give inconsistent affection and ineffective discipline tend to have high modeling boys. Girls showed more aggressive imitative behavior when their mothers exhibited conflict regarding the traditional mother role. Bandura and Walters (7) also note that affectional relationships of parents has an
effect upon whether or not the child imitates the parent's attitudes and behaviors.

**Influence of Workshops Upon Imitation and Employability of Mentally Retarded**

The performance of retarded late adolescents within a workshop setting has been examined by Kliebhan (19). Forty-eight male retardates with Intelligence Quotients ranging from 50-79 and chronological age of fifteen years, six months to twenty-three years were placed in a work setting forty-five minutes a day, five days per week, for five weeks. Base rate data was determined one week prior to the experiment. One group of subjects (expectancy group) was instructed how to perform the task and asked to set daily production goals and received knowledge of results. Another group (imitation group) was instructed and then exposed to a worker of normal intelligence. The last group (control group) was simply given verbal instructions concerning how to complete the task. The results indicate that the expectancy and imitation groups produced significantly more than the control group. Production rates of the two experimental groups did not differ significantly. Work quality and general workshop behavior was superior for the expectancy group in comparison to the imitation group.

Lastly, Newhaus (25), utilizing data gathered over a three year period, was interested in determining the factors underlying the employability of the mentally retarded. He
found that considerable time was necessary to develop requisite job skills, but the factors which determined success or failure on a job were acceptable work habits and personal skills.

Attention now will be focused on an experiment designed to facilitate consistent work habits via consistent productivity of mentally retarded within a workshop setting. A "token economy" technique will be established, with imitation procedures introduced to accelerate production.
CHAPTER BIBLIOGRAPHY


CHAPTER III

METHOD

The Subject Group

The subjects consisted of ten mentally retarded trainees enrolled in a workshop setting. The median age of the four boys and six girls was eighteen years, four months. The range of ages was fifteen years to twenty-one years. The mean Intelligence Quotient was 66.4, ranging from fifty-two to eighty-one. The subjects had been enrolled at the Institute an average of six and a half months. Parents were informed about the study and approved of their offspring's participation in writing (see Appendix).

Tasks Performed

Each subject had previously performed the following tasks at least 500 times each:

1. placing a rivet into a jig on a drill press and drilling a hole in the rivet.
2. grinding off the burr on the rivet left as a result of the drilling operation.
3. assembling one screw and two washers into a fastener combination.

Procedure

Each subject was matched with another in terms of average production on the previously mentioned tasks. One subject of
the matched pair was randomly assigned to one of two groups, designated the model group and the observation group. The other subject was automatically placed in the other group. The only limiting factor was that sex was equalized so that three girls and two boys comprised each group. This sex matching was thought to be necessary to further equalize the groups because both Bartup (1) and Madsen (3) noted sex differences in relation to imitation behavior.

Three days prior to the beginning of the study, all ten subjects were told that an effort to improve their production would be initiated. The ultimate goal of this program, they were told, was to increase their chances of obtaining jobs at the termination of training. This program was explained as being enjoyable in which each subject would receive a token for good production. They could exchange these for not previously enjoyed privileges and games during the afternoon break time. In addition, it was stated that only some of the trainees would begin immediately so that problems of procedure could be remedied. On the day before the study began, the names of the model group subjects were announced to the entire group as the individuals who would start the program first. At the beginning of the first day's session, each subject in the model group was told what his usual production had been in the past for a one-half hour interval and was urged to produce that quantity. This procedure is much like that of Klienbhan's (2) expectancy group. One half hour later,
production accomplished within that interval was recorded, and if the subject's individual average was met or exceeded, knowledge of the results was given as well as a token, and a verbal compliment. If the average was not met, knowledge of results was still given. A neutral statement followed such as, "You didn't do as much as you usually do." "It's too bad you don't get a chip, but try harder, and next time you will get one." The subjects had six opportunities to receive a chip each day from 12:30 p.m. to 3:30 p.m., Monday through Friday, for three weeks.

The individual average base rate changed from day to day. The previous day's average production constituted the new base rate if it exceeded the old base rate. This rate changing procedure remained in effect until twenty-five per cent increase was achieved over the original base rate. The original base rate was computed using the month's production prior to the start of the study. The subjects in the model group were allowed to cash in their tokens for privileges or games (see Appendix) during the afternoon break or keep them to exchange at a later date. The observation group was present during the entire time. The observation group worked along side the model group and observed them receive tokens for good production. The observation group also watched the model group enjoy the earned privileges and games. Tokens which were not spent during the break period were taken up and issued at the beginning of the session on the following day.
At the beginning of the fourth week, the observation group was included in the token economy and continued in the program until the sixth week. The model group continued with the program until the sixth week. For the first three days of the fourth week the procedure was identical for both groups as it had been the previous three weeks with the model group. At the end of the third day, the experimenter explained to both groups that he could not adequately check everyone's production every half hour and would therefore have to reduce the number of reinforcements from six to two. For the two remaining days of the fourth week, production was checked twice during the first hour or from 12:30 p.m. to 1:30 p.m. for both groups. The length of the daily sessions was thus reduced from three hours to one hour, but the production interval of one half hour remained the same. During the fifth and sixth week, the production interval was increased from one half hour to one and one half hours. The number of production intervals remained the same at two. The daily sessions increased back to the original three hours as a result of increasing the production interval. All subjects received prior notice of the termination date. They were also provided opportunities to cash in remaining tokens.
CHAPTER BIBLIOGRAPHY


CHAPTER IV

RESULTS

The performance of the model group was compared with that of the observation group to test the efficacy of imitation. A descriptive statistic, the per cent of error, was first computed for each group. This consisted of the number of times a subject failed to perform at or above the baseline divided by the total number of opportunities. The model group exhibited 13.11 per cent error during the first week of the study while the observation group exhibited 2.77 per cent during their first week on the token economy. The Sign Test for related samples, Siegel (1, p. 68) was employed to examine the significance of this difference. The absolute number of errors must be utilized for computational purposes which necessitates an equal number of opportunities for error by both groups. The number of opportunities to commit an error during the corresponding first week was greater for the model group than for the observation group. The model group was provided six opportunities per day for the first week and for two weeks subsequently. The observation group, by contrast, received six opportunities per day only for the first three days of the first week. The errors committed during the first three days of the corresponding first week were employed to fulfill the
computational requirements of the Sign Test. With N=5, and Table I indicating no Sign changes, the differences were significant, \( P=0.031 \) Siegel (1, p. 250). The observation group produced significantly fewer errors than did the model group.

**TABLE I**

COMPARISON OF ERRORS COMMITTED

<table>
<thead>
<tr>
<th>Model Group</th>
<th>Observation Group</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Paired B</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Subjects C</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Although an attempt was made to pair subjects according to production level for comparison purposes, a Randomization Test for matched pairs was performed to detect any real statistical difference. This test is particularly powerful, because all the information in the sample is utilized. Power efficiency is said to be 100 per cent Siegel (1, p. 92). Measurement in an interval scale, and small sample size, comply with the test requirements Siegel (1, p. 92). The observed difference pooled across tasks, were -2, -36, -9, +27, and +21 for the paired subjects. This outcome was not in the region of rejection for \( P=0.05 \); therefore, the null hypothesis was supported. The matched subjects, and thus the two groups, were considered
to be equivalent in terms of production at the beginning of the experiment.

The probability of a practice effect influencing the production of the observation group was remote. The effect of the three weeks' "practice" between starting the model and observation groups on the token economy is considered to be negligible when compared to an average six months' prior training. The only alteration in previously routine program, as far as the subjects were concerned, revolved around the fact that some would immediately receive tokens for good production and some would have to wait three weeks for the opportunity. At the end of the first three weeks (see Figure 1), three of the subjects in the model group equalled or exceeded twenty-five per cent increase production on at least one task. The other two subjects exhibited fifteen per cent and nineteen per cent increases. An analysis of the data in Table II, using the Randomization Test, indicates significant differences with $P=.05$.

**TABLE II**

**COMPARISON OF PRODUCTION BEFORE AND AFTER THE FIRST THREE WEEKS FOR THE MODEL GROUP**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Before</th>
<th>After</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1938</td>
<td>3257</td>
<td>+1319</td>
</tr>
<tr>
<td>B</td>
<td>3044</td>
<td>4175</td>
<td>+1131</td>
</tr>
<tr>
<td>C</td>
<td>9159</td>
<td>10511</td>
<td>+1352</td>
</tr>
<tr>
<td>D</td>
<td>5825</td>
<td>6897</td>
<td>+1072</td>
</tr>
<tr>
<td>E</td>
<td>3914</td>
<td>5601</td>
<td>+1687</td>
</tr>
</tbody>
</table>
Fig. 1—Production per cent increase for the model groups during the first three weeks.
All of the subjects in the observation group exceeded the twenty-five per cent increase on at least one task (see Figure 2) at the end of the second three weeks period. Utilizing the data in Table III the .05 level of significance was achieved with the Randomization Test.

**TABLE III**

**COMPARISON OF PRODUCTION BEFORE AND AFTER THE SECOND THREE WEEKS FOR THE OBSERVATION GROUP**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Before</th>
<th>After</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3257</td>
<td>4145</td>
<td>+ 888</td>
</tr>
<tr>
<td>B</td>
<td>4175</td>
<td>4207</td>
<td>+ 32</td>
</tr>
<tr>
<td>C</td>
<td>10511</td>
<td>11583</td>
<td>+1072</td>
</tr>
<tr>
<td>D</td>
<td>6897</td>
<td>7436</td>
<td>+ 539</td>
</tr>
<tr>
<td>E</td>
<td>5601</td>
<td>6613</td>
<td>+1012</td>
</tr>
</tbody>
</table>

Figure 3 indicates that the observation group increased production above that of the model group on two tasks, grinding and fasteners. Using both the Walsh Test, Siegel (1, p.85) and the Randomization Test, Siegel (1, p. 92), for related samples, the difference reproduced in Table IV on the grinding and fastener tasks are significant at the .05 level. Although the production of two subjects in the model group exceeds that of their counterpart in the observation group on the drilling task, the difference is not significant.
Fig. 2—Production per cent increase for the observation group during the second three weeks.
Fig. 3—A comparison of per cent increase in production between the observation and model groups.
TABLE IV
DIFFERENCE SCORES BETWEEN THE MODEL GROUP AND THE OBSERVATION GROUP ON FASTENER, GRINDING, AND DRILLING TASKS

<table>
<thead>
<tr>
<th></th>
<th>Fasteners</th>
<th></th>
<th>Grind.</th>
<th></th>
<th>Drill.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>+ 7.8</td>
<td></td>
<td>+487</td>
<td>- 15</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>+ 4.2</td>
<td></td>
<td>+960</td>
<td>+ 14</td>
</tr>
<tr>
<td>Subject</td>
<td>C</td>
<td>+25.6</td>
<td></td>
<td>+ 35</td>
<td>+102</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>+ 2.4</td>
<td></td>
<td>+126</td>
<td>+166</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>+ 2.2</td>
<td></td>
<td>+ 24</td>
<td>-180</td>
</tr>
</tbody>
</table>

As Figure 4 indicates, all the model group subjects accomplished at least twenty-five per cent increase production by the sixth week on the drilling operation. This finding was assumed to be significant because the lower per cent increase in production three weeks prior was significant and variability was comparable. Figure 5 shows that only two subjects in the model group exceeded the twenty-five per cent criterion on the grinding task. This finding is also assumed to be significant because the lower production three weeks prior was significant, and again variability was comparable. Figure 6 suggests increase production for all but one subject on the fastener task. Four subjects accomplished a net twenty-five per cent increase in production at the end of six weeks. Because one subject's per cent increase declined drastically, a Randomization Test was performed. The differences were significant at the .05 level.
Fig. 4—A comparison of Drilling per cent increase from the third to the sixth week for the model group.
Fig. 5--A comparison of Grinding per cent increase from the third to the sixth week for the model group.
Fig. 6—A comparison of Fastener per cent increase from the third to the sixth week for the model group.
The significantly increased production of both groups confirms studies previously cited concerning the efficacy of "token economies" Girardeau and Spradlin (2) and Lent (5). The subjects had previously learned the mechanics of the tasks and had benefit of six months practice, but behavior modification provided necessary feedback and immediate rewards to facilitate production and good work habits.

The hypothesis that the observation group would exhibit superior initial performance when compared to the model group, was substantiated. The observation group exhibited significantly fewer errors and exceeded production of the model group significantly on two of the three tasks. This finding receives support from Kliebhan (4). The model group showed superior performance on the drilling task, although the difference was not significant. This inconsistent result can perhaps be partially explained by the fact that one male subject's original production rate was extremely low in the model group, and he responded extraordinarily well to the token economy. One of the female subjects in the observation group expressed an aversion to the drilling task which could have been reflected in production rate. Generally though, the data
suggest rather strongly that subjects provided with peer models surpassed the performance of those who are not provided with a model. This conclusion receives support from the previously reviewed study by Hartup and Coates (3).

As predicted, reduction of reinforcement from one hundred per cent to thirty-three per cent did not decrease production rate. The observation group accepted the new conditions and continued to increase production. This result is consistent with that of Berkowitz (1) and Metz (6). An examination of Figures 4, 5, and 6 indicates that subjects in the model group tended to increase production after reinforcement reduction or maintained production level. A single exception, Subject E (see Figure 6), decreased from sixty-six per cent to twenty-nine per cent on the fastener task, but increased on the other two tasks. This subject was placed on the fastener task the last three days of the study and exhibited poor production. The experimenter's announcement that the study would end, could have adversely affected production. These three days constituted half of the days spent on the fastener task for this individual. However, this dissonant result is minor when compared to the supportive data. The observation group demonstrated that with imitation procedures only a short interval of one hundred per cent reinforcement is required before a partial reinforcement schedule will maintain and increase production with mentally retarded adolescents. On a larger scale the savings of staff time could be tremendous.
This study does not prove that applying modeling procedures before behavior modification is superior to behavior modification alone, because for practical reasons, a control condition of ten subjects starting out together, experiencing only traditional behavior modification techniques, was not provided. However, the results do lend some support to this contention. The advantage of using the combination of techniques could possibly aid limited institutions in terms of staff time even though the net effect might not be significantly different than using only the traditional technique.
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CHAPTER VI

SUMMARY

The study was undertaken to investigate the facilitating effects of imitation procedures upon a traditional behavior modification program. A "token economy" was instituted within a workshop setting.

The mentally retarded subjects were four boys and six girls, with a median age of eighteen years six months and mean Intelligence Quotient of 66.4. The subjects performed the following three production tasks an average of six and one half months prior to the study. One consisted of drilling a hole in a rivet. The second entailed grinding off the burr left by the drilling operation. The third was composed of assembling two washers and a screw into a fastener combination.

Each subject was matched with another in terms of production on the three tasks. One subject of the matched pair was randomly assigned to one of two groups, designated the model and observation groups. The other subject was automatically placed in the other group. Sex was equalized across groups.

At the beginning of the study, all the subjects in the model group were given a production goal to achieve based on
previous output. If this quantity was achieved within a half-hour period of time, verbal praise was given, as well as a token to be exchanged for privileges and games not ordinarily enjoyed. Although not involved directly with the token economy, the observation group worked in the presence of the model group and observed the distribution of tokens as well as the exchange for privileges and games.

The model group was provided six opportunities per day for reinforcement during three hours in the afternoon, five days a week, for three weeks. Production goals were increased as a function of increased production. At the beginning of the fourth week, the observation group was included in the reinforcement program. For three days both groups were allowed six opportunities per day to receive a token to be exchanged for games and privileges. The number of opportunities for reinforcement was subsequently reduced from six to two times per day. The reinforcement period was reduced from three hours to one hour. During the fifth week, this reinforcement period was gradually increased to the original three hours, but the number of opportunities for reinforcement remained constant.

The first hypothesis, predicting that all subjects would exhibit superior performance, received support from the results. All subjects accomplished at least fifteen per cent increase on all tasks, which was significant with $P=.05$. 
The hypothesis that the observation group would exhibit superior performance when compared to that of the model group, received considerable support from the results as well. The observation group committed significantly fewer errors and out performed the model group significantly on two of the three tasks.

The hypothesis that reduction of reinforcement from one hundred per cent down to thirty-three per cent would not adversely effect production of either group was also substantially confirmed. With a single exception, all subjects either maintained or increased production quantity. This result was significant with P=.05.

This study demonstrates that imitation procedures facilitate performance on production tasks of mental retardates involved in a traditional behavior modification program. The experiment does not prove that a combination of imitation and behavior modification is superior to behavior modification alone, but the results add support to this contention. The necessary control condition using behavior modification exclusively was not provided for practical consideration. Nevertheless, a sharp reduction in the number of reinforcements without a concomitant reduction in quality of work did conserve the technician's time. On a larger scale, the combination of procedures could relieve overburdened institutional staff personnel while maintaining production rate of patients.
June 24, 1970

Dear Parents:

A new project will start next week at Caruth and, with your permission, we would like to include your son/daughter in this program. The primary object of this project is to improve the rate of production to a level compatible with competitive employment.

In order to accomplish an increase in production, each trainee will be rewarded for doing more work by not only an increase on his paycheck, but an additional reward. This reward will be something the trainee does not ordinarily get to do. The type of reward given will be according to the interests of each trainee and with the approval of his/her parents. Of course, things which are not in the best interest of the trainee will not be permitted.

Please mail the enclosed acceptance slip as soon as possible. If you have any questions, please contact me at Caruth. The telephone number is 637-0740.

Sincerely yours,

Jim McCabe
Project Director

JM:mm

Enc.
AUTHORIZATION FOR RELEASE OF INFORMATION

We as parents/guardian of __________________________ give our consent for the use of any information and or photographic procedures as may be necessary for educational, training or research purposes.

__________________________________________
Date

__________________________________________
Signature of Parents/Guardian

PLEASE RETURN TO:  Mr. Jim McCabe
Dallas Rehabilitation Institute
7850 Brook Hollow Road
Dallas, Texas 75235
REWARDS AND EXCHANGE VALUE

1. Games - two tokens
   a. Checkers
   b. Cards
   c. Dominoes
   d. Other games.

2. Bring a hobby from home - six tokens.

3. Ride the front elevator - one token/ride.

4. Shuffle board - three tokens

5. Play record player - three tokens.

6. Play the piano - three tokens.

7. Take a walk outside - two chips.
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Report