*THE EFFECTS OF SEQUENTIAL PICTORIAL CUES,
SELF-RECORDING, AND PRAISE ON THE
JOB TASK SEQUENCING OF RETARDED ADULTS*

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The present study investigated the effects of a self-recording procedure using sequentially organized picture cues on independent task changes of four mentally retarded adults. Independent task changes were identified as the beginning of new tasks without directives or instruction. In addition to investigating treatment effects, the long-term maintenance of the task-change behavior was measured. During self-recording and picture-cue training, the subjects completed an increased proportion of independent task changes, and this behavior was maintained for more than 10 wk following removal of the training procedures. Self-recording using picture cues was shown to be an effective procedure for teaching mentally retarded adults to function more independently in a job setting.

DESCRIPTORS: sequential pictorial cues, self-recording, response maintenance, vocational training, adult retardates

An abundance of literature is available in which visual aids are used to instruct the mentally handicapped population. Much of the literature focuses on communication skills (Elder and Bergman, 1978; Harris-Vanderheiden, Brown, Mackenzie, Reinen, and Schiebel, 1975) or basic academic skill training (Heward, 1978). In vocational skill training, in contrast, research regarding visual stimulus factors has been limited to simple task acquisition, such as correct discrimination of objects in an assembly task (Gold, 1972; Irvin and Bellamy, 1977). Little research has been conducted on the use of visual aids to instruct the mentally handicapped population in more generalizable vocational skills. A study by Robinson-Wilson (1977) used sequential picture recipe cards to train retarded adults to cook independently. Performance on

recipe steps was counted as correct when done without help or with nonspecific verbal cues from the instructor. Each card contained about three pictorial representations of separate steps, although exact sequencing of steps was required only when necessary for a recipe outcome. The study suggested the value of such visual aids in increasing the independence of severely retarded adults in a home setting. If self-management programs could be used in a vocational setting, they might help retarded adults transfer newly learned behavior from the training setting into the community, *i.e.*, work settings.

Research regarding self-management of retarded individuals in work settings is limited (Wehman, Shutz, Bates, Renzaglia, and Karan, 1978). However, studies using self-management or self-control procedures with other populations have identified and found effective several behavioral components including self-assessment and self-recording (Bandura and Perloff, 1967; Glynn, Thomas, and Shee, 1973). Glynn and Thomas (1974) used a chart representing on-task behavior as a cueing procedure. The chart combined with a self-control procedure produced an increase in on-task behavior in

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students in a third-grade classroom. One purpose of the present investigation was to study the effects of visual cues combined with a self-management procedure on independent task changes of four mentally retarded adults in a vocational setting.

Studies reporting successful self-control procedures have found inconclusive results regarding behavior maintenance (McLaughlin, 1976). The Glynn and Thomas (1974) study, for example, observed (informally) a lack of maintenance beyond the period of the experiment. Santogrossi, O'Leary, Romanczyk, and Kaufman (1973) found similar results with a self-determined reinforcement procedure. In contrast, other studies have found successful behavior maintenance with self-control procedures (Drabman, Spitalnik, and O'Leary, 1973; Glynn *et al.*, 1973; McLaughlin and Malaby, Note 1). Clearly, more research is needed into response maintenance using self-control procedures. Therefore, a second purpose of the present study was to observe the effects of pictorial cue and self-recording procedures on maintenance of independent task change.

METHOD

Subjects and Setting

The study was conducted in a vocational training program located on the University of Washington Campus. On-the-job training activities for the subjects consisted of vocational skills in food service, such as dishwashing or washing and drying pots and pans. The training stations were part of a public restaurant facility that served lunches to approximately 500 persons daily.

Subjects were four mentally retarded adults: Alice, 24 yr old, with a Full Scale IQ of 50 on the Wechsler Adult Intelligence Scale (WAIS); Bill, 22 yr old and an IQ of 35 on the Stanford-Binet Intelligence Scale, Form L-M; Chuck, 24 yr old and a WAIS IQ of 43; and Doug, 21 yr old and a WAIS IQ of 48. Alice and Doug worked in a dishroom training station, Bill

washed pots and pans, and Chuck worked in a separate dishroom. All subjects had been assigned to their current jobs for more than 2 mo.

Observations were taken during the entire workday which extended from 10:30 a.m. to 3:30 p.m. Each subject had been assigned between 9 and 14 job tasks during the workday. These were performed in the same order every day. None of the subjects had common tasks with other subjects in the study. A training analyst in each training station evaluated and instructed the trainees in task performance. Prior to baseline measurements, all subjects in the study had been observed by the author to be dependent on the training analysts to direct them to begin a task. When the training analyst did not give prompts regarding the nature of a new task, the subjects would stand motionless for periods of time, watch other trainees work, engage in inappropriate behavior, continue their current task when unnecessary, begin an unassigned task, or begin a task that was not in correct sequence.

Dependent Variable

Independent task change. Independent task change was defined as beginning the correct (in sequence) assigned task without directives or instruction.

Observation Procedure

Independent task change was recorded by the training analyst. When a subject finished a task, the training analyst waited for a 40-sec period in which no interaction occurred with the subject. If the subject did not begin the next correct task, or started an incorrect task by the end of the 40-sec period, a directive was given. If the subject correctly changed tasks, no interaction occurred. End-of-a-task was identified as the completion of the last step in a detailed task analysis of the job task, *e.g.*, "hang up the broom" was the last step in "sweeping the dishroom floor."

Data were collected during the entire workday on a sheet listing each subject's tasks in cor-

rect order. A tally (1) was listed for each directive, a minus (—) for each independent task change, or a zero (0) for each nonapplicable task opportunity. A nonapplicable task opportunity occurred if the subject was prevented from performing his task, *e.g.*, no available window cleaner to wash windows, or the subject arrived late and had no time to do the task. At the end of each workday, training analysts calculated the percentage of tasks changed without directives, signed the data sheet(s), and returned them to the experimenter. Training analysts were provided no further feedback on the data or the progress of the treatment until the experiment was completed.

For the purposes of checking reliability, a pool of four trained observers (including the author) was used throughout the study. An observer recorded behavior simultaneously with and independently of the training analyst during selected sessions for each subject from an inconspicuous location in the job area. Both the training analyst and the observer were present in the work area when the subject began the first task of the day. They did not discuss subject behavior, procedures, or the data, and did not approach each other during the work session. A minimum of two agreement checks per subject taken over an entire workday was required for each phase of the study. At least one check was required to reach 95-100% before intervention occurred. Interobserver agreement scores were calculated by dividing the number of task-change agreements in a day's observation by the number of agreements plus disagreements for that day $\times 100$.

Design Elements and Experimental Conditions

The study consisted of three experimental phases conducted over a period of 60 vocational training days, with 6 subsequent follow-up probes extending through an additional 6-wk (30 training days) period. The phases were: (a) baseline, (b) picture-cue training, (c) posttraining (daily checks) and (d) posttraining (weekly checks). A multiple-baseline design across sub-

jects was used to show the effects of the treatment on independent task change behavior. The multiple-baseline procedure continued through the posttraining phase.

Baseline. Conditions during baseline represented the same procedures that existed during the normal training process. When a directive was given to a subject to begin a task (after a 40-sec interval), the training analyst said, "When you finish (name of task just completed), then you begin (name of next task); do (name of next task) now."

Baseline measurements of task changes for each subject began after a 3-day observation training and practice period for the subject's training analyst. Measurements began on days 1, 4, 7, and 10 for Alice, Bill, Chuck, and Doug, and baseline data were collected for 12, 14, 16, and 18 days, respectively.

Picture-cue training. This phase consisted of teaching the subjects to manage their task change behavior through use of photographs. Each photograph represented one of the subject's assigned tasks. The photos were taped in correct sequence on a clearly visible wall in the subject's work area. Below each picture was taped a small, blank square of paper, and at the beginning of the workday, each subject was given a pencil. The self-recording procedure required the subject to: (a) walk to the photographs, (b) look at the appropriate photo in sequence, (c) mark an X on the square of paper beneath the photo, and (d) begin the task represented in the photo within a 40-sec time limit.

Pre-instruction was given at the beginning of each training day on the use of the photos. Instruction included modeling, role-playing, long- and short-term rationales for learning the procedures (*e.g.*, to keep a job, to learn to work by yourself), and finally a request for acknowledgment that the procedure was understood. A head nod or "yes" was considered sufficient acknowledgment.

Instructional feedback was given during the workday regarding the use of the photos. When the subject completed the sequence correctly,

the training analyst praised him or her for changing tasks correctly, and the interaction was recorded as an independent task change. If at any time the subject did not perform all four components of the procedure, he or she was stopped; instructed on the correct behavior, *e.g.*, "You must go and look at the picture"; told what the task in the photo represented; and instructed to go on to that task. The interaction was recorded as a prompt (nonindependent). Picture-cue training lasted 23 days for Alice, 20 days for Bill, 17 days for Chuck, and 14 days for Doug.

Posttraining (daily checks). On workdays after training, the subjects performed the management procedures without praise or feedback. The subjects were not required to use the picture-cue and self-recording system. When a subject correctly changed tasks without directives, with or without use of the photos, an independent task change was recorded. If the subject failed to change tasks correctly by the end of the 40-sec period, a directive was given to the subject, *e.g.*, "Bill, when you finish washing dishes, you clean the refrigerator. Go clean the refrigerator now." The interaction was then recorded as a prompt (nonindependent).

Posttraining lasted 25 days for Alice, 23 days for Bill, 21 days for Chuck, and 17 days for Doug. Posttraining (daily checks) ended for all subjects on day 60.

Posttraining (weekly checks). Posttraining (weekly checks) consisted of procedures identical to posttraining (daily checks). Data collection during this phase consisted of observations made once per week for a 6-wk period. Weekly checks began on day 65 and ended on day 90.

RESULTS

Percentages of independent task-change behavior for each subject are presented in Figure 1. Consecutive training days represent 5-day work weeks, Monday through Friday. Inverted triangles represent the percentage of agreement between two independent observers.

Interobserver Agreement

Interobserver agreement, checked 48 times for the four subjects and comprising 20% of the observations during the study, ranged from 85% to 100% with the median being 100%. The mean interobserver agreement for each subject during the study was 98.9% for Alice, 100% for Bill, 97.8% for Chuck, and 98.5% for Doug. The individual scores shown in Figure 1 suggest that the presence of the second observer did not influence the subject's task change behavior.

Increases in Independent Task Change

Baseline means and ranges of independent task change for the four subjects, Alice, Bill, Chuck, and Doug, respectively, were $\bar{X} = 60\%$, $R = 38\%$ to 79% ; $\bar{X} = 50\%$, $R = 25\%$ to 88% ; $\bar{X} = 69\%$, $R = 27\%$ to 89% ; and $\bar{X} = 48\%$, $R = 27\%$ to 75% . No notable trends in baseline data were apparent before the training intervention began. Initiation of picture-cue and self-recording training increased independent task changes to 90% to 100% levels for all subjects. Percentages did not drop below 77% at any time during training. Means for the four subjects during training were 98%, 93%, 96%, and 99%.

Response Maintenance

Continuation of self-recording behaviors followed cessation of training and feedback procedures. Data during posttraining indicated maintenance of high levels of independent task change for a period of approximately 10 wk for all subjects. Mean scores during posttraining (daily checks) were 99%, 94%, 99%, and 96%. Mean scores for posttraining (weekly checks) were 97%, 100%, 97%, and 87% for Alice, Bill, Chuck, and Doug, respectively.

DISCUSSION

The results indicate the effectiveness of pictorial cues and self-recording in increasing and

CONSECUTIVE TRAINING DAYS

Fig. 1. The percentage of independent task changes.

maintaining independent task-change behavior. Implementation of the procedures eliminated the necessity for constant job supervision of the subjects, therefore allowing them a degree of independence in the work setting. The results supported conclusions found in previous research by Robinson-Wilson (1977) that retarded adults can learn to function independently on work tasks through use of pictorial cues. With the design used, the individual contributions of the pictorial cues, training procedures, and reinforcement (praise) to the effectiveness of the training cannot be isolated. It can only be concluded that the combination of all components produced the improvement in performance.

Withdrawal of the combined training procedures and reinforcement components had little or no effect on maintenance of the high levels of independent task changes. Similar response maintenance with a self-recording procedure was found by Drabman *et al.* (1973) during a 12-day period in which children in a classroom evaluated their social and academic behavior. The 12-day self-evaluation phase had followed extensive fading procedures. The present study supports the Drabman *et al.* (1973) research and shows that response maintenance can be attained for at least 10 wk when self-recording procedures are used by subjects.

This research exemplifies the technique for generalization over time described by Stokes and Baer (1977) as "Train and Hope." The training procedure increased the percentage of appropriate behavior, then part of the training package was discontinued in the hope that generalization would occur. Since generalization was evident over an extended period of time (10 wk), explicit programming for generalization was not done.

Withdrawal of all components of the package did not occur in this study; rather pictures, blank squares of paper, and pencils remained available to subjects throughout the entire 90 days of observation. The behavior might have stayed at its terminal high level even if the entire training package were removed. Observers informally

observed a decrease in the use of pictures toward the end of the posttraining phase. Subjects either were selective in marking the squares or marked several squares at once and then changed tasks correctly.

As a result of this anecdotal observation, observers checked the frequency of times that subjects approached and marked the pictures during two of the posttraining (weekly checks) observations. On day 70, Alice approached and marked 79% of her pictures, Bill 89%, Chuck 31%, and Doug 65%. On day 90, the last day of the experiment, the respective percentages were 21%, 78%, 31%, and 0%. The fact that subjects continued high percentages of independent task changes, even though their frequencies of picture-cue use diminished over time, suggests that the high proportion of independent task changes may have maintained with total removal of the training package. Future research into self-management training of retarded individuals might attempt to determine the best means of attaining response maintenance when all components of treatment are removed.

On the other hand, future research may suggest that complete withdrawal of the package does not indicate clearly response maintenance. If the pictures are still required after prolonged exposure, they are of little applied cost, and allowing them to remain in use might be a practical alternative to maintenance programming procedures. In addition, the pictures might remain available as a convenient means for future transfer of training to new settings and/or responses. Further research of this nature would contribute to a more complete understanding of generalization programming.

REFERENCE NOTE

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