GENERALIZATION AND MAINTENANCE OF COMPLEX SKILLS BY SEVERELY HANDICAPPED ADOLESCENTS FOLLOWING PICTURE PROMPT TRAINING

DAVID P. WACKER, WENDY K. BERG, PAT BERRIE, AND PAT SWATTA

THE UNIVERSITY OF IOWA AND DES MOINES PUBLIC SCHOOLS

Three severely handicapped adolescents were trained, using a picture prompt package, to complete three complex vocational or daily living tasks. Results indicated that all students required many training sessions to learn the first training task. Following initial training, however, all students generalized their use of the pictures across settings without additional training. The students also needed substantially reduced amounts of training on the remaining two tasks. During maintenance, two of the students continued to perform at relatively high levels of accuracy with and without the picture prompts, whereas one student continued to need the pictures.

DESCRIPTORS: picture prompts, generalization, severely handicapped students

Generalization and maintenance of performance are critical features of investigations on the use of permanent prompting techniques. Extensive training time may be needed, at least initially, to train clients to independently use permanent prompts to guide their performance. For example, Spellman, DeBriere, Jarboe, Campbell, and Harris (1978) reported that several of their clients trained to use picture prompts either required extensive training or never acquired the necessary skills to use picture prompts on daily living tasks. If picture prompts promote generalization or maintenance of performance following training, extensive training may be justified, especially for severely handicapped learners who frequently do not generalize or maintain their performance. Wacker and Berg (1983, 1984) reported that severely handicapped adolescents can generalize their use of pictures across very similar tasks, but the extent to which generalization occurs across dissimilar tasks was not determined.

Two types of generalization tasks were evaluated in the investigation reported here: (a) one that

used different materials from the training task but involved similar motoric responses and resulted in a similar outcome, and (b) one that utilized different materials, required different motoric responses, and resulted in a different outcome.

METHOD

Students, Tasks, and Settings

Three adolescents (13 to 19 years old) who were classified as severely or profoundly retarded (measured IQ scores of less than 26) participated. None of the students had previously been exposed to picture prompts, and none had received training on the tasks selected for investigation. All were ambulatory, and none had sensory impairments.

Each student was initially trained to complete one task; following training, performance was evaluated sequentially on two generalization tasks. For Denny, the training task was to dust tables, which consisted of 15 steps. During generalization (across settings) sessions, Denny dusted a table in an "apartment" located within the school. The first generalization task was to clean a window. This task was similar to the training task in that both tasks required similar motoric responses (spraying and wiping) and both resulted in similar outcomes (a clean surface). The second generalization task was a conduit-assembly task, which consisted of 22 steps.

This research was funded, in part, from a contract to the first author from the Iowa Department of Public Instruction. We express our appreciation to Steve Maurer, Dawn Rorlands, Jerry Caster, and the staff and students of Ruby Van Meter High School. Requests for reprints or task analyses of the target behaviors should be sent to David P. Wacker, Division of Developmental Disabilities, The University of Iowa, Iowa City, Iowa 52242.

The training task for Jason consisted of a 21-step laundry folding task, requiring that he fold four separate laundry items placed randomly in a laundry basket. Training on this task was conducted in the classroom, and generalization was assessed in the school apartment. The first generalization task was a different laundry folding task that consisted of 20 steps. The second generalization task was the conduit-assembly task.

For Alice, the training task was a 12-step envelope stuffing task. Alice was to insert three items into an envelope. Training was conducted in the classroom, and generalization was assessed in a school office. The first generalization task was the conduit-assembly task, and the second generalization task was to set up a board game.

The picture prompts consisted of black-and-white pictures (13 cm × 18 cm) bound into separate books for each task. Pictures indicated the object to be selected by the student, and in some cases (e.g., dusting), the motoric response required. The number of pictures used for each of the tasks ranged from 16 (envelope stuffing) to 29 (conduit assembly).

Design and Reliability

A multiple baseline (across subjects and tasks) was used to evaluate the effects of the training package. For the training task, baseline was conducted in both the training (classroom) and generalization settings. Training was begun immediately following baseline on the training task, and baseline was extended on the two generalization tasks.

Following the completion of training, posttraining was conducted for the training task in both the training and generalization settings. Probes on the first (similar) generalization task occurred simultaneously with posttraining, after which training was implemented. Probes and training were conducted in a similar fashion for the second (dissimilar) generalization task following the completion of training on the first generalization task.

All data were collected by the two classroom teachers and the experimenters. During reliability probes, an experimenter and a teacher, or both

teachers, recorded observations simultaneously and independently. An agreement occurred when the two observers recorded that the same step in the task analysis, or that the same page in the picture book, was completed (or turned) correctly.

Reliability probes were taken between 35 (Alice) and 39 (Jason) times for each student, and 10 times across all conditions. Reliability was computed by dividing the number of independent agreements divided by the number of agreements plus disagreements. Mean reliability was 99% for all students, and ranged from 91% to 100% across all sessions.

Procedure

Baseline. During baseline on all tasks and in all settings, the students were provided with the materials needed for a task, and told to complete the task (for the conduit-assembly and envelope stuffing task, a sample of a completed object was also presented). Each session continued until the student attempted to complete a task once. Students were provided with noncontingent praise intermittently within each session to keep them on task. Students did not have to complete the steps in the order specified in the task analysis to receive credit for a step (e.g., wiping table before spraying). A maximum of two sessions were conducted daily for a given student, with a maximum of two sessions conducted daily for any specific task.

Training. A three-step training sequence was used for all students on the training task. During Training Step 1, the students were taught to turn all the pages in the book in a sequential fashion. A demonstration of correct performance was provided prior to each session during which an experimenter modeled turning the pages in a picture book. Verbal and physical correction were provided following errors, and contingent praise or snack items were presented intermittently. Training Step 1 continued until the student turned all the pages correctly on two consecutive sessions.

During Training Step 2, the student selected the object depicted by the picture. The picture book contained only pictures of each new object, and the student was to select the appropriate object, place

it on the table, and turn to the next page. All other factors were the same as for Training Step 1.

During Step 3, all pages were again included in the book. The student turned each page, and either selected the appropriate object or performed the motoric response depicted by a picture. Two criteria were used for Training Step 3: (a) the student independently completed a minimum of 80% of the steps correctly and in the correct sequence for two consecutive sessions, and (b) the student independently selected all items correctly for two consecutive sessions.

Posttraining. Posttraining was conducted in both the training and generalization settings under baseline conditions, except that the picture prompts were available to guide performance. Posttraining in both settings continued for two to three sessions.

Generalization probes and training for the generalization tasks. Generalization probes were conducted for both generalization tasks with the same procedures used for posttraining. Following the generalization probes, training was the same as described for the training task, except that training consisted only of Training Step 3.

Maintenance. Maintenance data were collected 3–4 months following the completion of training for the second generalization task. Maintenance was conducted under posttraining conditions. For the training task, maintenance data were collected when the picture book was both available and not available to the students. For the generalization tasks, the picture book was always available during maintenance.

RESULTS AND DISCUSSION

The performance of the students is provided in Figures 1 (Alice), 2 (Denny), and 3 (Jason). Every fifth session is shown in the figures for Training Step 3 (except for the final training sessions) because of the large numbers of sessions required.

During baseline, the students performed all tasks with less than 55% accuracy. Alice required 143 total training sessions to reach the performance criteria, Denny required 79 sessions, and Jason 83.

During posttraining, Alice demonstrated an ini-

tial decrease in performance in the training setting, but she turned all pages and completed all tasks steps in sequence during the final two sessions in the classroom and in the office.

Alice demonstrated no improvement in performance, and only inconsistent use of her picture book, during the probe sessions for the first generalization task. Training for this task took 22 sessions to complete; a reduction of 121 training sessions from the number of sessions needed for the original training task. Alice generalized her use of the picture book during the generalization probe on the second generalization task, but her skills in using the pictures to independently guide her performance did not improve. However, only 13 training sessions were required for this task. Alice maintained her use of the picture prompts over a 4-month period across all tasks.

Denny displayed consistently high levels of performance in both settings during posttraining, turning a minimum of 90% of the pages consistently and completing a minimum of 80% of the task steps correctly. Denny also demonstrated substantial improvement in both performance and use of pictures during the first generalization probe. He turned a minimum of 90% of the pages correctly and completed a minimum of 78% of the tasks steps correctly (compared to 38% during baseline). Training on this task required only 17 sessions. During the second generalization probe, no generalization in either page turning or task performance occurred. Training on this task, however, required only six sessions. With the exception of one session (Session 1 for the second generalization task), Denny maintained both his use of the pictures and his task performance over a 3-month interval.

Jason performed very similarly in both settings during posttraining. He turned all pages sequentially and completed a minimum of 95% of the task steps correctly.

During the first generalization probe, Jason generalized his use of turning the pages and demonstrated substantial improvement in his performance. Jason required only 15 training sessions on this task (a reduction of 68 sessions). Jason also

Figure 2. Denny's performance across all conditions of the investigation.

Figure 3. Jason's performance across all conditions of the investigation.

generalized his use of the pictures across the second generalization task, turning 70% and 100% of the pages during the two probe sessions. During training, he required only 19 sessions to reach criterion on this task.

Jason's performance during maintenance on the training task indicated that he continued to need the pictures to guide his behavior. Jason turned all pages correctly during both generalization tasks, but maintained his performance on only the first (similar) task. On the first generalization task, he completed at least 70% of the steps correctly.

The results can be summarized as follows: (a) all students required relatively extensive training to acquire the training task, (b) following training, the students continued to perform at high levels of accuracy when all components of the training package were withdrawn except for the picture books, (c) all students generalized their skills to a second setting without need for additional training, (d) the amount of training on both a similar and a dissimilar generalization task was substantially reduced following acquisition on the training task, and (e) all students maintained their skills on both the training task and at least one generalization task over a 3–4 month interval.

Documentation of generalization was based on the guidelines proposed by Stokes and Baer (1977), who suggested that generalization has occurred when either no training or substantially reduced training is needed during generalization conditions. Given these criteria, generalization occurred across settings because no training was required, and generalization occurred across tasks because substantially reduced training was required. This latter finding is of particular interest because both a similar and a dissimilar task were selected for each student. In addition, no improvement in the students' performance occurred within any of the baseline conditions, even after repeated practice.

Gifford, Rusch, Martin, and White (1984) and Martin, Rusch, James, Decker, and Trtol (1982) suggested that picture prompts, like other cuing procedures, produce generalization because the students acquire self-control, i.e., the students learn to guide their own behavior through the use

of picture cues. In our investigation, the students immediately generalized their skills across settings, and then required substantially reduced training across tasks. It is plausible that they learned to guide their behavior with the picture prompts (i.e., developed self-control) but continued to need relatively minimal training to modify the quality of their skills. It should also be noted, however, that the students were trained to complete the tasks with a package of procedures that included demonstrations of correct performance, correction, and praise. The isolated effects of the picture prompts are not known, and only Jason demonstrated the continued need for pictures during maintenance.

Jason (Figure 3) rapidly acquired the necessary skills to perform the training task but during Training Step 3, he appeared to not acquire the independent page turning skills. Following training, however, he consistently turned the pages independently to guide his performance. This result occurred because Jason frequently delayed turning a page, resulting in a spurious amount of correction during training. In future investigations, reinforcement might be delivered only after the look-then-do chain has been demonstrated, rather than separately after both the look and do components.

The major benefit of training students to use picture prompts may be more related to generalization rather than to acquisition of performance. In each of the previous studies, once the use of pictures was trained, generalization also occurred. The results of this investigation extend previous findings by demonstrating generalization of performance across settings, generalization across both similar and dissimilar tasks, and maintenance over a 3–4-month interval. In addition, the participants were inexperienced in completing complex tasks and were lower functioning than those in most previous studies.

REFERENCES

- Gifford, J., Rusch, F., Martin, J., & White, D. (1984). Autonomy and adaptability: A proposed technology for maintaining work behavior. In N. Ellis & N. Bray (Eds.),

- International review of research on mental retardation* (Vol. 12) (pp. 285–314) New York: Academic Press.
- Martin, J., Rusch, F., James, V., Decker, P., & Trtol, K. (1982). The use of picture cues to establish self-control in the preparation of complex meals by mentally retarded adults. *Applied Research in Mental Retardation*, **3**, 105–119.
- Spellman, C., DeBriere, T., Jarboe, D., Campbell, S., & Harris, S. (1978). Pictorial instruction: Training daily living skills. In M. Snell (Ed.), *Systematic instruction of the moderately and severely handicapped* (pp. 391–411). Columbus, OH: Charles E. Merrill.
- Stokes, T. & Baer, D. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis*, **10**, 349–367.
- Wacker, D., & Berg, W. (1983). Effects of picture prompts on the acquisition of complex vocational tasks by mentally retarded adolescents. *Journal of Applied Behavior Analysis*, **16**, 417–433.
- Wacker, D., & Berg, W. (1984). Training adolescents with severe handicaps to set up job tasks independently with picture prompts. *Analysis and Intervention in Developmental Disabilities*, **4**, 353–365.

Received February 11, 1985

Final acceptance August 20, 1985