*TRAINING AND GENERALIZATION OF LAUNDRY SKILLS:
A MULTIPLE PROBE EVALUATION
WITH HANDICAPPED PERSONS*

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An instructional procedure composed of a graded sequence of prompts and token reinforcement was used to train a complex chain of behaviors which included sorting, washing, and drying clothes. A multiple probe design with sequential instruction across seven major components of the laundering routine was used to demonstrate experimental control. Students were taught to launder clothing using machines located in their school and generalization was assessed later on machines located in the public laundromat. A comparison of students' laundry skills with those of normal peers indicated similar levels of proficiency. Follow-up probes demonstrated maintenance of laundry skills over a 10-month period.

DESCRIPTORS: community survival skills, laundry skills, mental retardation, generalization, multiple probe technique, task analysis

The recent emphasis on placing handicapped persons in normalized living environments has led to the development and experimental validation of training programs for a variety of daily living skills (Cuvo, Leaf, & Borakove, 1978; Neef, Iwata, & Page, 1978; Page, Iwata, & Neef, 1976; van den Pol, Iwata, Ivancic,

Page, Neef, & Whitley, 1981). These studies used detailed task analyses and reinforcement procedures to teach community survival and vocational skills to the developmentally disabled.

A factor apparently related to successful community adjustment is the maintenance of acceptable personal hygiene and appearance. Survey data (O'Conner, 1976; Power, 1979) and casual observation suggest that maintaining clothing cleanliness is an important skill that can have significant impact on the occurrence and quality of a wide range of personal and professional interactions. Using a simulated laundry task, Cuvo, Jacobi, and Sipko (1981) taught a set of laundry skills to mentally retarded subjects but did not document generalization or maintenance of skills. This study experimentally validates a training program for a complex sequence of laundry skills and extends the work of Cuvo et al., by requiring subjects to launder soiled clothing and by assessing generalization in a novel setting and maintenance of skills over time.

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METHOD

Students

Three male students, Ronald, Chester, and Foster participated in the study. Their ages were 24, 17, and 12, respectively, with I.Q. scores in the trainable or educable mentally impaired ranges. Criteria for selection were: motor skills necessary to perform the required behavior; ability to discriminate colors and wet vs. dry clothing; ability to follow simple instructions under token reinforcement conditions; ability to attend to a task for at least 30 min; and no previous record of systematic training in laundry skills.

Setting and Apparatus

The study was conducted at an educational facility for students with physical handicaps and/or developmental retardation. Training sessions were conducted in a simulated apartment containing a washing machine and dryer. Laundry materials included powdered laundry detergent, fabric softener sheets, an 8-oz. cup, a laundry basket, and two sets of 30 clothing articles. Each set included 15 light and 15 dark pieces of clothing with a variety of shades of nine common colors.

Special prompting devices were constructed to facilitate training. Students were taught to sort dark and light articles by matching the color of clothing items to color charts attached to the front of the washing machine. Colored triangles and squares were initially placed on the washing machine control panel to indicate the proper dial settings, and were later faded systematically until the student could complete the response correctly without these cues.

Response Measures and Observations

A detailed task analysis, comprising 74 discrete responses divided into seven major components, was prepared from observations of

people doing laundry. Each component contained 4 to 30 responses and functioned as a logical unit with a distinct beginning and ending. Observers scored each consecutive response in the chain as correct or incorrect and the prompt level and the consequence delivered for each response.

Sessions lasting 20-90 min (mean = 31) were conducted once or twice daily. Machine cycles were shortened by manipulating the control dials while the student was seated away from the training area, thus reducing the time needed to complete the entire chain by about 50%. No cycle time alterations were made during the final training condition or in laundromat sessions.

Reliability observers were given instructions and two practice recording sessions in which scoring disagreements were discussed with the primary observer. The observers were situated so that both could observe the training area without viewing the data sheet of the other. Interobserver agreement checks were evenly distributed across all conditions in both training and laundromat settings on 5%, 29%, and 46% of the sessions for Ronald, Chester, and Foster, respectively. Agreement percentages were calculated using the formula: $\text{agreements} / (\text{agreements} + \text{disagreements}) \times 100$. An agreement was scored only when both observers scored the same response as correct or incorrect. Overall agreement averaged 96%, 99%, and 97% for Ronald, Chester, and Foster, respectively.

Probes and baselines. Performance was assessed during a variable number of probe and baseline sessions which preceded training on each component. All probe and baseline sessions began with an instruction to do the laundry. The student was then allowed to perform each step in the sequence. If an incorrect response occurred or if no response occurred within 5 sec of a prompt to continue working, the student was seated away from the laundry area and the observer correctly performed the response. The

student was then called back and asked to continue.

Probe sessions differed from baseline sessions in two ways. First, a probe measured each response in the entire chain and occurred immediately prior to baseline and training for every component. Baseline sessions occurred following the probe and measured only previously trained components plus the component about to be trained. Baseline data were gathered on a variable number of consecutive sessions immediately prior to training sessions. Second, no tokens or descriptive praise were delivered during probes. During baseline, tokens were delivered for previously trained responses only. The density of token delivery for previously mastered components was reduced during baseline sessions.

Training. Following baseline, each component was trained using a graduated 3-prompt procedure (Horner & Keilitz, 1975), consisting of verbal instruction, modeling, and graduated guidance. If one prompt level failed to produce a correct response within 5 sec, the next level was introduced.

When the student performed a component at 100% accuracy for two consecutive trials, he was required to perform the entire laundry chain from the beginning through the component most recently mastered. The entire chain of previously mastered components was trained (chain training condition) until it was performed without errors or prompts for two consecutive trials. When errors occurred on previously mastered components during the chain training condition, that component was trained as a unit until it was performed once without errors and chain training trials were resumed.

An existing token economy was continued during the study. While training each component, tokens were initially delivered on a CRF schedule for correct responses. As training progressed, the reinforcement schedule was changed through a series of successively larger VR schedules until tokens were no longer delivered for

responses in previously trained components. To approximate natural contingencies, no tokens were available during the final chain training condition and the student was allowed to engage in a preferred activity following completion of the task.

Experimental design. A modification of the multiple probe design (Horner & Baer, 1978) was used to demonstrate the effects of the training package on each successive laundry component. Training on each component was preceded by a probe of the entire chain and by a variable number of baseline sessions which measured responding on previously trained components and the component about to be trained.

Generalization. Generalization of the clothes sorting skill was assessed on a set of 30 novel clothing items. Generalization of the entire laundry chain was assessed in a public laundromat using procedures identical to those used during probe sessions. Following the generalization assessment, training was implemented to retrain steps performed incorrectly and to train additional responses necessitated by the presence of coin slots and minor differences between the training and laundromat equipment. The dependent variables were the percentage of correct responses and the number of trials necessary for the student to complete the entire chain at 95% accuracy.

Follow-up. Two follow-up probes were conducted for each student 10 mo after training had ended. These probes were conducted in the training setting using the same procedure as in pretraining probes.

Social validity. Social validity was assessed during the final chain training condition by having a student and a normal peer each wash one of two loads of equally soiled clothes, as judged by three naive observers. One female and two male university students served as peers. Using a 5-point scale ("much cleaner" to "much less clean"), 15 naive observers rated the relative cleanliness of sets of articles laundered by the students and normal peers.

Fig. 1. Percent correct responses for each trial on each component of the laundry chain. Heavy vertical lines on the horizontal axis represent successive training sessions. Lighter vertical lines along the horizontal axis indicate trials within a session.

RESULTS

The effect of the instructional procedure on the acquisition of the laundry skills chain for Chester is presented in Figure 1.

Figure 1 shows a low percentage of correct responses during probe and baseline sessions for the seven laundry components. Correct responding reached 100% in each component only after training procedures were applied to that component.

Figure 1 also shows an increase in the number of chain training sessions required to master the sequence of trained components as addi-

tional components were trained and added to the chain. Similar results were obtained for Foster and Ronald who required 83 and 92 sessions, respectively, to complete the program. No student performed more than 18% of the laundry steps correctly on the initial probe or required more than seven training sessions to master a component.

Generalization. Each student showed generalization of the sorting task to a set of novel items and generalization of laundry skills in the laundromat. Correct response percentages for the laundromat generalization probe were 79%, 82%, and 37% for Ronald, Chester, and

Foster, respectively. Most of Foster's errors (30 of 37) were due to a failure to sort clothes correctly. During retraining trials, each student showed rapid acquisition of the responses performed incorrectly in the generalization probe, requiring 3, 5, and 3 trials, respectively, to meet the criterion of 95% unprompted accuracy.

Follow-up. Students had a variable number of opportunities to perform the laundry task in the interim between generalization and follow-up probes. Ronald, who had regularly laundered his personal clothing and participated in a work activities project involving laundry, averaged 95% correct on the follow-up probes. Chester, who had not performed the laundry task for 2 mo prior to the probes performed at 90% accuracy. Foster, who had not performed the task for 10 mo, completed the two probes at an average of 51% correct. As in the laundromat generalization probe, most of his errors were due to his failure to sort clothes before laundering.

Social validity. Of the 15 naive observers, 10 rated the students' laundry as clean as their peers' laundry. Four of the observers scored the students' laundry as slightly cleaner than that laundered by their peers, while one observer scored the normal peers' laundry as much cleaner than the students' laundry.

Cost analysis. The cost for materials, utility services, trainer wages, and laundromat expenses was calculated using actual community rates. For Chester and Foster, training costs were separated from obvious research costs (baseline and reliability expenses) since the former better represented the true amount of resources that were required. Costs were calculated at \$111.55 for Chester and \$121.46 for Foster. Costs were not available for Ronald.

DISCUSSION

This study demonstrated the effectiveness of a 3-prompt procedure in training a complex sequence of laundry skills which generalized to

a public laundromat. Maintenance was seen over a long period at a level of proficiency which appeared to be related to the number of posttraining opportunities to perform the task. Social validation showed that the quality of the students' performances was not discriminable from community norms.

The multiple probe design, described by Horner and Baer (1978) using hypothetical data, was modified slightly in demonstrating experimental control in this study. Because components mastered as independent units were unlikely to occur in correct sequence without training, it was necessary to add a chain training condition. Each of the 74 discrete responses occurred only once per laundry sequence, thus requiring the development of a procedure for the immediate correction of errors occurring in previously trained components during baseline and chain training sessions. To avoid extinction of previously mastered components, tokens were provided for responses from these components during baseline conditions on components about to be trained. Correct responses from the component about to be trained were never followed by token delivery. Finally, it was necessary to extend the number of trials beyond prescribed limits in several baselines to achieve stability.

The ascending baselines seen on a few components late in the laundry sequence could be accounted for in several ways. Responses occurring in later components were topographically similar and occurred under stimulus conditions similar to responses trained in earlier components thus presenting the opportunity for stimulus and/or response generalization to occur. Furthermore, simply observing the arrangement of stimulus conditions for the performance of each successive step in the chain during baseline and probe conditions may have also influenced baseline response levels by "modeling" the correct response and response sequence. Therefore, it may be necessary to impose an upper limit on the number of baseline sessions and make other modifications in the multiple probe design based on practical constraints.

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