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ABSTRACT	

Two adults (ages 37 and 57) with severe mental retardation in a supported employment setting (a janatorial supply company) were taught to use self-instruction in combination with multiple exemplar training to solve work-related problems. The combined strategy resulted in generalization to nontrained problems. The use of the strategy to promote independent performance among supported employees is discussed. (Author/DB)

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Teaching Supported Employees with Severe Mental Retardation to Solve Problems

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Running Head: PROBLEM-SOLVING

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Abstract

Two individuals with severe mental retardation, employed by a janitorial supply company, were taught to use self-instruction in combination with multiple exemplar training to solve work-related problems. The combined strategy resulted in generalization to nontrained problems. The use of the strategy is discussed in terms of promoting independent performance among supported employees.

Descriptors: self-instruction, multiple exemplar training, problem-solving, supported employment, response generalization, severe mental retardation.



Teaching Supported Employees with Severe Mental Retardation to Solve Problems

Lack of independence has been identified as a factor contributing to job termination of supported employees (Lagomarcino, in press; Kregel, Wehman, Revell, & Hill, in press). Direct instruction methods typically introduced and monitored by employment training specialists have been criticized because they increase the likelihood that work behavior will be performed only in the presence of the specialist (Agran & Martin, 1987; Alberto, Sharpton, Briggs, & Stright, 1986; Rusch et al., 1984). Because job retention requires independent work performance under a wide range of job-related circumstances, supported employees need to learn to generalize their performance across people, tasks, and situations not associated with training (Berg, Wacker, & Flynn, in press).

Among the suggestions made by Berg and her colleagues (Berg et al., in press), self-instruction was identified as a strategy in promoting independent performance among supported employees. Two studies have investigated the effectiveness of self-instruction among individuals with severe mental retardation in vocational settings (Agran, Salzberg, & Stowitschek, 1987; Rusch, McKee, Chadsey-Rusch, & Renzaglia, 1988). Agran et al. (1987) indicated that although the participants in their study learned to seek assistance, they generally did not verbalize self-instructions in either the training or generalization setting. In contrast, participants



with mild to moderate mental retardation did learn to verbalize self-instructions in an earlier study reported by Agran, Fodor-Davis, and Moore (1986).

Rusch et al. (1988) found that instructional feedback provided during work performance sessions combined with self-instruction training was required before a student with severe mental retardation would request assistance from a supervisor or request more materials to complete his work assignment. Rusch et al. (1988) concluded that self-instruction may not be a sufficiently powerful strategy to produce generalization to target settings. In a previous study, Rusch, Morgan, Martin, Riva, and Agran (1985) indicated that self-instruction training was sufficient to produce generalized responding. However, the subjects in their earlier study were moderately mentally retarded.

The purpose of this study was to extend the findings of Agran et al. (1987) and Rusch et al. (1988) by examining the application of self-instruction among individuals with severe mental retardation in a supported employment setting in addition to utilizing multiple exemplars. Specifically, because studies had failed to achieve generalization of either self-instructing or correct responding, this investigation sought to teach generalized responding by combining multiple exemplar training (Berg et al., in press; Sprague & Horner, 1984; Stokes & Baer, 1977) with self-instruction training. Multiple exemplar training strategies have been shown to produce within-class response generalization. In an attempt to increase response



generalization to an even broader response class (problems that occur throughout the work day to which employees do not respond independently versus, for example, crossing streets (Horner, Jones, & Williams, 1985), using vending machines (Sprague & Horner, 1984), or crimping and cutting electronic capacitors (Horner & McDonald, 1982)), the use of a verbal mediation strategy (i.e., self-instruction) was combined with a multiple exemplar strategy.

Method

<u>Subjects</u>

Two supported employees participated in this study because their work supervisor indicated that they did not solve work-related problems independently. When confronted with a work-related problem (e.g., task materials in the wrong place or equipment not working), the employees were observed either to stop working (e.g., when materials could not be found) or to continue to work but to ignore the consequences of a problem (e.g., bag full of leaking soap). Myra, who was 37 years old, was diagnosed as severely mentally retarded (her estimated IQ was 27) and exhibited frequent occurrences of self-injury and personal property damage at a 60-bed residential facility where she had been living for 11 years. Instances of self-abuse occurred less frequently when she was working. She was being treated with anti-psychotic medication for behavior disorders and anti-convulsant medication for epilepsy. She had been employed for two years by a janitorial supply company that packaged liquid soap, previous to which she had been employed in



a sheltered workshop for nine years. However, at the time cf this investigation, Myra's employer was considering decreasing her hours considerably due to her continuing to fail to perform tasks independently.

Les was 57 years old and diagnosed as severely mentally retarded (his IQ was estimated to be 33). Les had been living in a separate wing of the same residential facility as Myra for 16 years and had been employed by the same janitoral supply company for two years. Prior to his current employment, Les had worked in a sheltered workshop for 14 years. Les's work supervisor reported that without assistance Les consistently failed to adjust to minor changes in his work routine.

Both Myra and Les typically spoke in sentences of two to three words. Myra's enunciation was generally intelligible, but Les's speech was difficult to comprehend. Neither employee could read, write, count, or tell time. Both employees worked from 8:45 to 3:00 daily and were transported to and from work in a bus owned by the adult service agency serving these individuals.

<u>Setting</u>

This investigation took place in a supported employment clustered placement that provided continual supervision to five employees with moderate and severe mental retardation. The worksite was situated within the warehouse of a large janitorial supply company in a large work room that was set up specifically for packaging liquid soap. All training and observation sessions were conducted in the work room.



Job Tasks and Materials

Job tasks related to packaging soap included filling holding trays, operating a soap-dispensing machine, operating a heat-sealing machine, cleaning soap residue from bags, assembling boxes, and packing completed soap bags. The subjects performed all job tasks on a rotational basis with the cther employees at the job site. Upon arrival each day, all employees were expected to put on an apron and a hair net, check the job board to see which job they were assigned for that day, prepare job materials, and begin work independently.

<u>Dependent and Independent Measures</u>

Five separate measures were taken in this study (three dependent measures and two independent measures). As a measure of training effectiveness, two dependent measures were assessed during training. These included (a) the frequency of self-instruction steps verbalized and (b) the frequency of correct responses to multiple examples of trained problem situations. The third dependent measure was the frequency of correct responses to untrained problem situations, which was measured during work performance. Self-instruction statements and correct responses to trained problem situations served as independent measures when Myra and Les were required to solve problems during work performance.

Self-instruction comprised four statements: (a) stating the problem; (b) stating the correct response; (c) reporting the response; and (d) self-reinforcing. Table 1 lists the multiple examples of work-related problem situations and appropriate



responses to these situations that were identified by the work supervisor. These situations and responses then were grouped randomly into five responses that would be trained and five responses that would serve as generalization probes (untrained). As indicated in Table 1, trained responses for Myra served as generalization probes for Les, and trained responses for Les served as generalization probes for Myra.

Insert Table 1 about here

Observation and Recording Procedures

Myra's and Les's work performance was observed in the employees' work room for 20-min sessions daily across all conditions of this study. To ensure consistency of opportunities to respond throughout the study, five randomly assigned problem situations were presented during each observation session, chosen from either an employee's group of trained or untrained problem situations. The subjects also were observed during self-instruction and multiple exemplar training which took place in the work room daily immediately prior to work performance observation sessions.

Observers and Observer Training

The first author and a second university student served as observer and observer and trainer respectively. Before data collection began, both observers read and discussed the definitions of the dependent and independent measures, the description of the training procedures, and the definitions of



the problem situations and appropriate responses. The observers, then practiced the observation and recording procedures in the actual work setting. The observers were required to reach 90% interobserver agreement for both the dependent and independent measures for two consecutive practice sessions before collecting data for this study.

Interobserver Agreement

Interobserver agreement of all five measures was taken at least two times per condition for each employee. Interobserver agreement was assessed across 33% of all training sessions (N = 15) and 38% of all work performance sessions (N = 11). The point-by-point agreement method (Kazdin, 1982) was used to assess percent agreement. Overall agreement during training was 98% for self-instruction steps verbalized, ranging from 80% to 100%, and 100% across all sessions for correct responses to trained problem situations. Overall agreement during performance was 100% across all sessions for correct responses to untrained problem situations. Overall agreement during performance was 99% for self-instruction steps verbalized, ranging from 96% to 100%, and 100% across all observation sessions for correct responses to trained problem situations. <u>Experimental Design</u> and Conditions

A multiple-baseline across subjects with a partial-withdrawal component (Rusch & Kazdin, 1981) was used to evaluate the effects of the combined training strategy. There were three experimental conditions: (a) Baseline, (b) Self-instruction and Multiple Exemplar Training, and (c)



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Withdraw Training (Partial-withdrawal).

Baseline. During the Baseline condition, no instructional feedback was provided. Five randomly assigned problem situations were set up for each employee. Each observation session consisted of either trained problem situations or untrained problem situations (generalization probes). Generalization probes occurred on an average of once every three sessions. A verbal instruction to respond to the problem situation was given to the employee as indicated on Table 1. No other information or fer back was provided. Baseline lasted five sessions for Myra and ten sessions for Les.

Self-instruction and multiple exemplar training. The five problem situations chosen for training were presented randomly across all training sessions. During each training session, the employees were given three opportunities to respond to each of the five problem situations (15 response opportunities per session). Each employee was trained individually in the employees' work area for approximately 30 min immediately preceding observation of actual work performance. Training sessions for both Myra and Les continued until correct responding during performance stabilized at four or five correct responses per session (i.e., 16 sessions for Myra, 15 sessions for Les).

After a rationale for training was presented, self-instruction training was introduced using the problem situations chosen for training. Self-instruction procedures were adapted from Meichenbaum and Goodman's (1971)



salf-instruction training sequence. First, the appropriate task response was modeled while the trainer described verbally what she or he was doing (Step 1). Then the employee performed the same response while the trainer instructed aloud (Step 2), after which the employee performed the response again while self-instructing aloud (Step 3).

The employees were taught to verbalize four statements while performing the correct response. These statements also were similar to those reported by Meichenbaum and Goodman (1971) _ j consisted of (a) stating the problem (e.g., "Tape empty"); (b) stating the correct response to solve the problem (e.g., "Need more tape"); (c) self-reporting (e.g., "Fixed it"); and (d) self-reinforcing (e.g., "Good"). The employees were allowed to develop individual adaptations of the statements. However, prompting and corrective feedback were provided if they did not verbalize an approximation of each statement. This feedback consisted of stopping the trial, modeling the correct verbalization, and then allowing the employee to practice the correct response.

Beginning with Session 24 for Myra and Session 29 for Les, both employees were asked, "What are you doing?" after their independent performance of a correct response to determine if they could produce the appropriate self-instruction statements during work performance. If either of the employees did not initiate a response (i.e., solve the problem), they were not questioned.

Withdraw training (partial-withdrawal). Both components of



the training package (i.e., multiple examples and self-instruction training) were withdrawn on Session 27 for Myra and 5 sessions later for Les. Generalization probes occurred approximately every four, rather than every three sessions during this condition.

Results

<u>Work performance</u>. Figure 1 displays the frequency of correct responses to trained and untrained problem situations for both employees during work performance. As can be seen by the Baseline displays, Myra did not correctly respond to any untrained problem situations. After self-instruction training on multiple examples was introduced, Myra correctly responded to three problem situations during each of the first two sessions. Thereafter, she correctly responded to four or five trained situations per session during the remainder of the Self-instruction and Multiple Exemplar Training condition (mean = 4.5) and during Partial-withgrawal (mean = 4.7).

Insert Figure 1 about here

Myra also learned to respond correctly to the five untrained situations over the course of this study. During the training condition, her correct responses increased steadily from one to four per session (mean = 2.7), as compared to no responses during Baseline. She continued to respond correctly when she no longer received training (partial-withdrawal condition, mean = 4.7.)



Les correctly responded to only two trained problem situations during Baseline and failed to respond to 33 out of 35 trained problems. Correct responses increased more gradually for Les during Self-instruction and Multiple Exemplar Training than for Myra, ranging from one to five correct responses per session (mean = 3.7). Les correctly responded to all five trained responses per session when he no longer received training during the partial-withdrawal condition.

In contrast to Myra's more gradual increase in correct responding to untrained problems, Les made four correct responses during the first generalization probe of the Self-instruction and Multiple Exemplar Training condition, as compared to one or no responses per session during Baseline. This level of responding maintained throughout the study (mean = 4.0 and 4.5 during Self-instruction and Multiple Exemplar Training and the partial-withdrawal condition, respectively).

Figure 1 also displays the frequency of the four self-instruction steps verbalized during work performance. Only occasional verbalizations of Step 1 (States problem) and Step 2 (States response) occurred for both employees during the Baseline condition. Few verbalizations occurred after the introduction of the training package until requests for verbalizations were initiated during Session 24 for Myra and Session 29 for Lis (refer to darkened areas of Figure 1). When asked, "What are you doing?" after the initiation of a correct response, the frequency of verbalization of all four se?f-instruction steps corresponded, with few exceptions, to the



frequency of correct responses for both Myra and Les. On only 2 occasions out of 85 did Myra fail to verbalize a self-reinforcement statement. Les failed to state the correct response twice and to self-report 3 times out of 60 opportunities. On all other occasions, frequency of self-instruction steps corresponded identically to frequency of correct responses.

<u>Self-instruction and multiple exemplar training</u>. Data indicate that Myra responded correctly to problem situations across all training sessions, except once (Session 6). Myra verbalized 92% of the self-instruction steps across all training sessions. Les verbalized 81% of the self-instruction steps across all training sessions.

Long-term maintenance. Follow-up data collected at monthly intervals for six months following daily, repeated observation and recording revealed that both employees continued to respond correctly to either four or five drained and untrained problem situations. (See Figure 1). Both Myra and Les also continued to verbalize all problem-solving steps when asked, "What are you doing?" after the independent performance of each correct response.

Discussion

This investigation demonstrated "reralized problem-solving by two supported employees with severe mental retardation as a result of a combination of self-instruction and sufficient exemplar training. Generalized use of the training components (i.e., self-instruction steps verbalized and correct responses

to trained problem situations) was observed, as well as generalized responding to untrained problem situations. These results are important because they suggest that persons with severe mental retardation can learn to use self-instructional statements to solve unique problems when self-instructional statements are learned with multiple examples.

Our findings extend the work of Agran et al. (1987) and Rusch et al. (1988) in several important ways. First, participants in the Agran et al. (1987) study failed to self-instruct in either the training or generalization setting. Agran and colleagues used single-instance training in combination with self-instruction across four 30-min sessions. The current study used multiple examples of problem situations in response to which both subjects learned to self-instruct. However, it is unclear whether increased opportunity for practice or multiple exemplars account for the differences observed between the Agran et al. (1987) study and the present investigation. In the present investigation, the supported employees learned to self-instruct while they were learning to solve five problems that were presented three times (resulting in 15 problem situations in the present study versus 4 in the Agran et al. (1987) study).

Second, Rusch et al. (1988) found that correct responding (i.e., requesting materials) did not generalize from the training situation to the work performance situation without instructional feedback during performance. Unlike Agran et al. (1987), Rusch and colleagues used extensive training sessions to



teach the employee in their study to self-instruct (i.e., 42 and 28 sessions for materials missing and not enough materials, respectively). However, Rusch et al. (1988) also used single-instance training. Our study suggests that adding multiple exemplars does account for generalized problem-solving, a finding that was not evident in Rusch et al. (1988).

Although the effects of self-instruction cannot be separated from multiple examples, it may be that the combined strategy produces generalized problem-solving across a broader stimulus class than has been demonstrated when either strategy has been used exclusively. Previous investigations of multiple exemplar training (e.g., general case programming) typically have focused upon within-class generalization, for example, generalized use of vending machines or crossing similar intersections (Haring & Laitinen, in press). The subjects in the current study learned to solve a broad range of problems requiring a variety of functionally dissimilar responses. For example, the employees learned to remove obstacles that were in the way, get more materials that were missing, and plug-in equipment that was disconnected from a power source. Clearly, future research is needed to understand more fully the relationship between the self-instruction and the multiple exemplar learning strategies when applied to similar and dissimilar stimuli.

This investigation also poses some limitations worthy of consideration. First, both supported employees' abilities to produce self-instructional statements were not assessed during generalization until several work days after training was



introduced. Future research should consider subjects' abilities to generalize the self-instructional statements in an attempt to understand more fully the relationship between self-instruction and multiple exemplar training.

Additionally, because the first author served as one of the primary observers the possibility of observer bias exists. However, in this investigation, data collected by the first author did not differ from those collected by the second observer throughout the duration of the study, supporting the possibility that observer bias was not a possible confound. Further, the second observer was naive to the objectives of this investigation.

In summary, self-instruction training with multiple examples was found to be effective in teaching two supported employees with severe mental retardation to solve untrained work-related problems. Because supported employees who can perform job tasks independently are more likely to retain their jobs (Lagomarcino, in press), this investigation is an important addition to emerging research. The ability to solve problems increases the marketability and employability of individuals with mental retardation, including those with severe mental retardation. Self-instruction combined with multiple exemplar training appears to hold some promise as a teaching strategy that employment specialists could readily adopt in providing follow-up services to supported employees. This strategy also represents the emergence of a technology that seeks to promote employee independence.



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Author Notes

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Table 1

Work-related Problem Situations and Correct Responses

	Problem Situation	Instruction	Correct Response
1.	Paper towel in drain of sink; sink full of water ^a	Instructed by trainer to wring out rag in sink	Remove paper towel; drain sink
2.	5 pieces of trash on table ^D	Instructed by trainer to go to table to begin work	Throw trash in basket located within 2m of table
3.	Radio is unplugged	Instructed by trainer to turn on radio	Plug in radio and turn on
4.	Box is on table next to soap dispensing machine	Instructed by trainer to put tray on table	Put box in proper place or seek assistance
5.	Bundle on table where work is to be conducted	Instructed by trainer to begin working	Put bundle in proper place
6.	Tape dispenser is empty	Instructed by trainer to get tape dispenser	Fill tape dispensor
7.	Cardboard pad is in box with chip beards	Instructed by trainer to get more chip boards	Put pad in proper place
8.	Chair is in center of work room	Instructed by trainer to hang rag by sink	Put chair next to table
9.	Puddl e of soap on table where work is to be conducted	Instructed by trainer to begin working	Wipe up soap with rag
10.	Box containing hair nets is in wrong place	Instructed by trainer to get hair net	Put box in proper place

^aTrained Responses for Myra; Caneralization Probes for Les: 1, 3, 5, 7, 9

^bTrained Responses for Les; Generalization Probes for Myra: 2, 4, 6, 8, 10



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Figure Caption

Figure 1. Frequency of correct responses to trained and untrained problem situations (generalization probes) and frequency of self-instruction steps verbalized during performance. Broken lines indicate data missing due to employee absence.



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